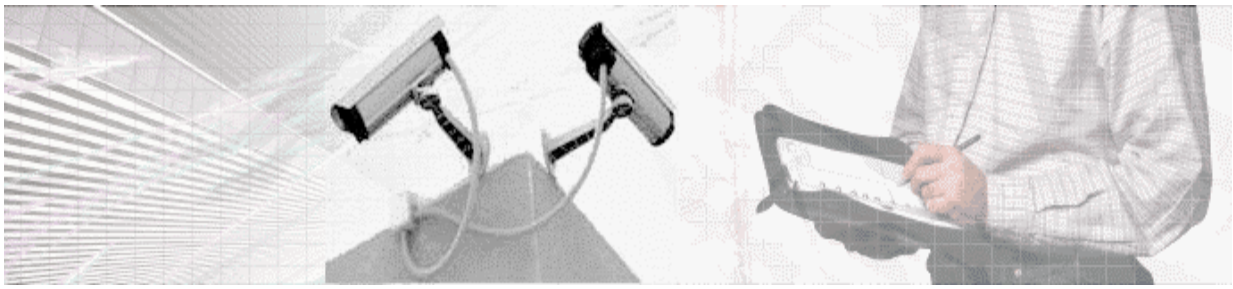


VideoCAD

Program for professional CCTV system design

version 8.2 Professional

User manual

Table of Contents

Part I

General information on VideoCAD 8 Professional

1 General information on VideoCAD 8 Professional

VideoCAD is a multifunctional tool for professional video surveillance system design, modeling parameters of video image and video equipment.

VideoCAD allows even the beginners to use the new opportunities appearing to be hard to obtain without it due to the complexity of calculations and therefore not being used even by the skilled engineers of CCTV.

VideoCAD practically boosts the quality of CCTV design to a new level which appears to be beyond any competition with those lacking the program.

Four VideoCAD versions are offered:

- ***VideoCAD 8 Professional*** *- the most powerful, professional version with many unique tools.*
- *VideoCAD 8 Lite* 31 *- basic version offers the most useful and easy-to-master tools for CCTV design;*
- *VideoCAD 7 Starter* 45 *- easiest, low cost version;*
- *VideoCAD 7 Starter II Kit* 45 *- is like the Starter version but with several valuable features* 45 *in addition. Starter II version is offered only in a kit with IP Camera CCTV Calculator and VideoCAD Plugin for SketchUp;*

VideoCAD 8 Professional is registered with USB dongle. All other VideoCAD versions are registered only by personal registration code. This code doesn't depend on computer hardware or a dongle. This code is valid on any computer.

VideoCAD Starter, VideoCAD Starter II Kit and VideoCAD Lite can be upgraded to VideoCAD 8 Professional at discount price.

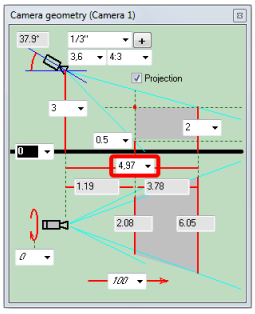
Licenses of **VideoCAD 8 Professional** and **VideoCAD 8 Lite** allows free use of the **demo versions** for educational purposes, for research, theses, writing articles, etc. non-profit activities.

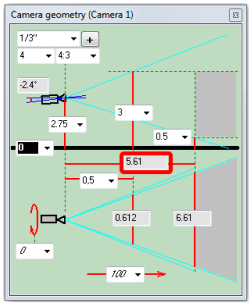
Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

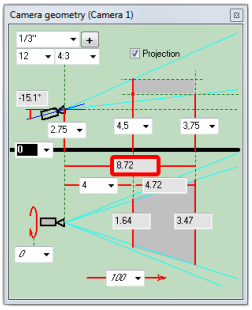
The main features of VideoCAD 8 Professional:

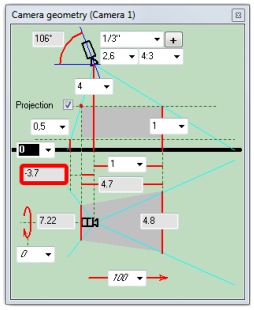
Calculations

Calculating geometric parameters 289 of camera view area in any camera position.



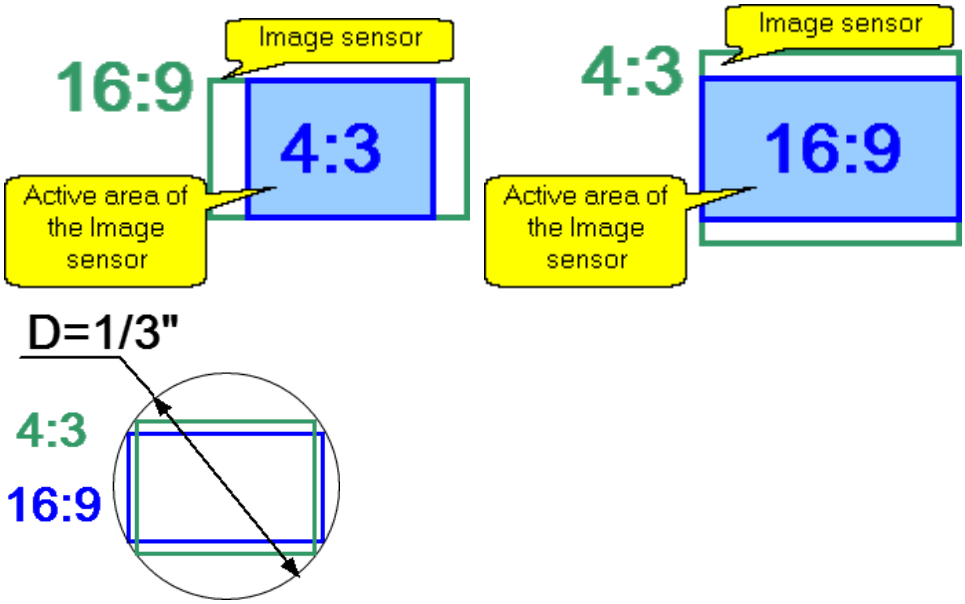




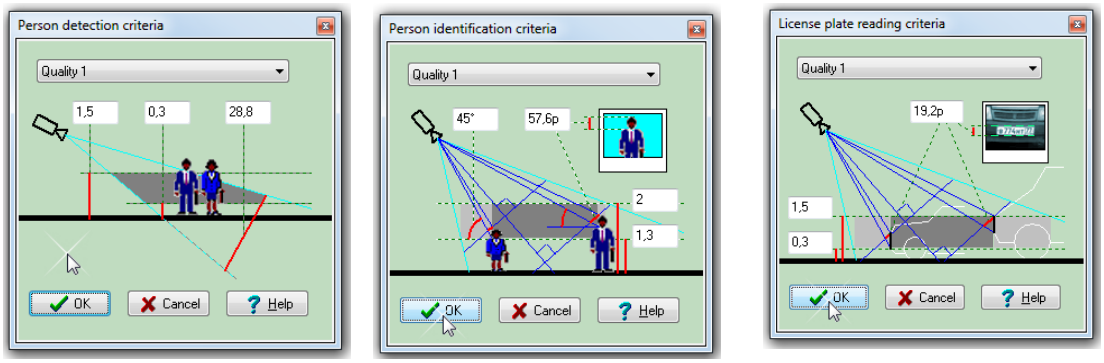


Calculating size of the active area of the image sensor in dependence of the aspect ratio of the

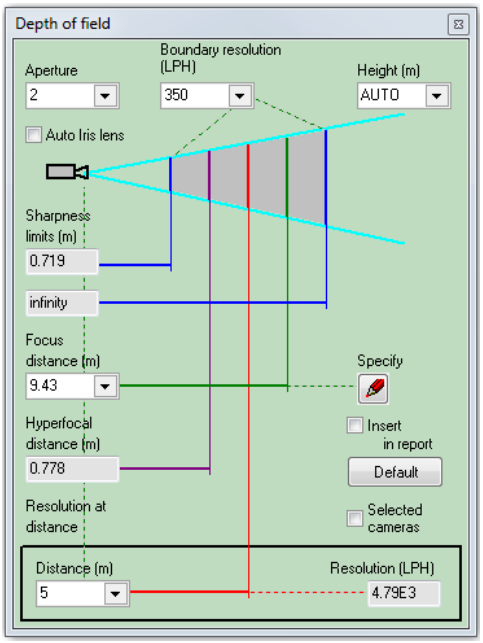
image sensor and the aspect ratio of the output image of the camera.



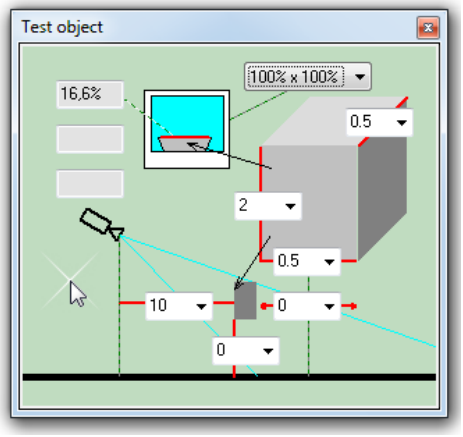
Calculating horizontal projection sizes of person detection, identification and license plate reading areas.



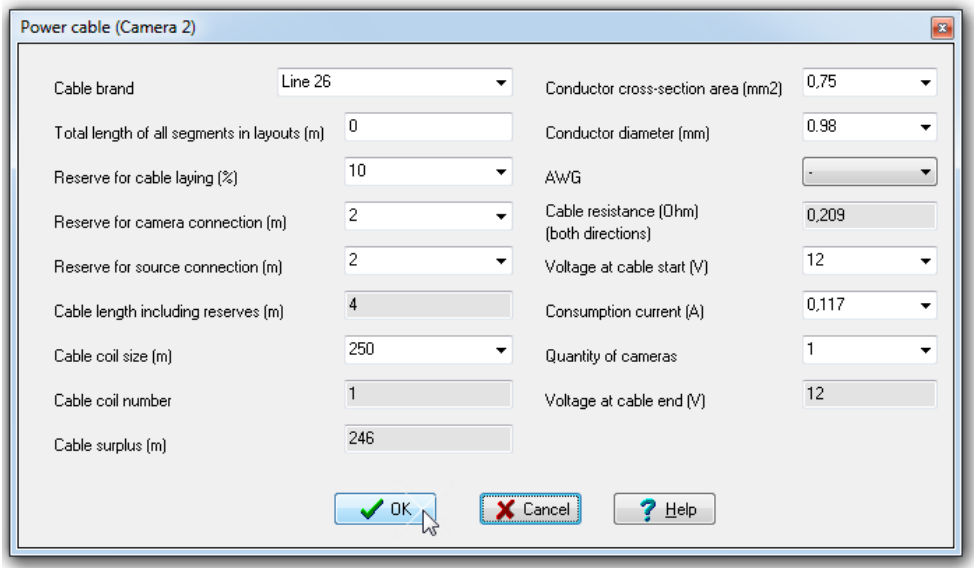
Calculating Depth of Field 454 of each camera of the project.



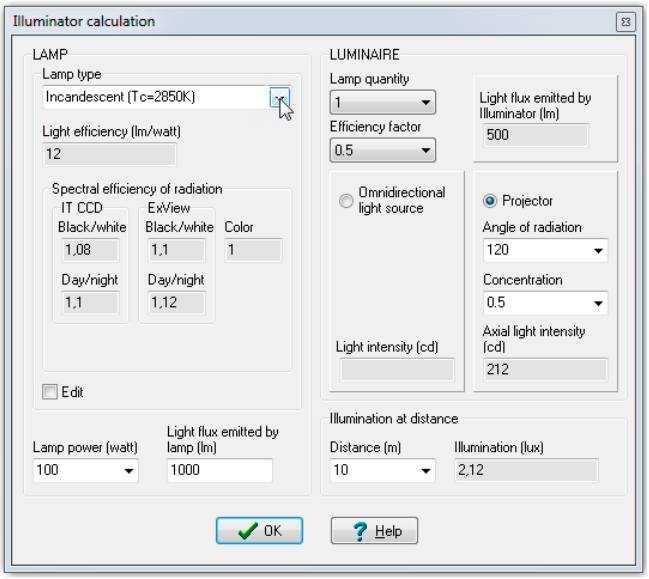
Calculating the image size on display of any object 507 in camera view area in percentage of display size, pixels and millimetres (inches in case of Imperial format).



Calculate length 590 and electric parameters of cables 515.

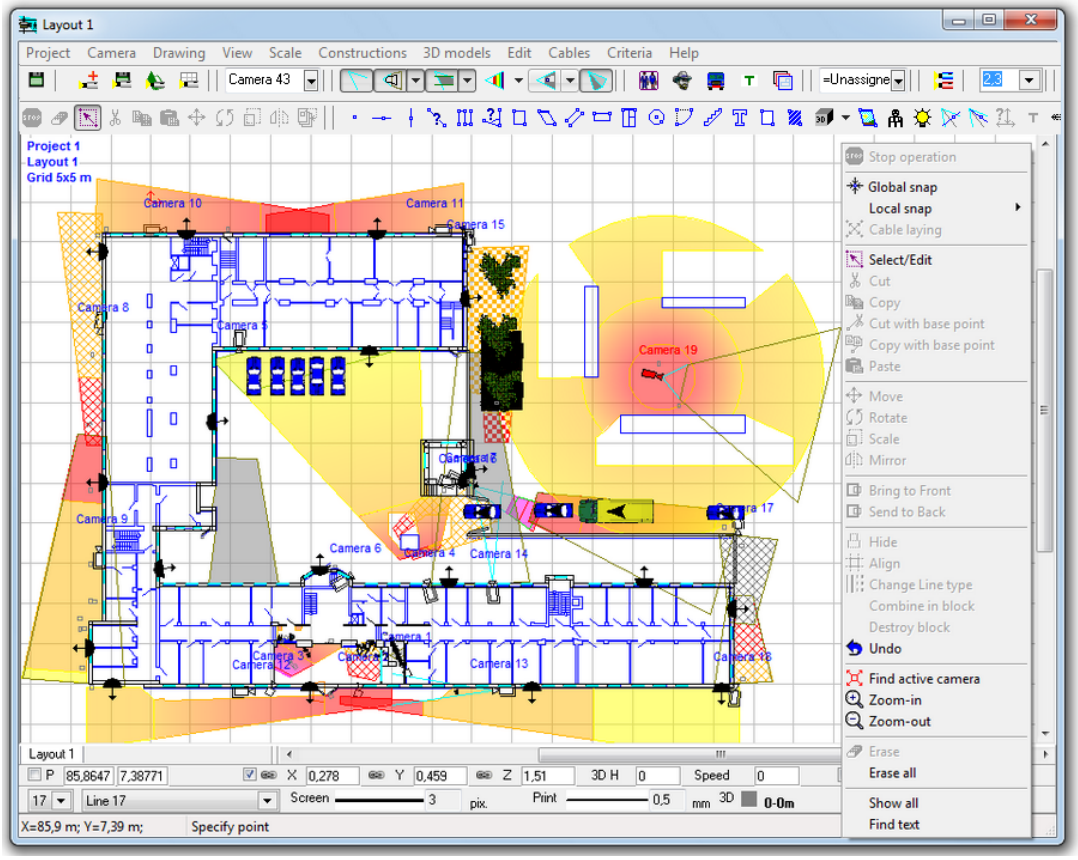


Calculate light power and illumination produced by illuminators 461.



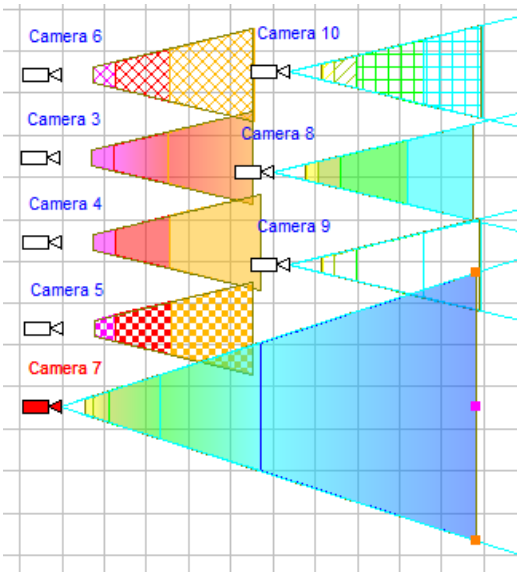
Working with 2D projections

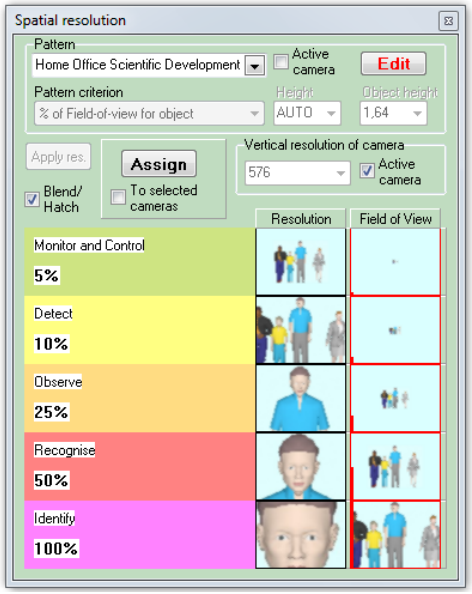
Use 2D Graphics window with CAD interface 161. Use a lot of 2D/3D constructions and CAD tools, line types, font types, snaps 209, horizontal and vertical projections, up to 10 layouts in each project, unlimited number of layers 276.



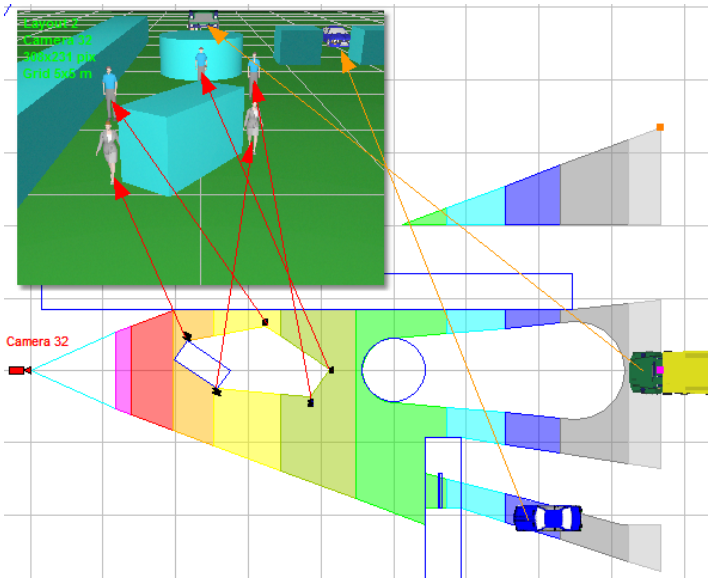
Display on the 2D layout results of calculations 3: view area projections, person detection and identification areas, depth of field limits, test object, cables and luminaries.

Display by separate colors and hatch styles different regions of spatial resolution 177 and field-of-view size. There are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch; Home Office Guidelines for identification; P 78.36.008-99, Australian Standard AS4806: Closed Circuit Television, European Standard EN50132-7, ISO/IEC 19794 Biometric data interchange formats.

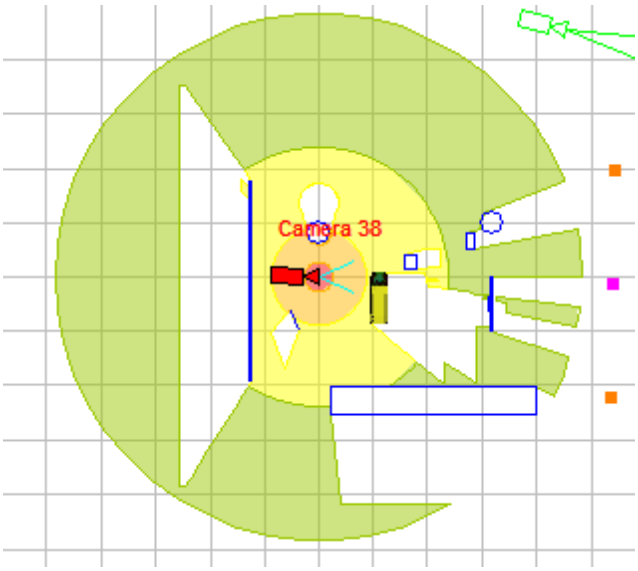




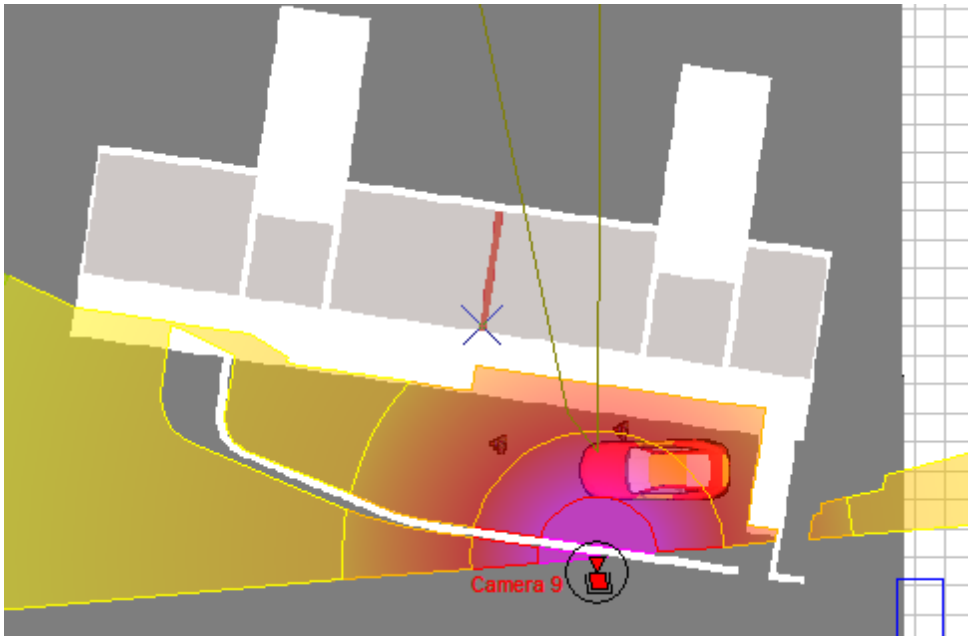
Construct the horizontal projection of camera control areas including shadows 178 from obstacles on the scene.



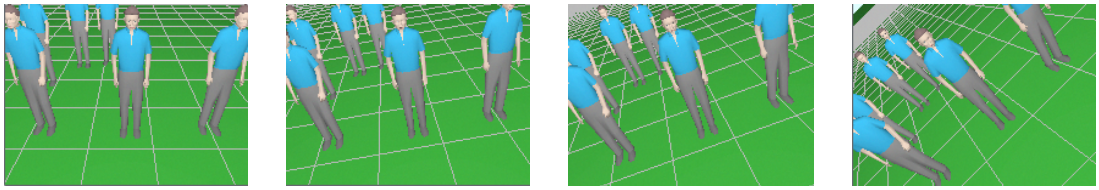
Choose the best positions and calculate control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.

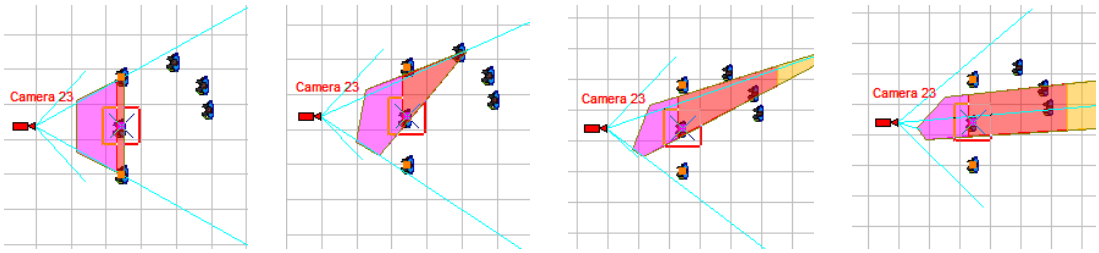


Simulation of the horizontal projection of the view area and visualization of the spatial resolution distribution of panoramic cameras 626 (fisheye, 360°/180°).

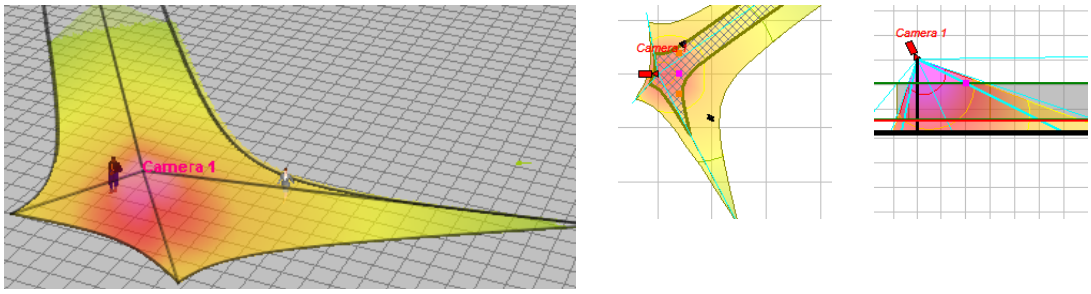


Modeling camera rotation 297 around the main optical axis.



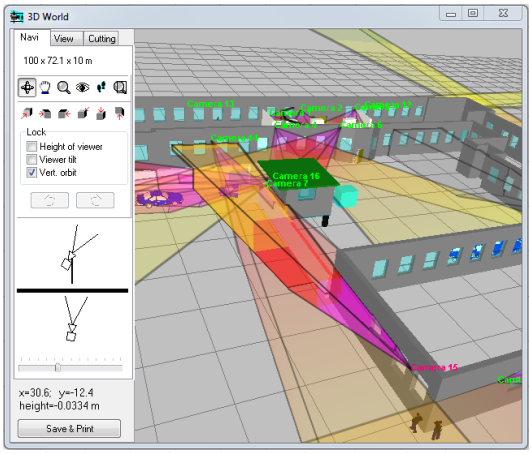


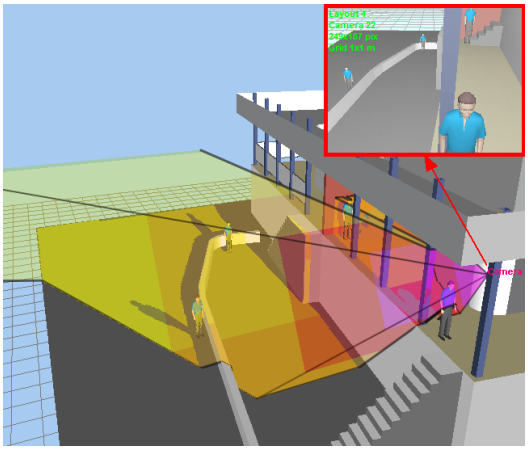
Modeling lens distortion 654. Modeling influence of the lens distortion on view area shape, on view area projection shape and spatial resolution distribution.Correct modeling wide-angle lenses with strong distortion.

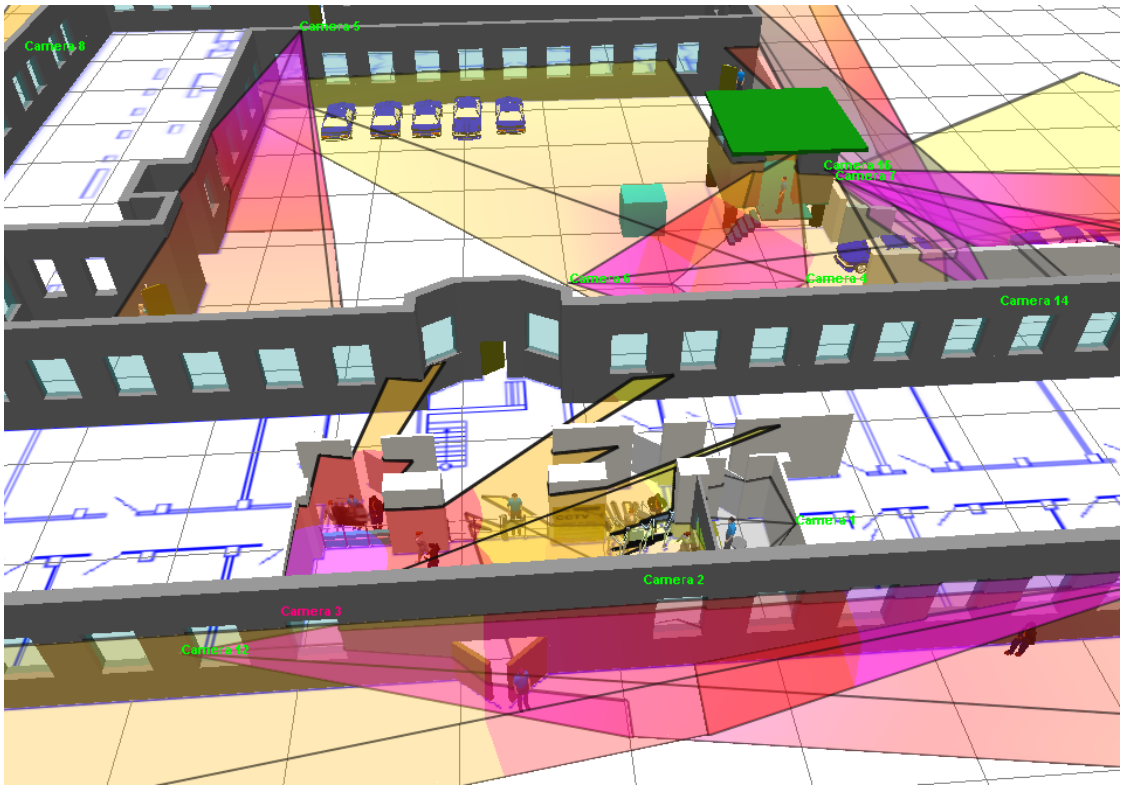


3D modeling layout and camera view areas

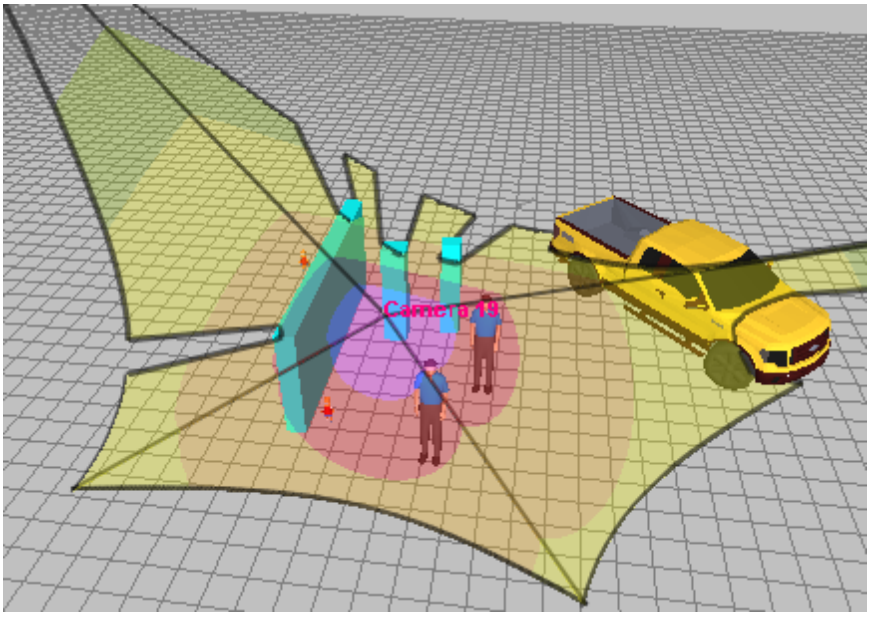
VideoCAD has special 3D World 342 window with standard tools for 3D navigation 343 (**Orbit, Move, ZOOM, Walk, Look around, Zoom frame**). With the help of the window you can observe the layout in 3D representation. You can work on the project in usual 2D projections and watch it in 3D. You can "walk" on the floors of 3D models of buildings and study every detail.



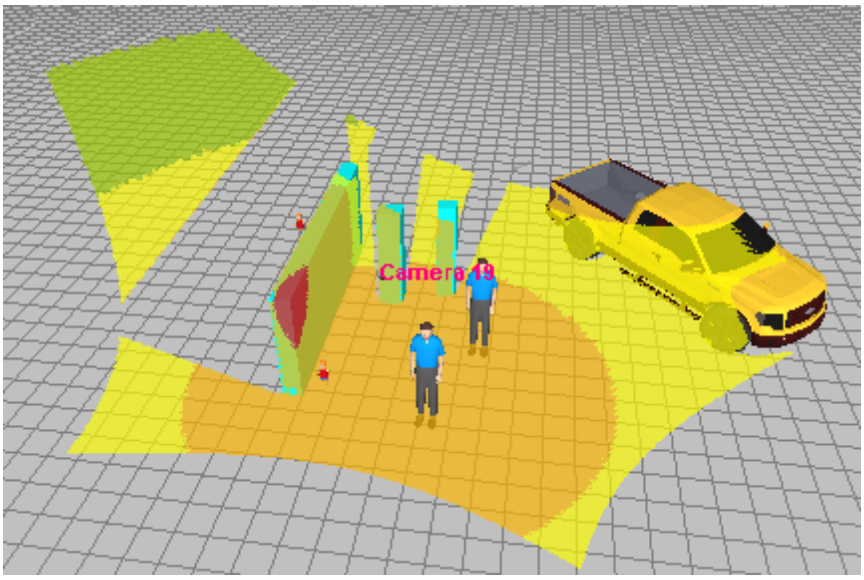




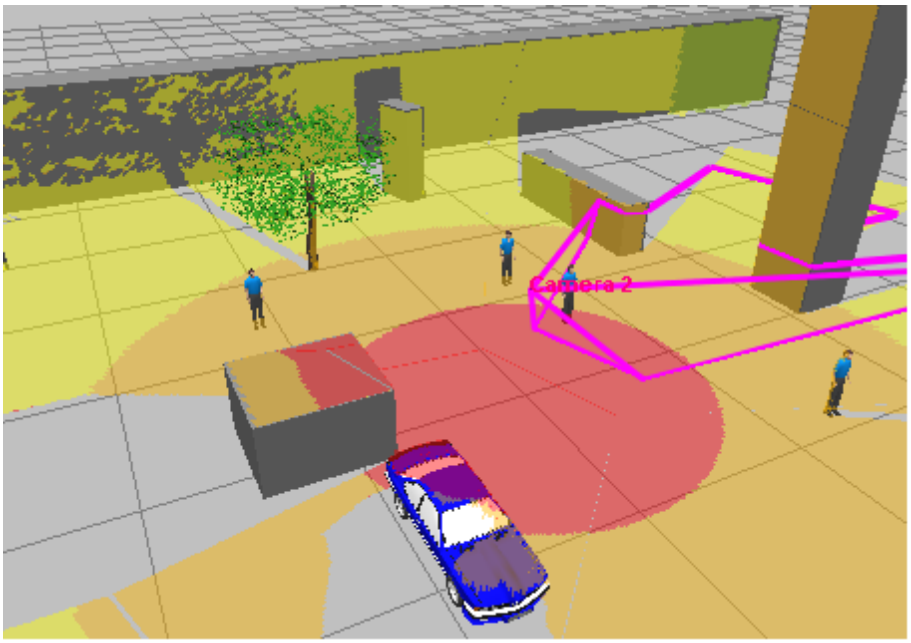
3D visualization of the camera view area surface 346 taking into account spatial resolution, shadows, lens distortion.



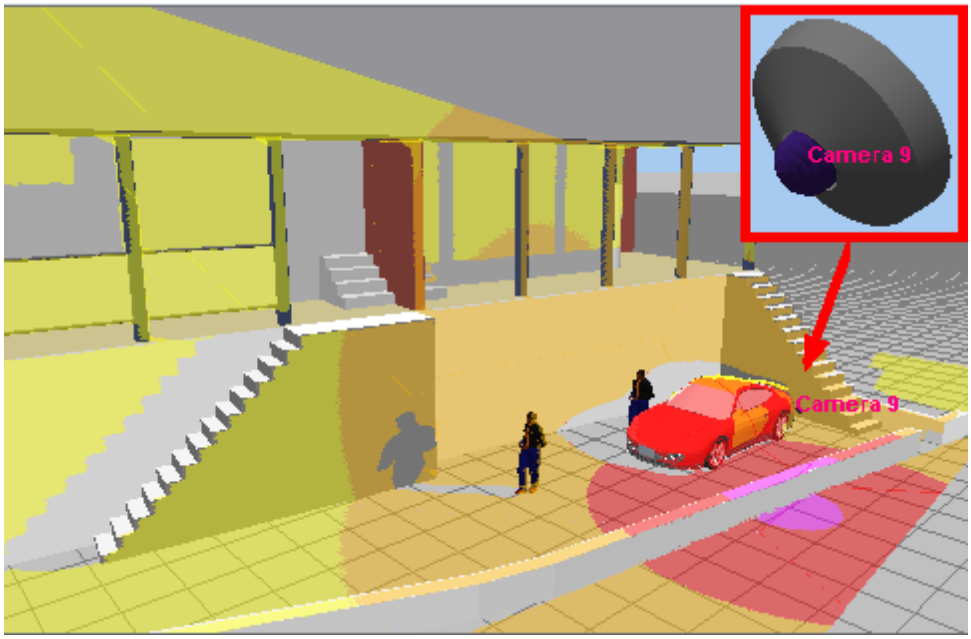
3D visualization of the active camera coverage 348 on the environment taking into account spatial resolution, shadows, lens distortion.



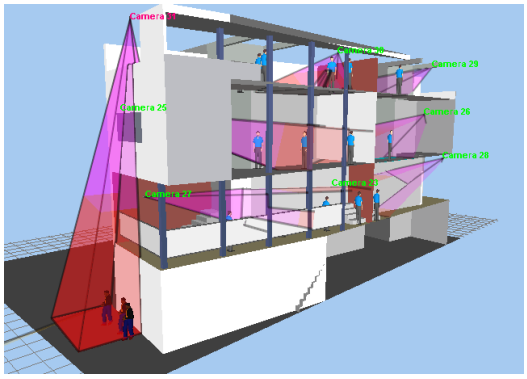
3D visualization of control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.

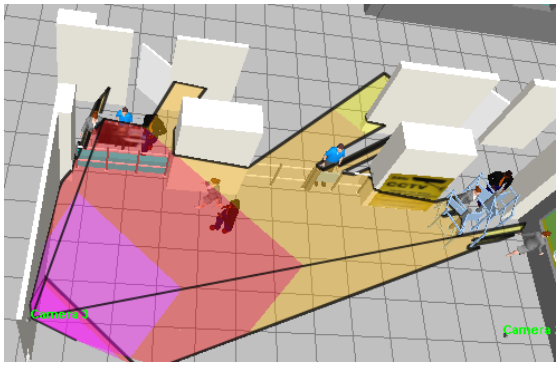


Visualization of camera coverage area and spatial resolution distribution on the surrounding objects of panoramic cameras 626 (fisheye, 360°/180°).

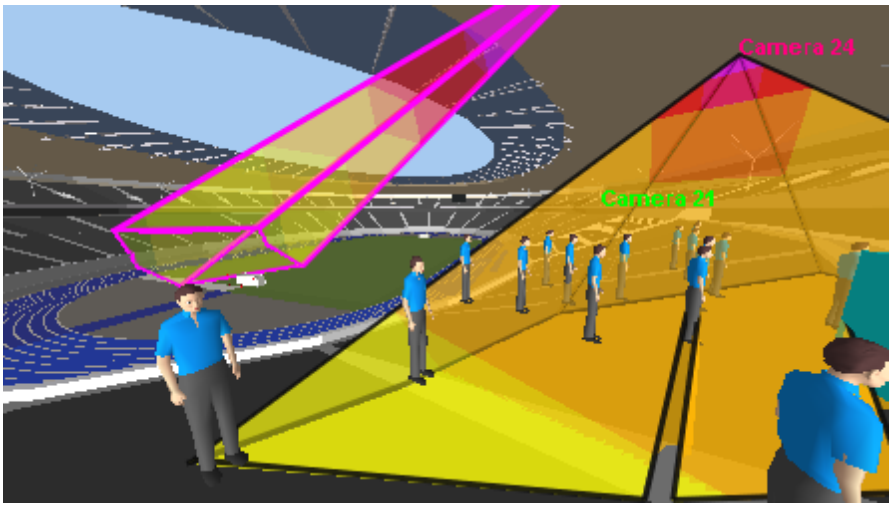


Free cutting 352 3D layout by six planes to provide access to any point of complex 3D buildings.



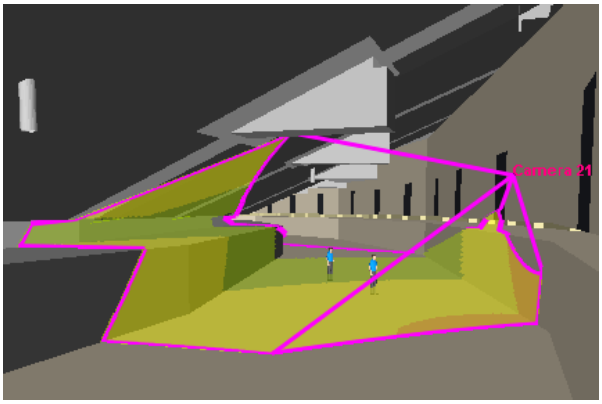


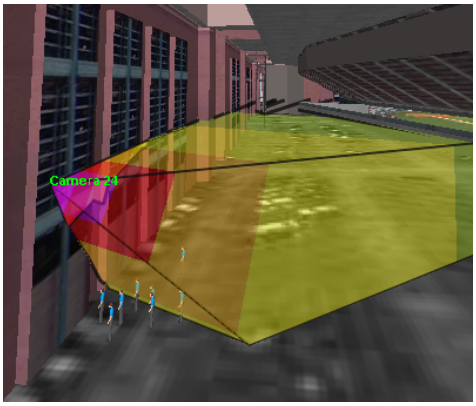
Working with multilevel 600 3D layouts and terrains with complicated vertical structure.



Possibility of loading prepared 3D models 259 (a person, a car, etc.,). You can add your own 3D models from **3ds max** and Sketchup 599.

Possibility of using 3D models-territories 600, to place inside them cameras, constructions and other 3D models.

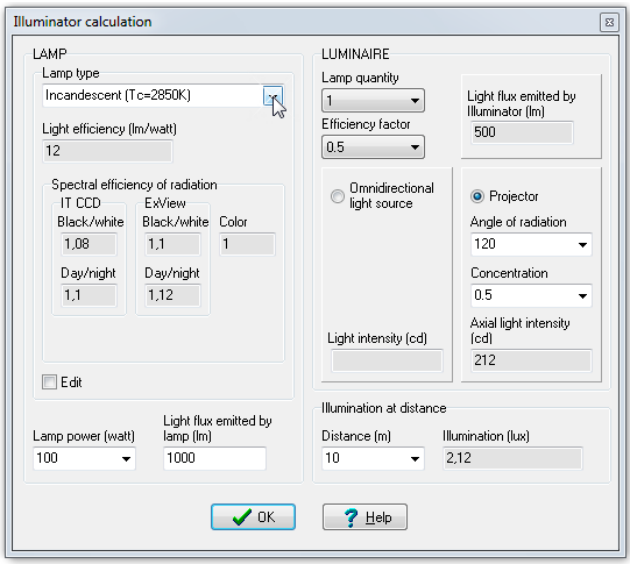




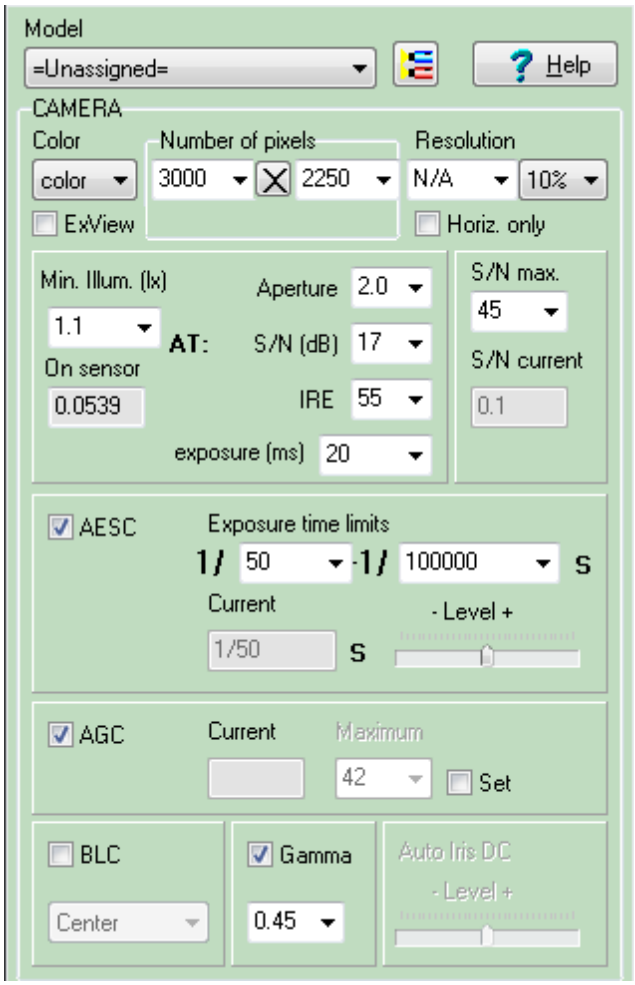
Modeling images from cameras based on camera parameters and scene conditions

Modeling observed scene 371 parameters (illumination, visibility limitations).

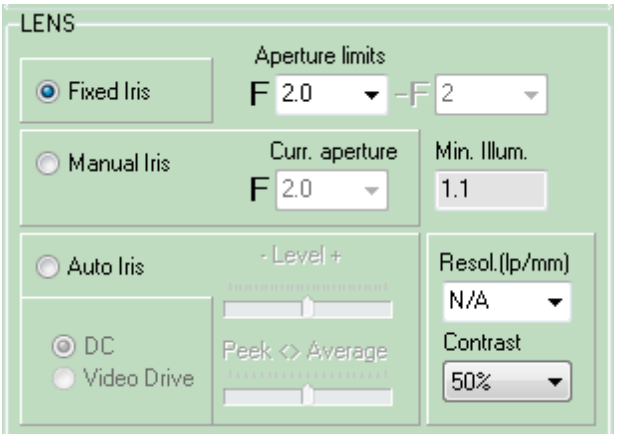
Model luminaires 461 considering spectrum of radiation and spectral sensitivity of image sensors, including discharge lamps with complex spectrum and infrared LED illuminators.



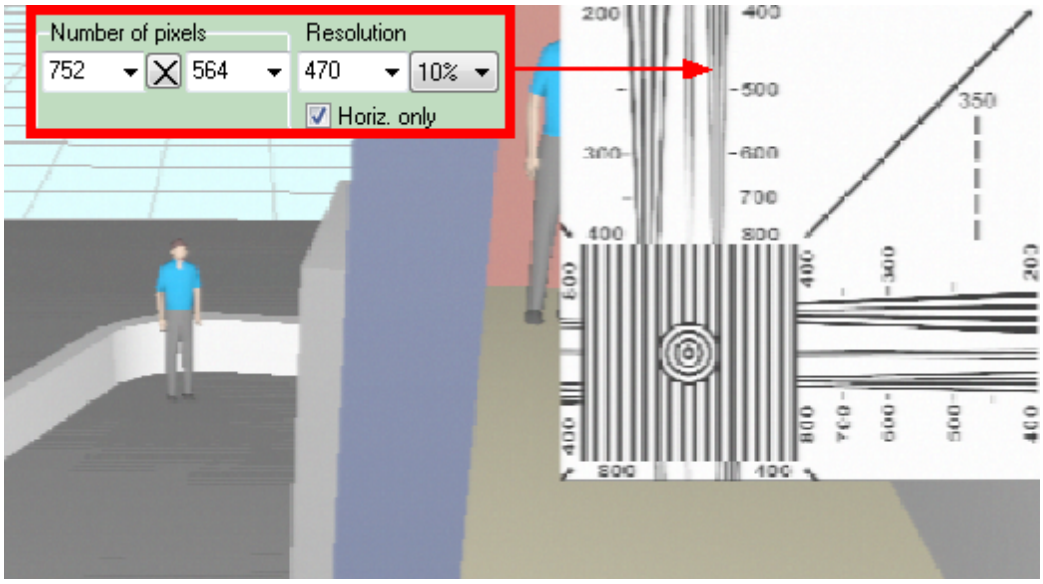
Model camera parameters 329 (spectral response, number of pixels, resolution, minimum illumination 334 at known signal/noise ratio, IRE and aperture, maximum signal/noise ratio, electronic shutter, AGC, BLC, gamma, day/night cameras, frame rate 375, interlace scan, global shutter and rolling shutter).



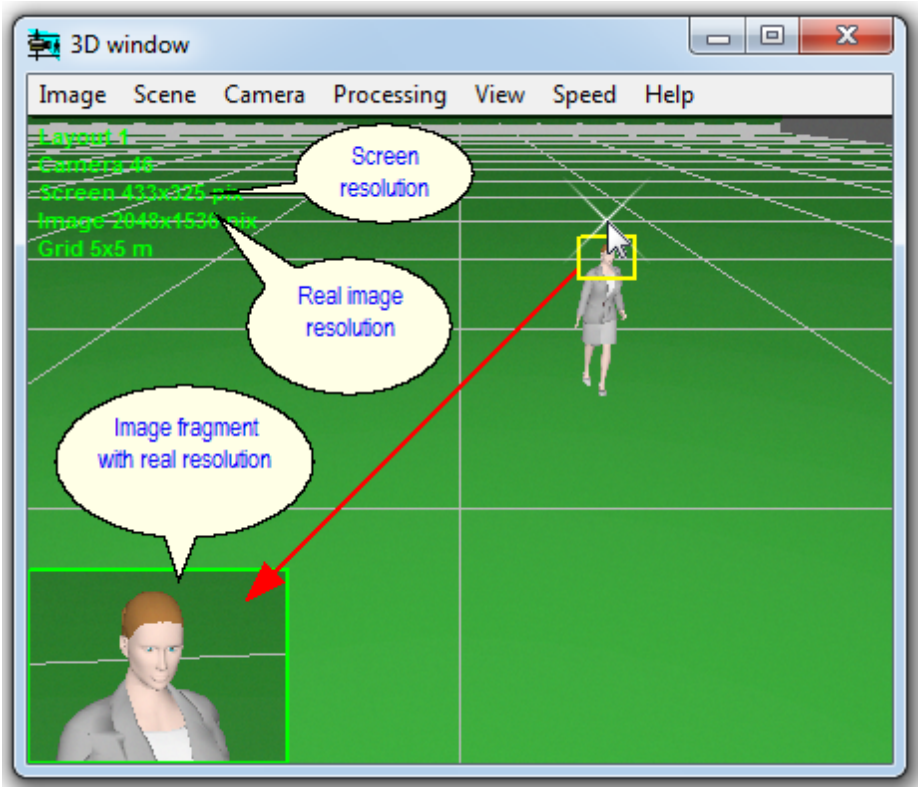
Model lens parameters 339 (focal length, aperture, auto iris DC and Video Drive, resolution).



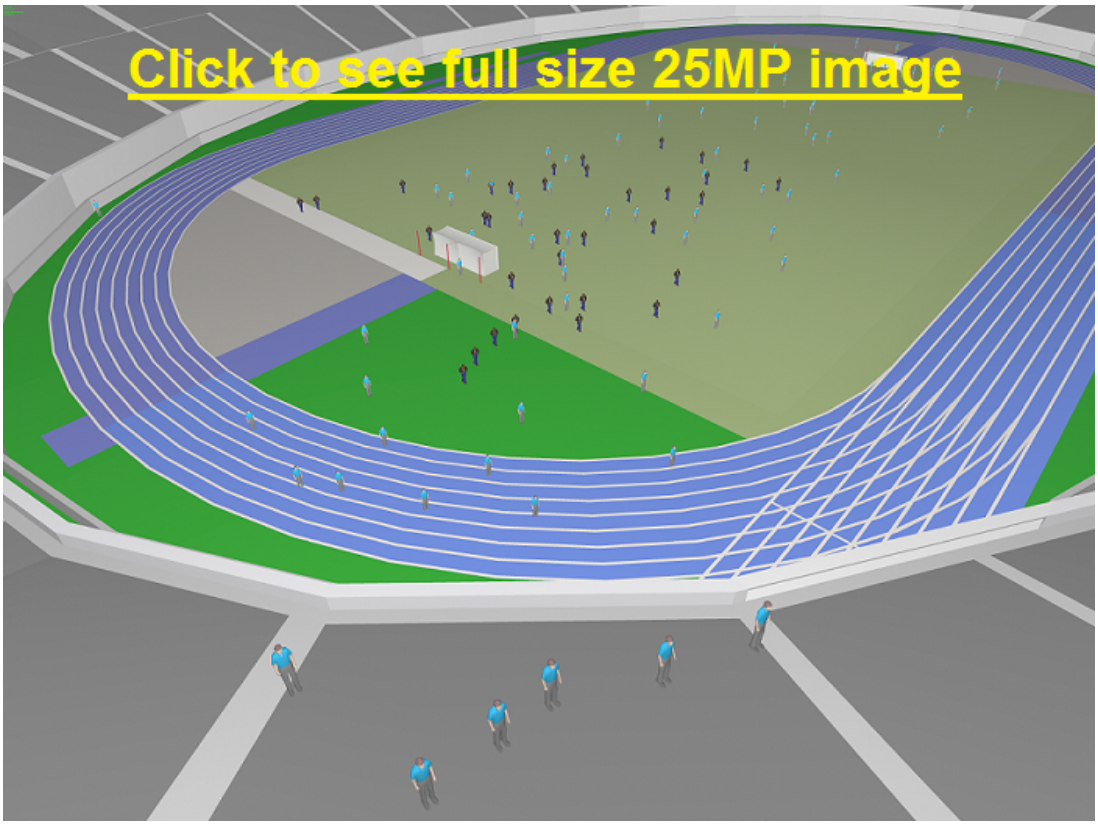
Visually control modeled resolution with the help of the Test chart 388



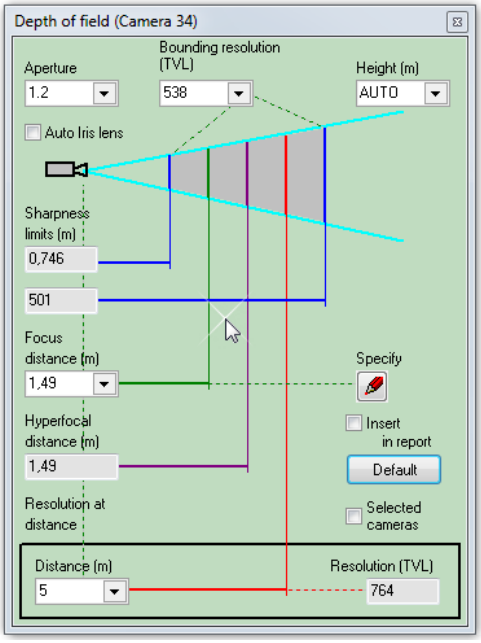
Model images from megapixel cameras 573 with number of pixels exceeds Windows screen number of pixels (Up to 100 megapixel and more!) with PiP 391 (Picture in Picture) and without PiP.

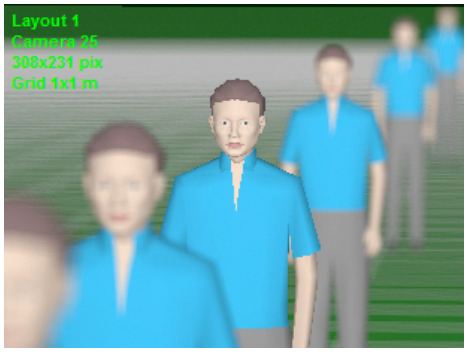


See examples: 5 megapixels, 10 megapixels, 25 megapixels.



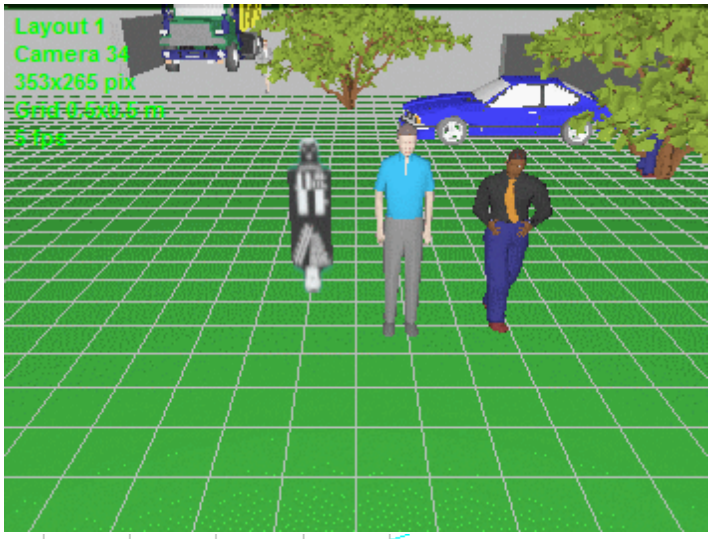
Calculate and model depth of field 454 of each camera in project.

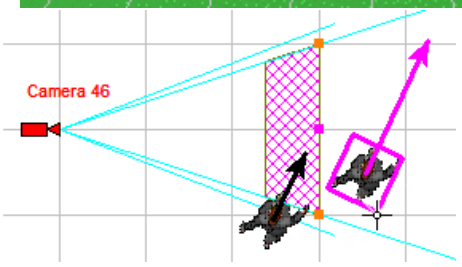




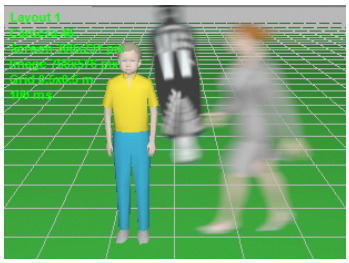
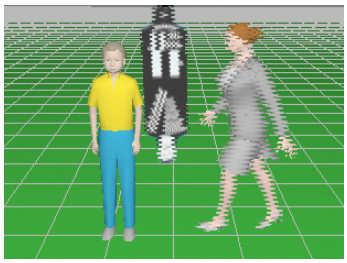
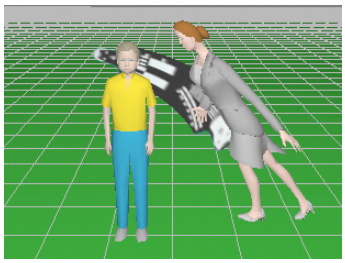
Model brightness 381, contrast, compression, horizontal and vertical sharpness.

Model moving objects 203, camera frame rate 575, create animated images 386 with moving 3D models.

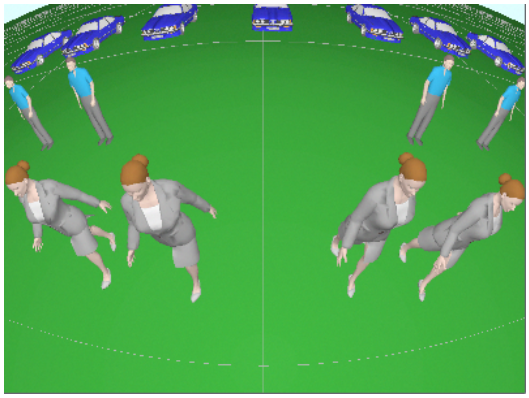
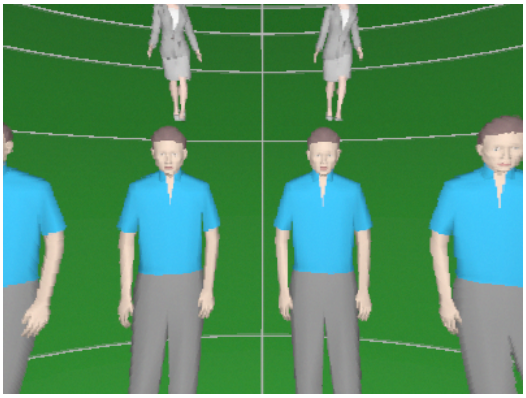




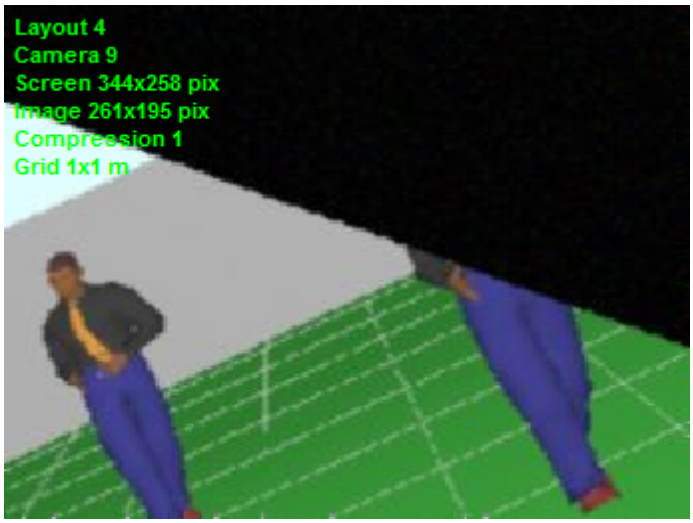
Model blur and distortion 585 of moving 3D models depending on camera parameters (exposure time, interlacing, rolling shutter).

Modeling images taking into account lens distortion 654 (barrel and pincushion). Correct modeling wide-angle lenses with strong distortion.

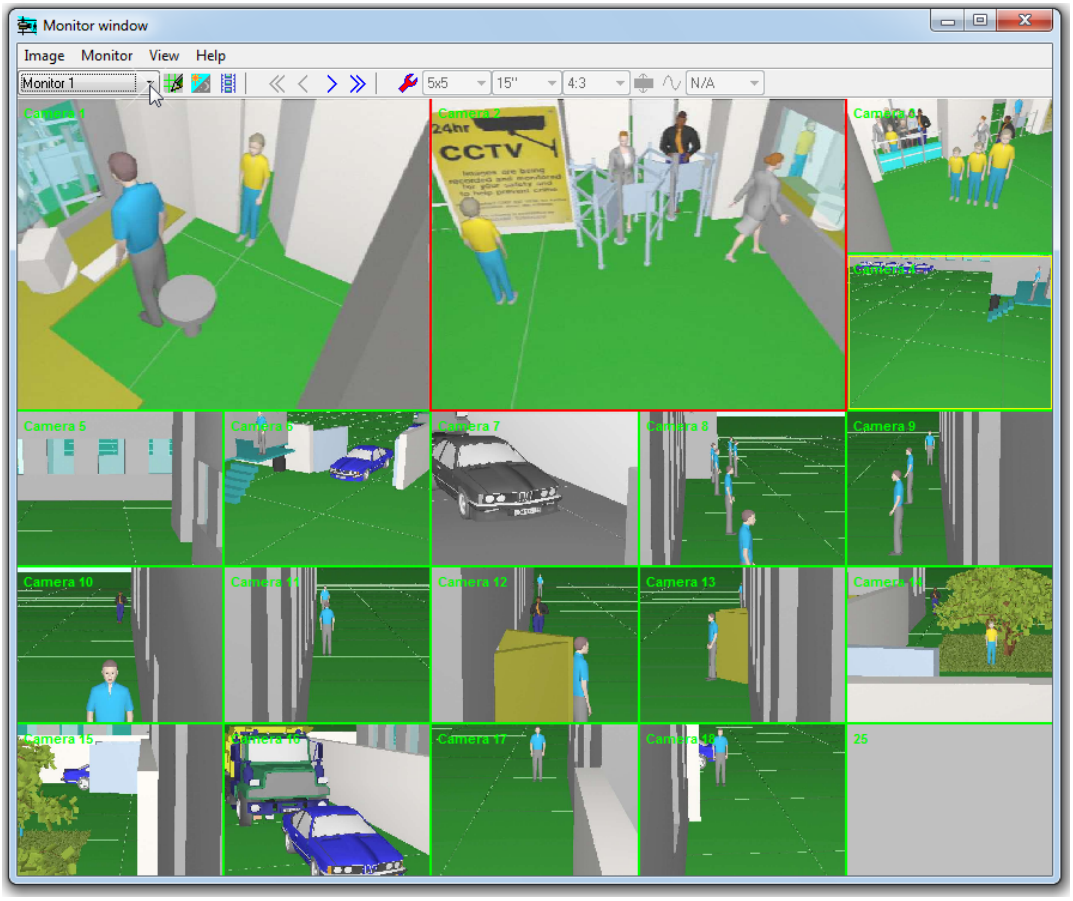
Simulation of image resolution and view area limits of panoramic cameras 312 (fisheye, 360°/180°).



Obtain Image Model 357 for each camera in the project based on models of scene and equipment.

Design operator interface

Design operator interface using the Monitor window 407.



Modeling size and resolution 411 of monitors.

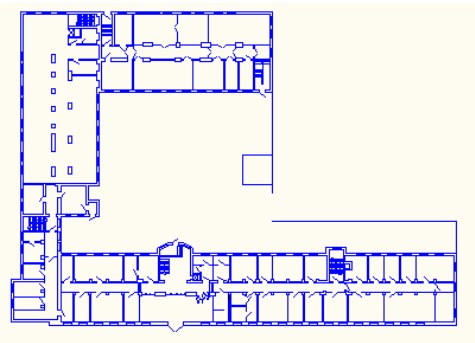
Create animated monitor models 577 as html files with moving 3D models and different frame rates of each camera. See an example of animated monitor (file size about 4 Mb).

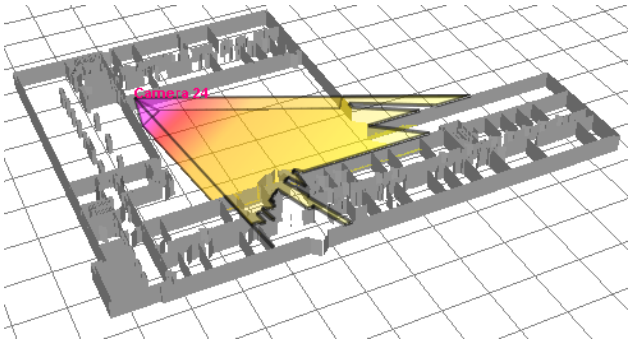
Import from other CAD programs

Locate cameras and cables on the prepared layouts 222 in *.bmp, *.jpg, *.emf, *.wmf, *.png, *.gif, *.tif, *.pdf. **AutoCAD *.dxf *.dwg** formats.

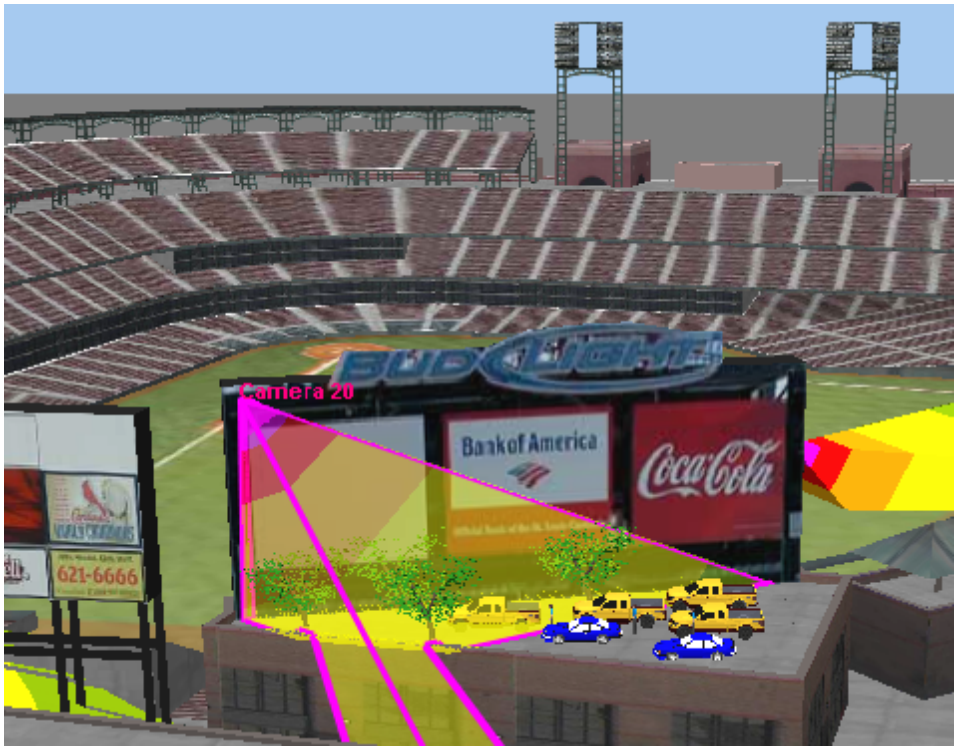
For backgrounds in **AutoCAD *.dxf *.dwg** formats you can choose Layout in the background, control visibility of layers, hide texts. For backgrounds in PDF format you can choose page and resolution of the background.

Import constructions 224 from a 2D background in AutoCAD formats to 3D VideoCAD constructions automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions.

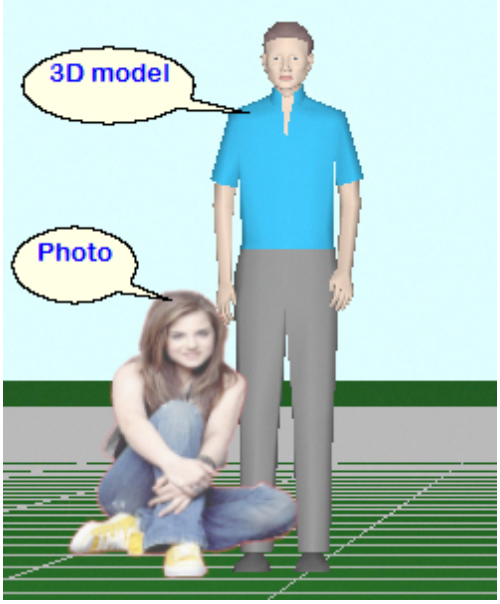




Import 3D models of objects and 3D models of territory 602 using VideoCAD plugin for SketchUP 599 .



Import raster images 205 to display them in 3D.



Import camera model parameters to the **Table of camera models** via copying and pasting 428 from Excel.

Export

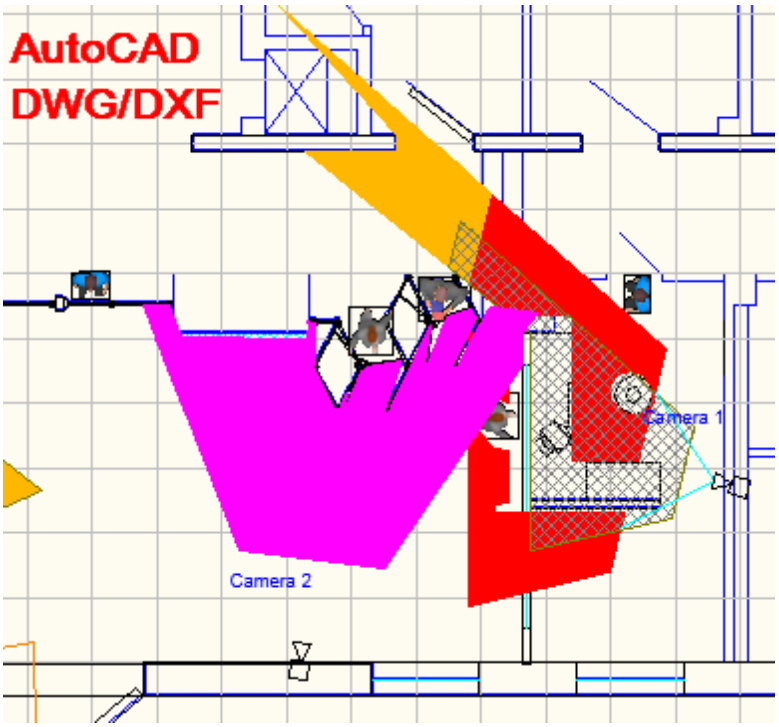
Export 219 the 2D drawing into any of the following formats:*.bmp, *.jpg, *.emf, *.wmf, *.png, *.gif, *.tif, *.pdf (raster and vector), **AutoCAD *.dxf, AutoCAD *.dwg,** PLT (HPGL/2), CGM (Computer Graphic Metafile), SWF (Adobe Flash).

Advanced export to AutoCAD formats. At exporting to AutoCAD DWG and DXF formats, cameras and illuminators are exported as blocks. The most important parameters of cameras and illuminators are recorded to the block attributes. VideoCAD layers, fonts and line types are exported.

When you export a drawing with a background in AutoCAD DWG/DXF format, VideoCAD constructions can be added to the background on separate layers 486 or the background can be added as an external links to the file of the background. In both cases the structure of the background is saved.

Possible scheme of the combining AutoCAD + VideoCAD:

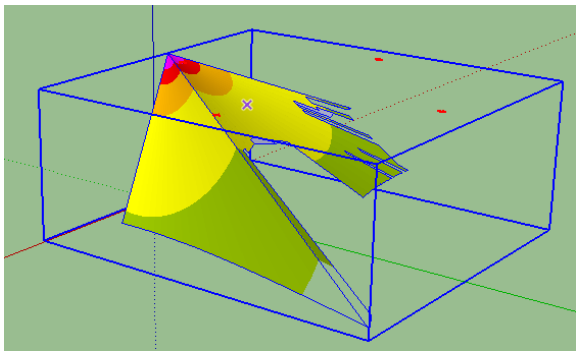
1. Load drawing 222 in AutoCAD format as a background;
2. Import 224 AutoCAD lines to VideoCAD 3D constructions automatically;
3. Adding cameras and constructions on special layers.
4. Export 219 the obtained drawing to AutoCAD format to work with it in AutoCAD.

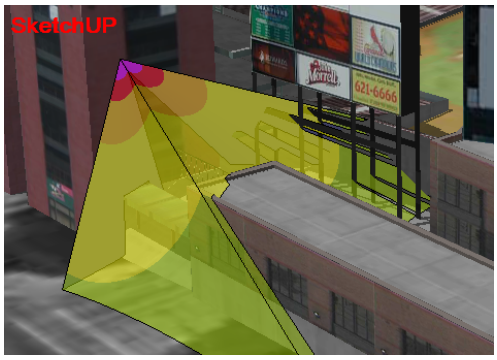


Export to DXF file 3D view areas 354 and camera coverage 355 taking into account lens distortion, spatial resolution, and shading.

This feature allows the convenient scheme of work with combination of 3D BIM Software (SketchUP) + VideoCAD.

1. Export layout as a 3D model-territory through SketchUP and loading it into VideoCAD.
2. Adding cameras with 3D view areas in VideoCAD.
3. Export 3D view areas in DXF format, loading them into 3D BIM Software and combining with the original layout in 3D.





Export images from the 3D World 342 window to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png. Size in pixels of the exported file can exceed 354 the Windows screen size.

Export 3D images 360 from cameras to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png. Size in pixels of the exported file can exceed 573 the Windows screen size.

Export animated image models 360 with moving 3D models to **animated gif.** See an example of animated monitor (file size about 4 Mb).

Export images from monitors 412 to *.bmp, *.jpg,*.gif,*.tif,*.png.

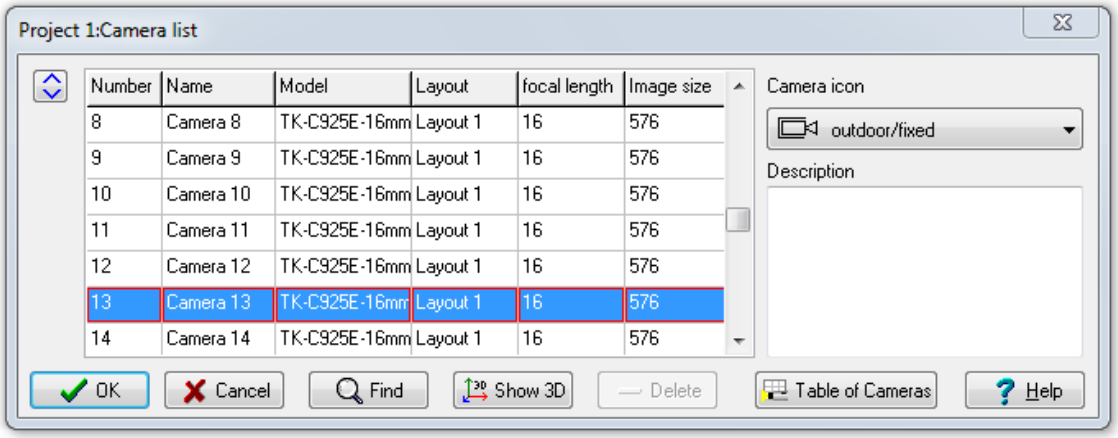
Export images from monitors to animated monitor models 577 as html files, with moving 3D models, taking into account frame rate of each camera.

Obtain the text report 216 with full description of all cameras in the project, view areas and cables to be pasted into a project explanatory note or used as instruction for installation.

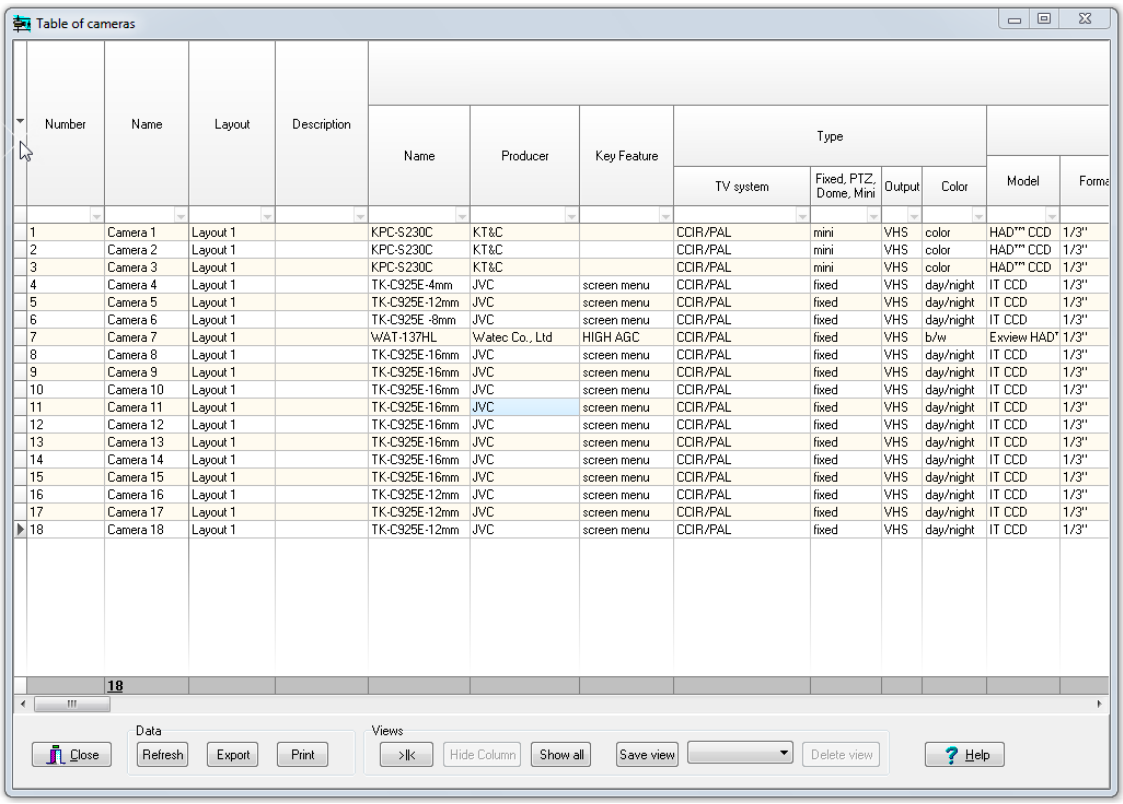
Get a report in PDF format 216, with full description of all cameras in the project, view areas and cables. The **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable. See example of PDF report.

Obtain the cable report 271.

Copy the Camera list with most important parameters 509 to MS Excel, MS Word and other software.



Get detailed adjustable table 443 of all initial and calculated parameters of cameras in project. Print the table or export it to *.txt, *.csv,*.rtf, *.xls, *.htm formats.



Printing

Printing 226 the obtained 2D drawing in raster or vector mode on one or several pages for pasting together. You can use prepared frames with standard title-block and logo. Sizes, colors styles of fonts and lines, weights of lines can be adjusted.

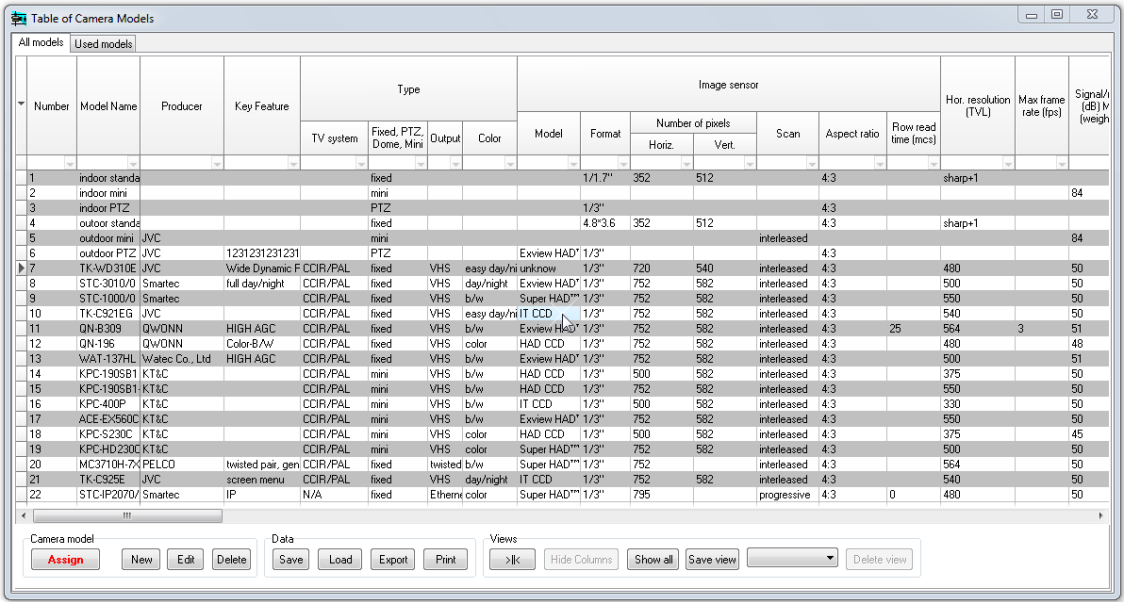
Printing image models from cameras 360 and monitors 412.

Printing 3D images from the 3D World 356 window.

Printing the Table of cameras 450 and the Table of camera models 429 as a whole or by selected fragments.

Database of camera models

Maintain database of camera models 419, assign different models to cameras in project, compare models with each other.



VideoCAD will help you: spare the means and win tenders due to optimization of cameras' quantity in projects and increase of their efficiency, reduce time expended and boost design quality, cut down the amount of controversial situations with customers and accelerate their solution.

VideoCAD can be used for the prompt, but exact calculations of view area projections to draw on a location plan when performing a graphical part of CCTV project. It can be also used to perform scrupulous analysis complicated cases to choose the most suitable camera location and lens parameters.

VideoCAD is employed by *security firms, army, police, universities and security department of many companies worldwide.*

VideoCAD is effective for CCTV designer training 645.

It is more than you need? See:

- ***VideoCAD Lite*** 31, ***Differences between VideoCAD 8 Professional and VideoCAD 8 Lite*** 53
- ***VideoCAD Starter II*** 45, ***Differences between VideoCAD 8 Lite and VideoCAD 7 Starter II*** 75
- ***VideoCAD Starter*** 49, ***Differences between VideoCAD 7 Starter II and VideoCAD 7 Starter*** 85

Differences between versions of VideoCAD 53

What is new in VideoCAD 89

Part II

General information on VideoCAD 8 Lite

2 General information on VideoCAD 8 Lite

VideoCAD Lite is a basic version offers the most useful and easy-to-master tools for CCTV design.

If VideoCAD Professional 3 version seems too complicated or slow, try the Lite version! It does not contain complex tools. At the same time VideoCAD Lite is a powerful tool, not a very restricted version.

VideoCAD Lite is less demanding of computer resources because of absence of resource-intensive tools. However, these tools when they are not needed, can be disabled 650 in version Professional too.

VideoCAD 8 Lite is registered only by personal registration code. This code doesn't depend on computer hardware (HID) or a dongle. This code is valid on any computer.

VideoCAD Lite purchased separately can be upgraded to more powerful Professional version.

VideoCAD Starter, VideoCAD Starter II Kit can be upgraded to VideoCAD Lite at discount price.

One license of VideoCAD 8 Lite purchased separately allows to use the program on two workplaces nonsimultaneously (work and home computers) if both workplaces belong to one person.

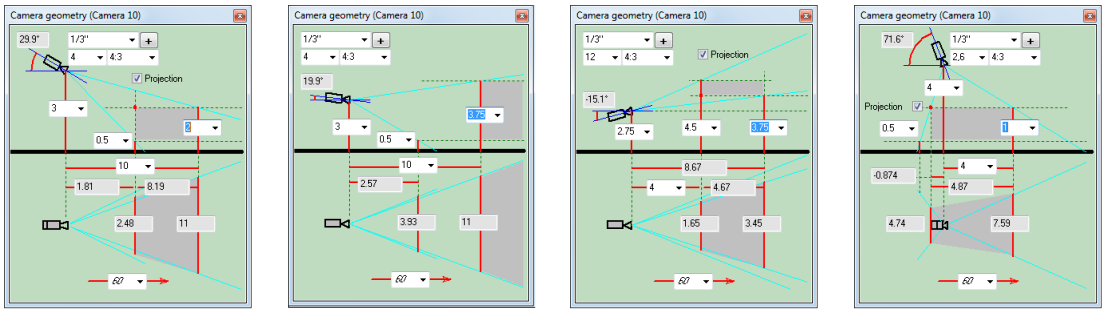
VideoCAD 8 Lite demo allows to change lens focal length of cameras. Licenses of **VideoCAD 8 Professional** and **VideoCAD 8 Lite** allows free use of the **demo versions** for educational purposes, for research, theses, writing articles, etc. non-profit activities.

Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

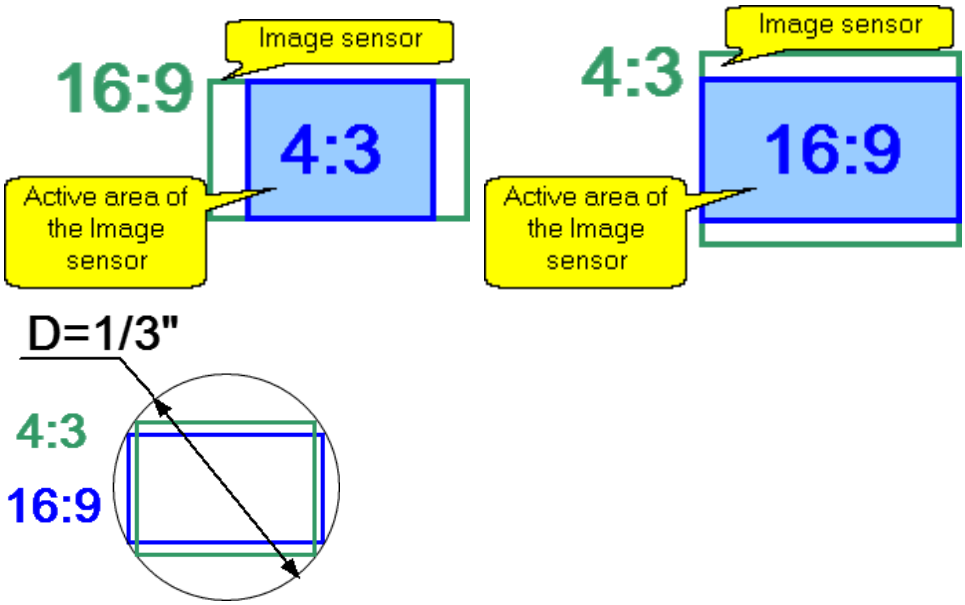
The main features of VideoCAD 8 Lite:

Calculations

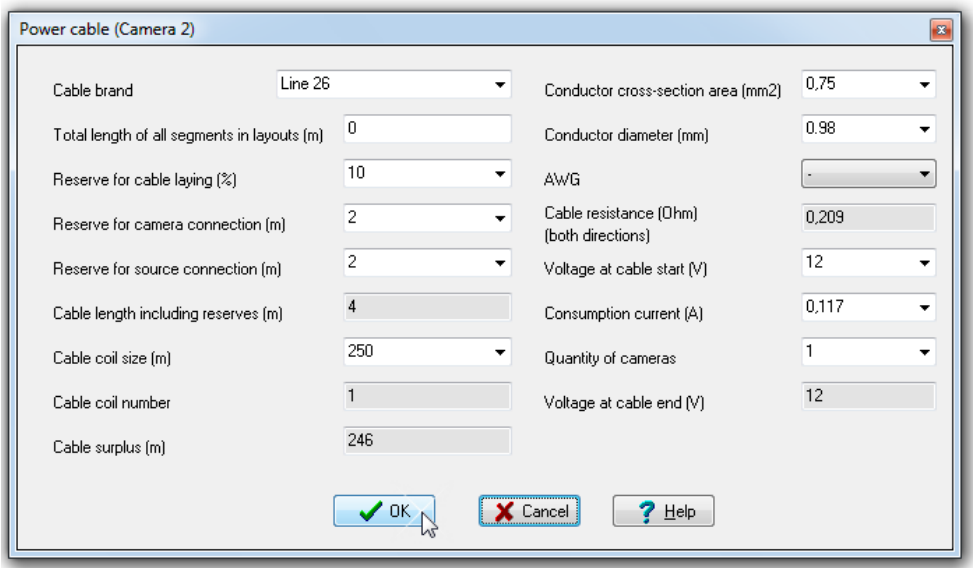
Calculating geometric parameters 289 of camera view area in any camera position.



More accurate modeling cameras taking into account the size of active area of the image sensor in dependence of the aspect ratio of the image sensor and the aspect ratio of the output image of the camera.

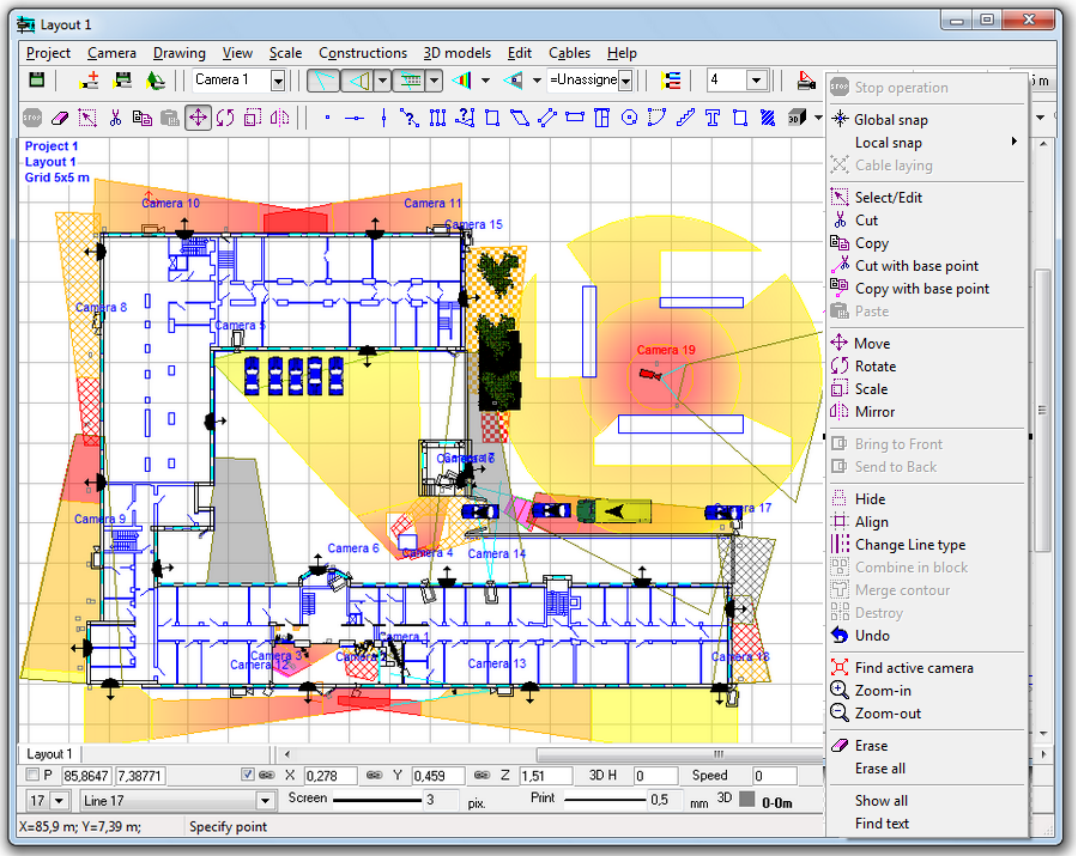


Calculate length 590 and electric parameters of cables 515.



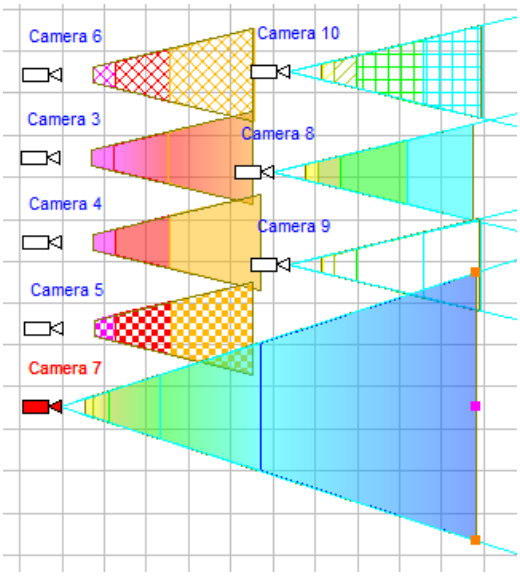
Working with 2D projections

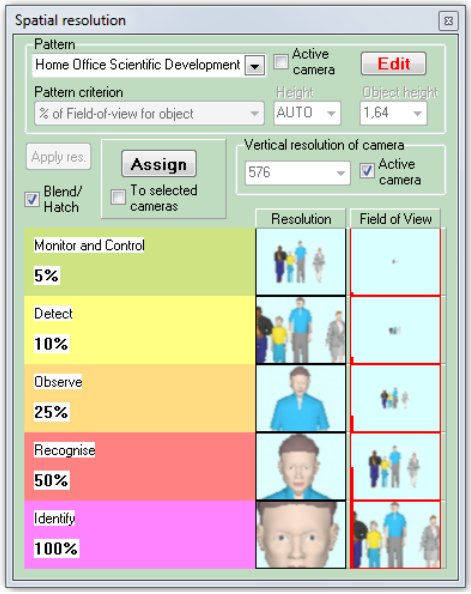
Use 2D Graphics window with CAD interface 161. Use a lot of 2D/3D constructions and CAD tools, line types, font types, snaps 209, horizontal and vertical projections, up to 10 layouts in each project.



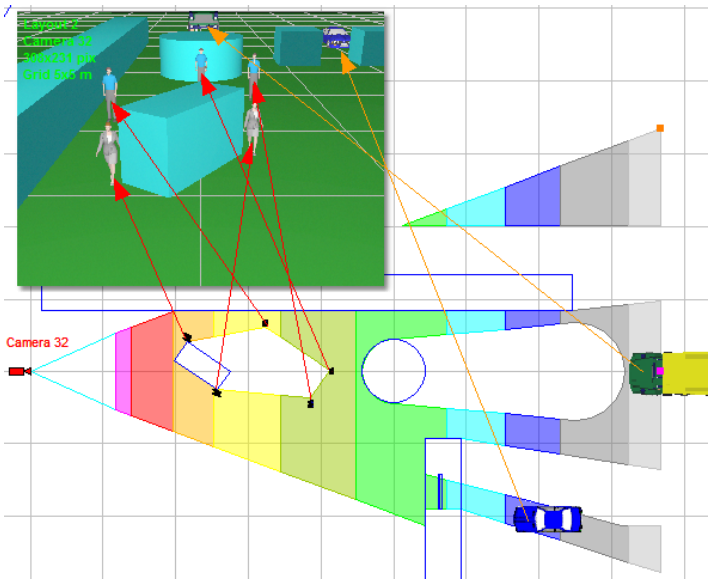
Display on the 2D layout results of calculations of view area projections.

Display by separate colors and hatch styles different regions of spatial resolution 177 and field-of-view size. There are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch; Home Office Guidelines for identification; P 78.36.008-99, Australian Standard AS4806: Closed Circuit Television, European Standard EN50132-7, ISO/IEC 19794 Biometric data interchange formats.

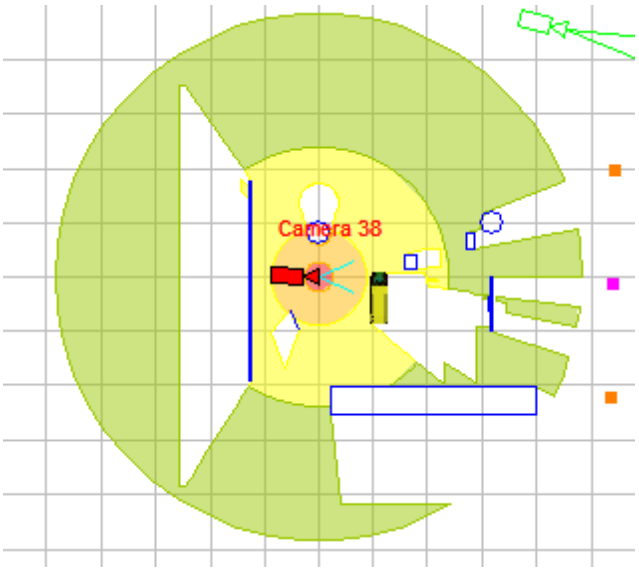




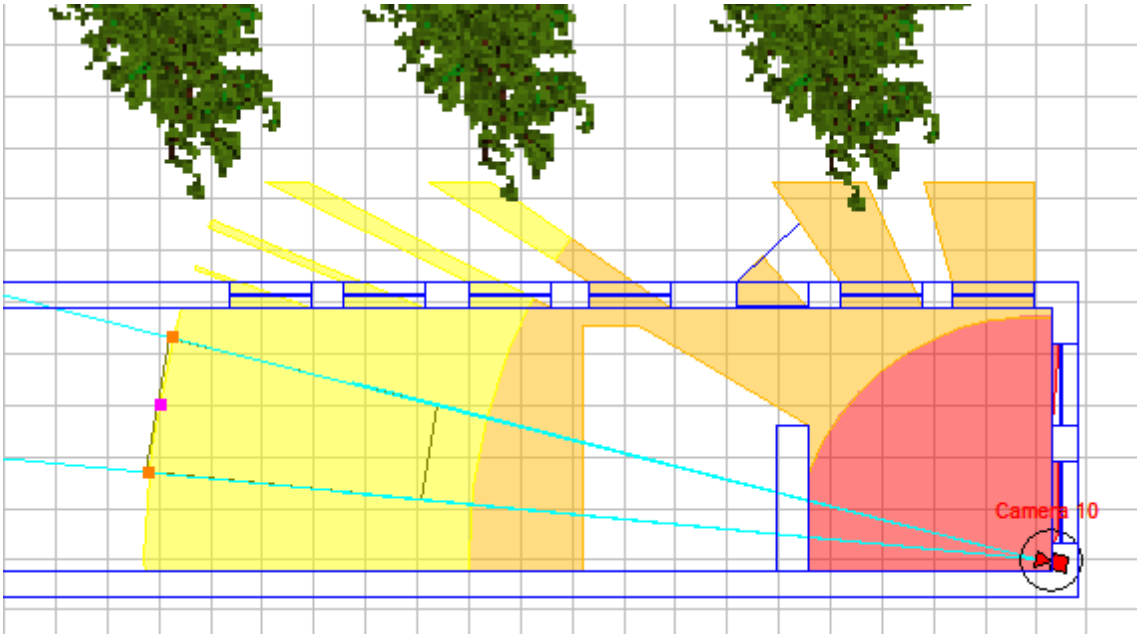
Construct the horizontal projection of camera control areas including shadows 178 from obstacles on the scene. In VideoCAD Lite obstacles can be constructions only. In VideoCAD Professional 3 3D models also can be obstacles.



Choose the best positions and calculate control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.

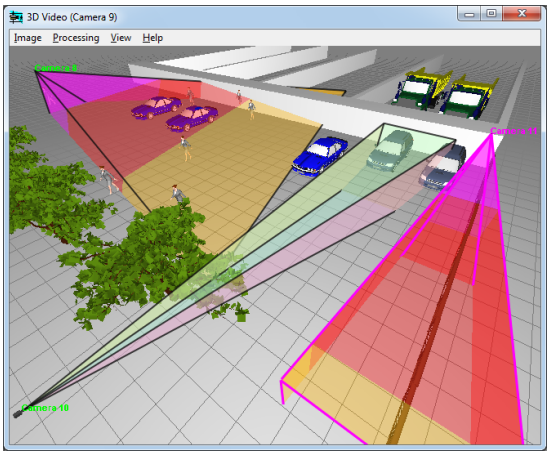


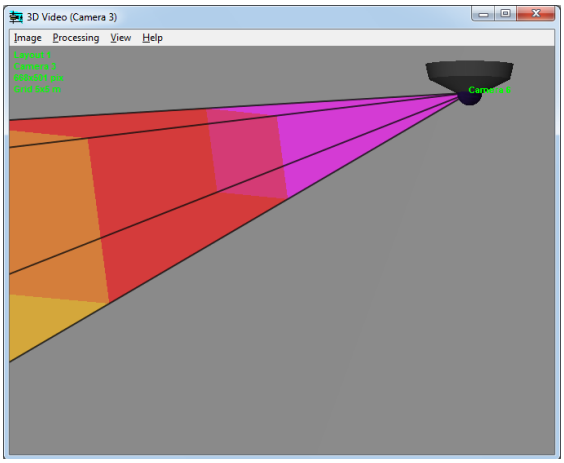
Simulation of the horizontal projection of the view area and visualization of the spatial resolution distribution of panoramic cameras 626 (fisheye, 360°/180°).



3D modeling layout and camera view areas

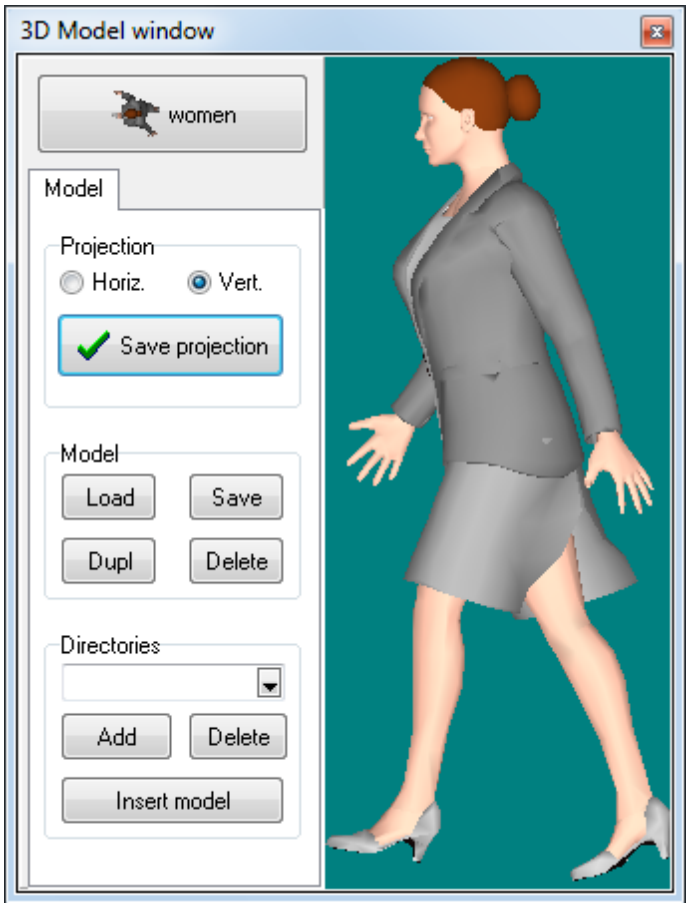
3D visualization of the location plan and camera view areas in the 3D Video 357 window by other cameras. Visualization of the spatial resolution. Flexible adjustment of displaying view areas from the side.





Possibility of loading prepared 3D models 259 (a person, a car, etc.,). You can add your own 3D models from **3ds max** and Sketchup 599.

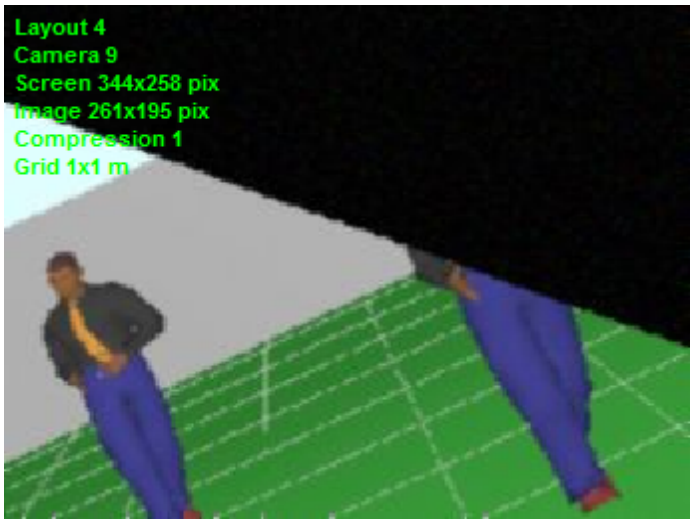
In special 3D models 397 window you can create 3D model projections 401 with specified resolution. You can load 3D models from files, save 3D models to files, create copies of 3D models



Modeling images from cameras based on camera parameters and scene conditions

Model camera parameters: number of pixels and compression.

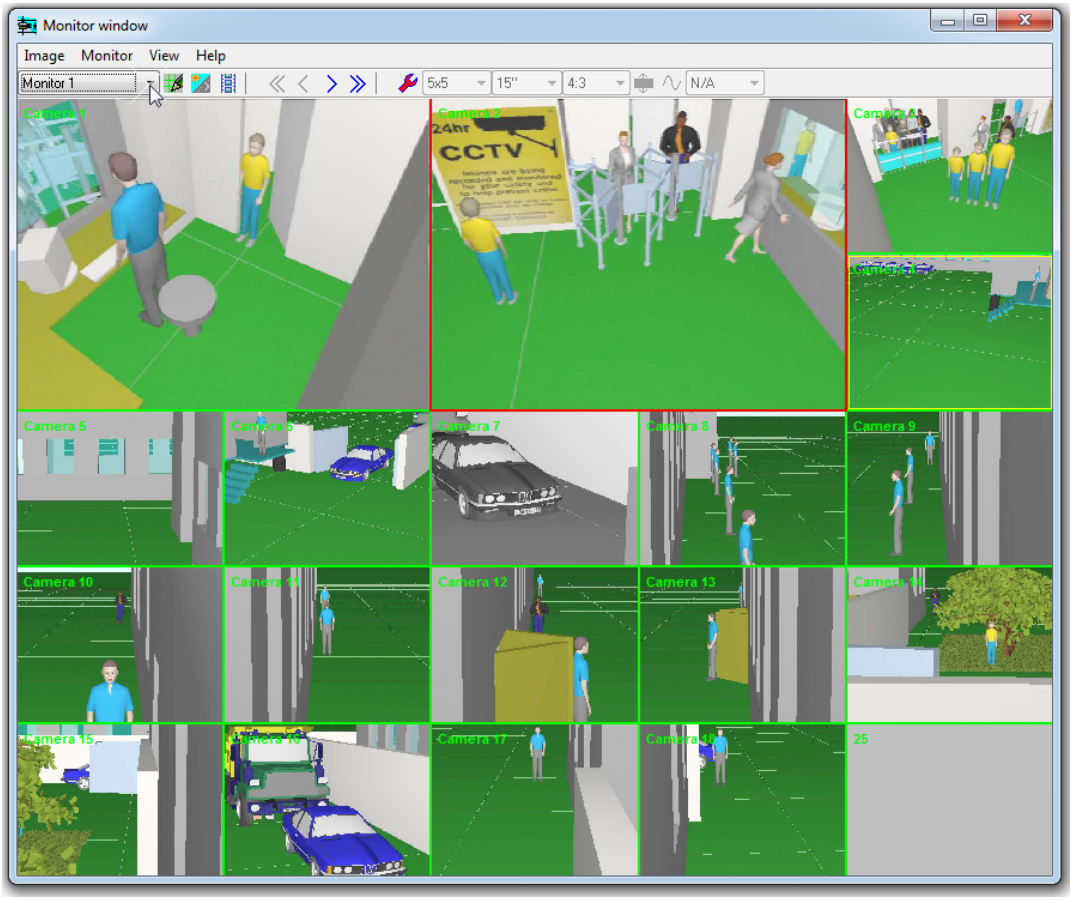
Simulation of image resolution and view area limits of panoramic cameras 312 (fisheye, 360°/180°).



Obtain Image Model 357 for each camera in the project based on models of scene and equipment.

Design operator interface

Design operator interface using the Monitor window 407.

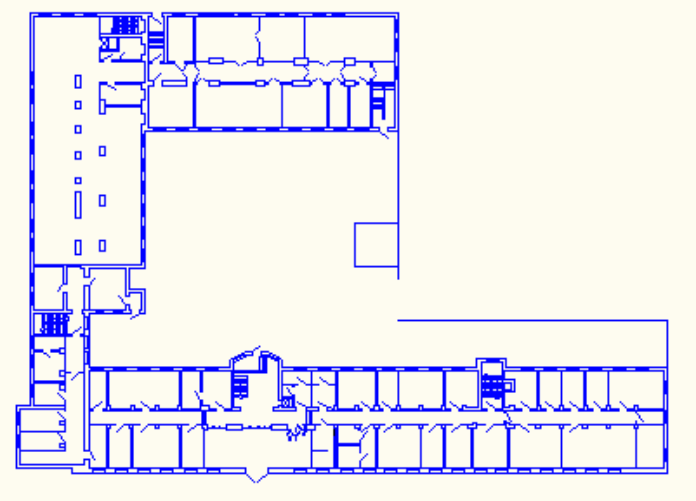


Modeling size and resolution 411 of monitors.

Import from other CAD programs

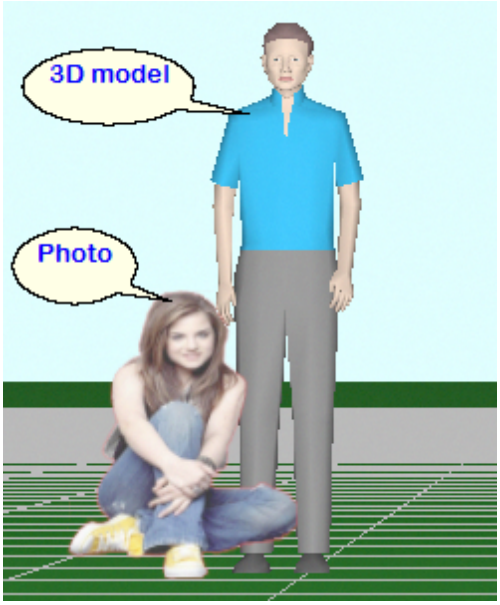
Locate cameras and cables on the prepared layouts 222 in *.bmp, *.jpg, *.emf, *.wmf, *.png, *.gif, *.tif, *.pdf. **AutoCAD *.dxf *.dwg** formats.

For backgrounds in **AutoCAD *.dxf *.dwg** formats you can choose Layout in the background, control visibility of layers, hide texts. For backgrounds in PDF format you can choose page and resolution of the background.



Import 3D models of objects and 3D models of territory 602 using VideoCAD plugin for SketchUP 599 .

Import raster images 205 to display them in 3D.



Import camera model parameters to the **Table of camera models** via copying and pasting 428 from Excel.

Export

Export 219 the 2D drawing into any of the following formats:*.bmp, *.jpg, *.emf, *.wmf, *.png, *.gif, *.tif, *.pdf (raster), **AutoCAD *.dxf**.

Export 3D images 360 from cameras to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png.

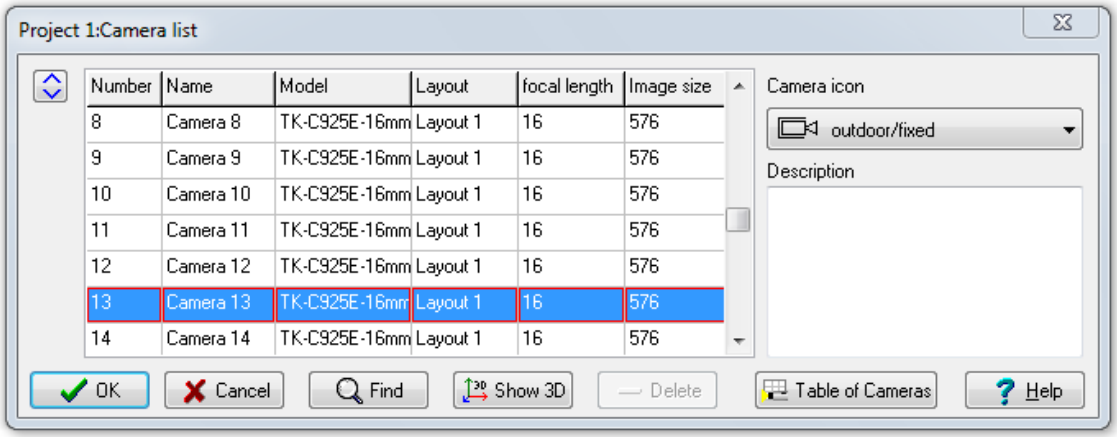
Export images from monitors 412 to *.bmp, *.jpg,*.gif,*.tif,*.png.

Obtain the text report 216 with full description of all cameras in the project, view areas and cables to be pasted into a project explanatory note or used as instruction for installation.

Get a report in PDF format 216, with full description of all cameras in the project, view areas and cables. The **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable. See example of PDF report.

Obtain the cable report 271.

Copy the Camera list with most important parameters 509 to MS Excel, MS Word and other software.



Printing

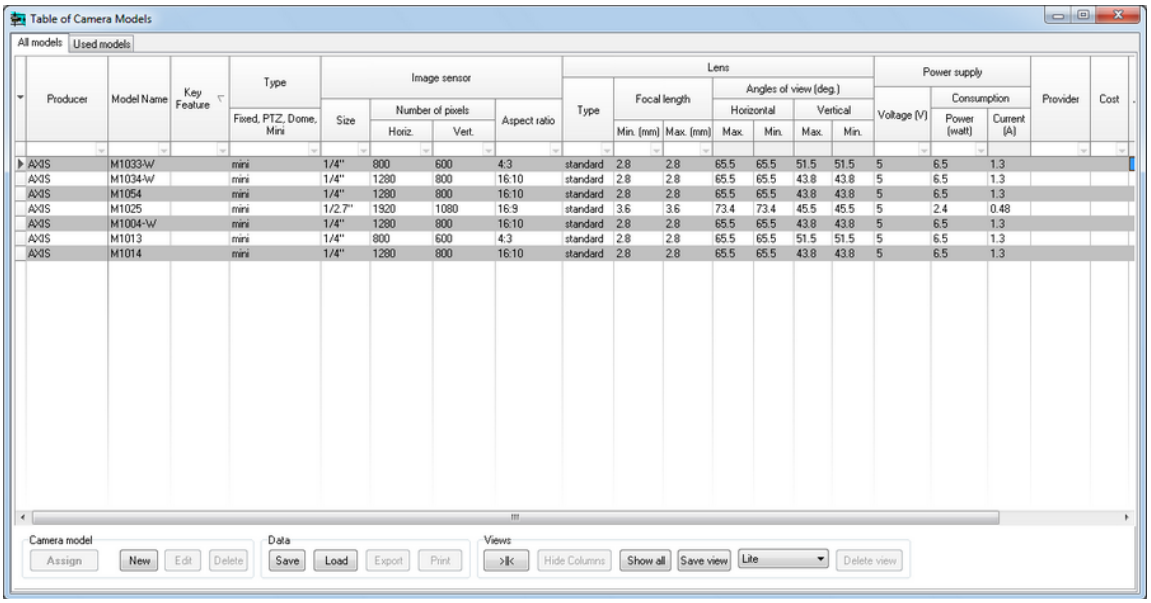
Printing 226 the obtained 2D drawing in raster or vector mode on one or several pages for pasting together. You can use prepared frames with standard title-block and logo. Sizes, colors styles of fonts and lines, weights of lines can be adjusted.

Printing image models from cameras 360 and monitors 412.

Printing the Table of camera models 429 as a whole or by selected fragments.

Database of camera models

Maintain database of camera models 419 with the most important parameters (22 fields for each camera model). You can add your models, assign different models to cameras in project, compare models with each other.



Producer	Model Name	Key Feature	Type	Image sensor Size	Image sensor Number of pixels Horiz.	Image sensor Number of pixels Vert.	Image sensor Aspect ratio	Lens Type	Lens Focal length Min. (mm)	Lens Focal length Max. (mm)	Lens Angles of view (deg.) Horizontal Max.	Lens Angles of view (deg.) Horizontal Min.	Lens Angles of view (deg.) Vertical Max.	Lens Angles of view (deg.) Vertical Min.	Power supply Voltage (V)	Power supply Consumption Power (watt)	Power supply Consumption Current (A)	Provider	Cost
AXIS	M1033-W		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1034-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1054		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1025		mini	1/2.7"	1920	1080	16:9	standard	3.6	3.6	73.4	73.4	45.5	45.5	5	2.4	0.48		
AXIS	M1004-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1013		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1014		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		

Download VideoCAD 8_Lite demo version

Need more? See: ***VideoCAD Professional*** 3, ***Differences between VideoCAD 8 Professional and VideoCAD 8 Lite*** 53

It is more than you need? See:

- ***VideoCAD Starter II*** 45, **Differences between VideoCAD 8 Lite and VideoCAD 7 Starter II** 75
- ***VideoCAD Starter*** 49, ***Differences between VideoCAD 7 Starter II and VideoCAD 7 Starter*** 85

Differences between versions of VideoCAD 53

What is new in VideoCAD 89

Part III

General information on VideoCAD 7 Starter II

3 General information on VideoCAD 7 Starter II

VideoCAD Starter II - advanced version of VideoCAD Starter 49.

VideoCAD Starter II differs from the Starter version by presence of additional features 45 formerly available in the Lite and Professional versions only.

VideoCAD Starter II is registered only by personal registration code. This code doesn't depend on computer hardware (HID) or a dongle. This code is valid on any computer.

VideoCAD Starter II is offered only in a kit of three programs - VideoCAD Starter II Kit. This Kit includes:

- VideoCAD Starter II;
- IP Camera CCTV Calculator;
- VideoCAD Plugin for SketchUp.

VideoCAD Starter II can be upgraded to more powerful Lite 31 and Professional 3 versions. You can also upgrade from version VideoCAD Starter 49 to VideoCAD Starter II Kit. To get this upgrade you should purchase VideoCAD Plugin for SketchUp and IP Camera CCTV Calculator if you have not purchased them yet.

Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

With VideoCAD 7 Starter II you can:

- Choose the most suitable **lenses**, **heights** and **locations** for camera installation to provide the required parameters of view areas.
- Calculate the horizontal projection sizes of view areas to draw them on the location plan.
- Display by separate colors different regions of spatial resolution 177 and field-of-view size.
- Choose visually a relative location of cameras using the graphics window 161 with CAD interface.
- Locate cameras on the prepared layouts 222 in *.bmp, *.jpg, AutoCAD ***.dxf *.dwg** formats.
- Obtain a drawing 219 containing horizontal projection of site layout with the camera images, calculated view areas, and with coordinate grid to be used in graphical path of the project.
- Export 219 the obtained drawing into any of the following formats: *.bmp, *.jpg. Saving the drawing 219 in the Graphics windows with **resolution exceeding Windows screen resolution.**
- Copy the Camera list with most important parameters 509 to **MS Excel, MS Word** and other software.
- Construct three dimensional models 357 of real scenes.
- Use many 3D models 202 (people, cars, bus, furniture, turnstile, tree, grass). You can add other 3D models from **3ds max** and Sketchup 599.

- **Spare the means and win tenders due to the reduction of cameras' quantity in projects and increase of their efficiency.**
- **Reduce time expended and boost design quality.**
- **Cut down the amount of controversial situations with customers and accelerate their solution.**

Download VideoCAD Starter II demo version

Need more? See:

- ***VideoCAD Lite*** 31, ***Differences between VideoCAD 8 Lite and VideoCAD 7 Starter II*** 75
- ***VideoCAD Professional*** 3, ***Differences between VideoCAD 8 Professional and VideoCAD 8 Lite*** 53

It is more than you need? See: ***VideoCAD Starter*** 49, ***Differences between VideoCAD 7 Starter II and VideoCAD 7 Starter*** 85

Differences between versions of VideoCAD 53

What is new in VideoCAD 89

Part IV

General information on VideoCAD 7 Starter

4 General information on VideoCAD 7 Starter

VideoCAD Starter - the easiest, low cost version of VideoCAD.

VideoCAD Starter is less demanding of computer resources because of absence of resource-intensive tools.

VideoCAD Starter is registered only by personal registration code. This code doesn't depend on computer hardware or a dongle. This code is valid on any computer.

VideoCAD Starter can be upgraded to more powerful Lite 31 and Professional 3 versions. You can also upgrade from version VideoCAD Starter to VideoCAD Starter II Kit 45 To get this upgrade you should purchase VideoCAD Plugin for SketchUp and IP Camera CCTV Calculator if you have not purchased them yet.

Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

With VideoCAD 7 Starter you can:

- Choose the most suitable **lenses**, **heights** and **locations** for camera installation to provide the required parameters of view areas.
- Calculate the horizontal projection sizes of view areas to draw them on the location plan.
- Display by separate colors different regions of spatial resolution 177 and field-of-view size.
- Choose visually a relative location of cameras using the graphics window 161 with CAD interface.
- Locate cameras on the prepared layouts 222 in *.bmp, *.jpg formats.
- Obtain a drawing 219 containing horizontal projection of site layout with the camera images, calculated view areas, and with coordinate grid to be used in graphical path of the project.
- Export 219 the obtained drawing into any of the following formats: *.bmp, *.jpg.
- Copy the Camera list with most important parameters 509 to MS Excel, MS Word and other software.
- Construct three dimensional models 357 of real scenes with the possibility of loading prepared 3D models 259 (a person, a car).

- **Spare the means and win tenders due to the reduction of cameras' quantity in projects and increase of their efficiency.**
- **Reduce time expended and boost design quality.**
- **Cut down the amount of controversial situations with customers and accelerate their solution.**

Download VideoCAD7 Starter demo version

Need more? See:

- ***VideoCAD Starter II*** 45, ***Differences between VideoCAD 7 Starter II and VideoCAD 7 Starter*** 85
- ***VideoCAD Lite*** 31, ***Differences between VideoCAD 8 Lite and VideoCAD 7 Starter II*** 75
- ***VideoCAD Professional*** 3, ***Differences between VideoCAD 8 Professional and VideoCAD 8 Lite*** 53

Differences between versions of VideoCAD 53
What is new in VideoCAD 89
What is new in VideoCAD 89

Part V

Differences between versions of VideoCAD

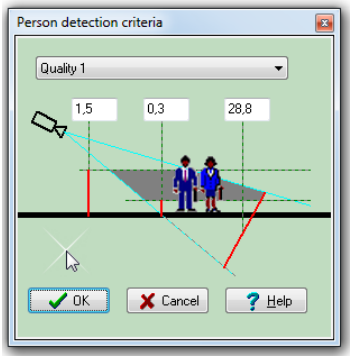
5 Differences between versions of VideoCAD

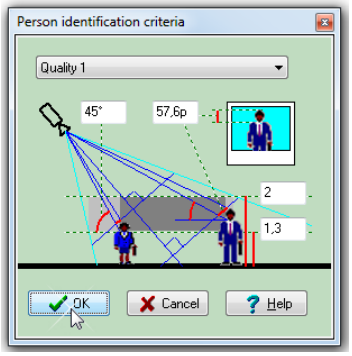
Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

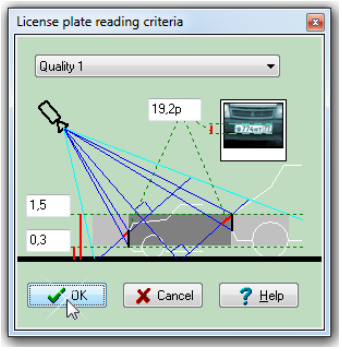
Differences between VideoCAD 8 Professional 3 and VideoCAD 8 Lite 31

Calculations

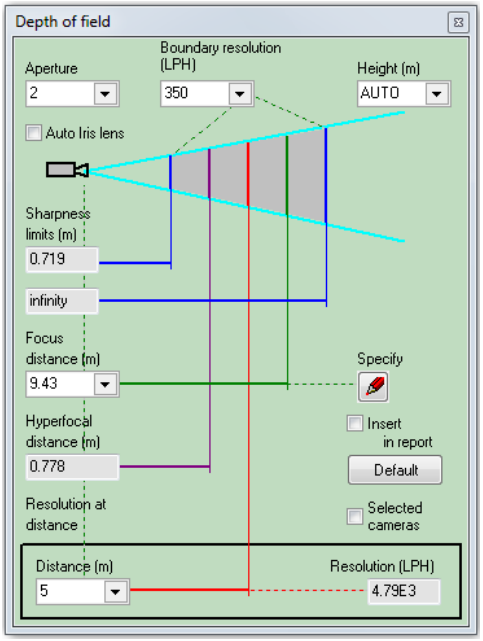
Calculating horizontal projection sizes of person detection, identification and license plate reading areas.



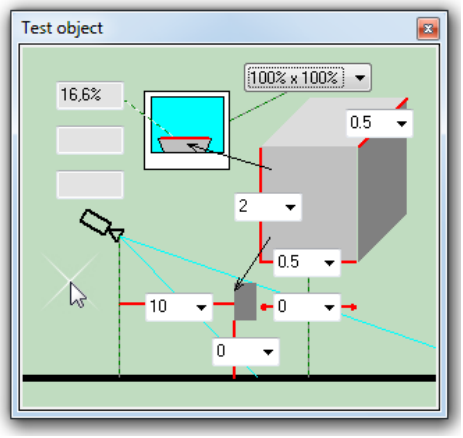




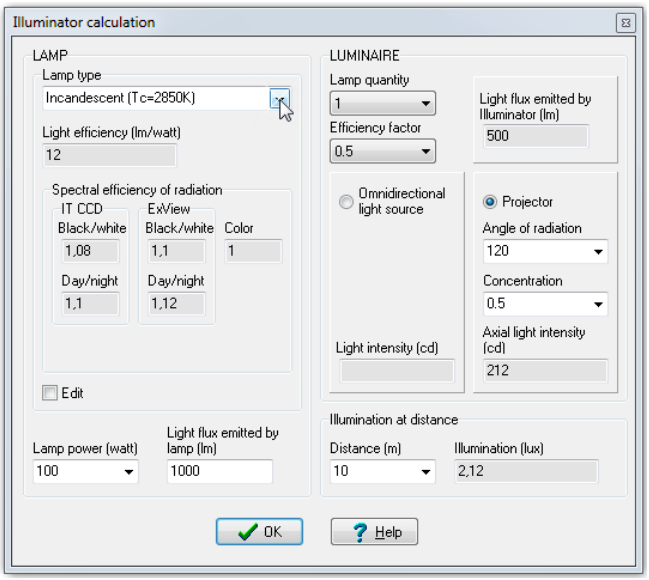
Calculating Depth of Field 454 of each camera of the project.



Calculating the image size on display of any object 507 in camera view area in percentage of display size, pixels and millimetres (inches in case of Imperial format).

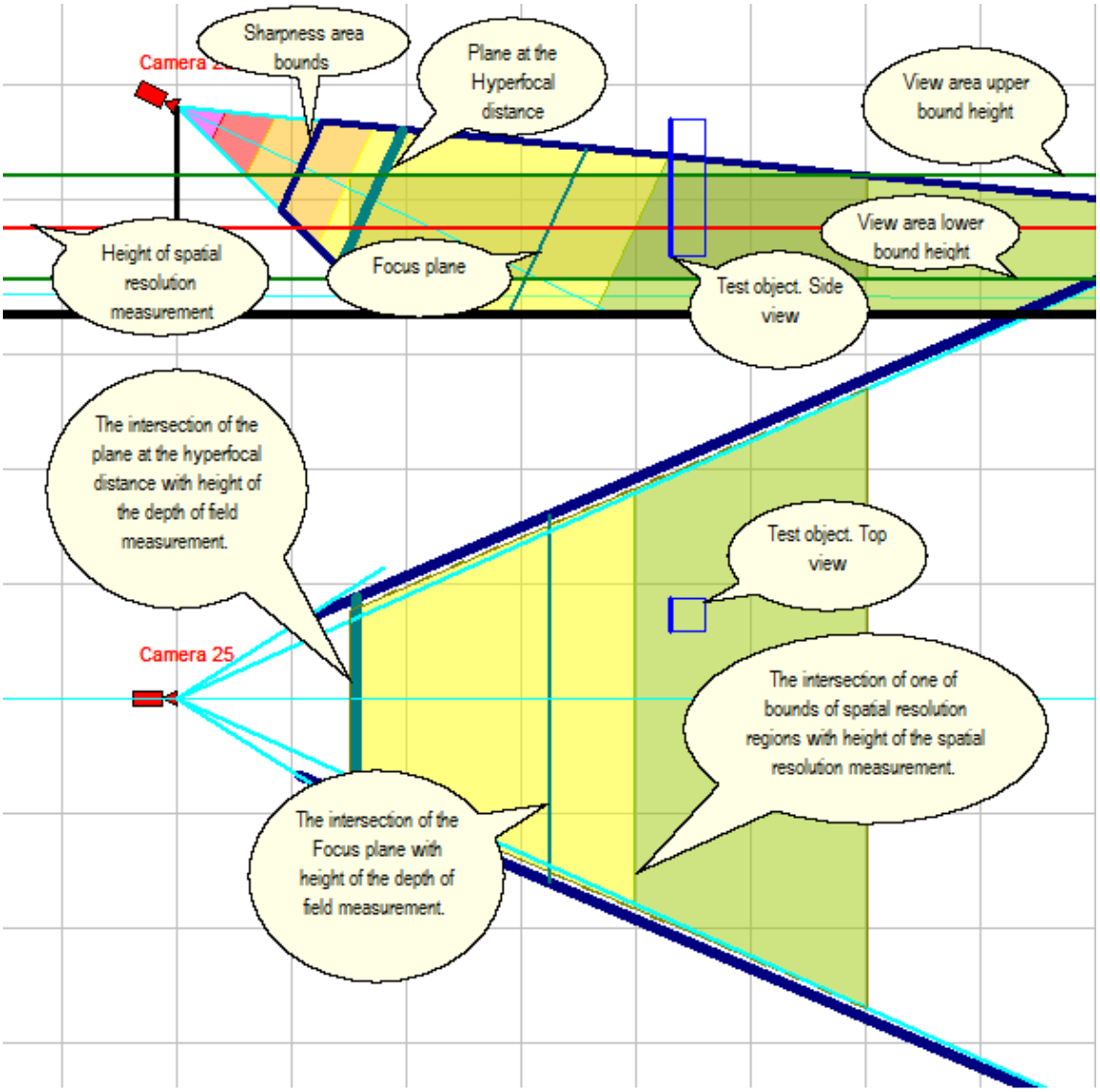


Calculate light power and illumination produced by illuminators 461.

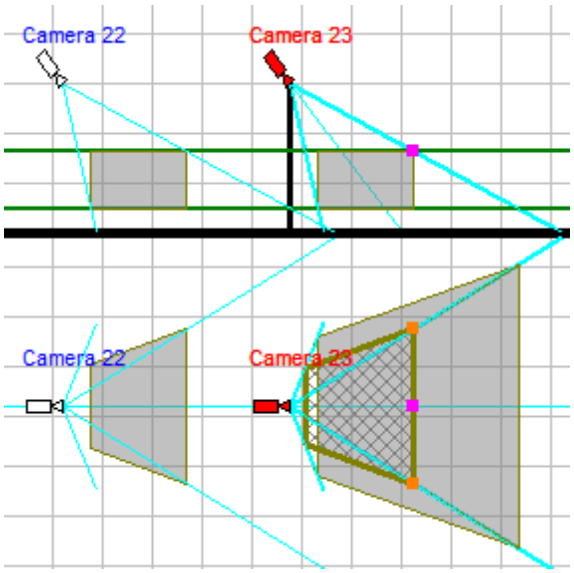


Working with 2D projections

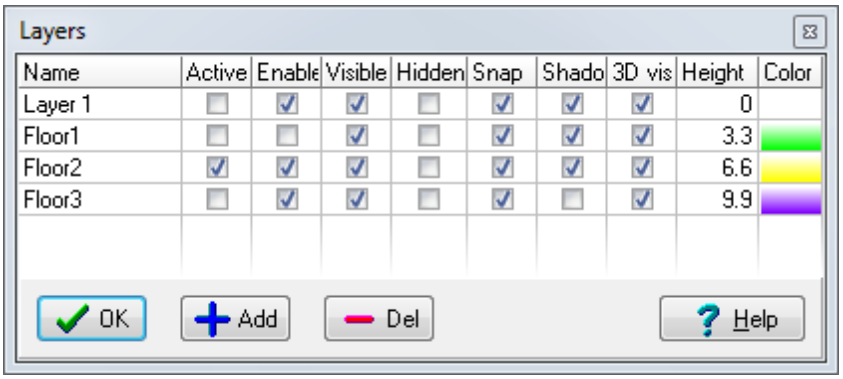
Graphical editing state of the Active camera 166 . In this case the **objects** in the **horizontal projection** rotate so that the direction of the camera lens **main optical axis** becomes parallel to a screen plane, and the bounds of **active camera** view area are marked with lines of double thickness. The **graphical editing state** enables a detailed analysis of **view area** using the test object 507, in the **vertical projection** it becomes possible graphical calculation of depth of field, 454 spatial resolution analysis and field-of-view sizing 207 at any point of **view area**. In the graphical editing state the **Test object** is visible in the 3D Video 357.



Ability to display horizontal projection of the view area as two sections 175 by planes on the minimum and maximum heights of the view area (Camera 23). One of the sections is drawn by a transparent filling, the other in the form of hatching. In many camera positions such representation is more informative than standard volume projection (Camera 22).

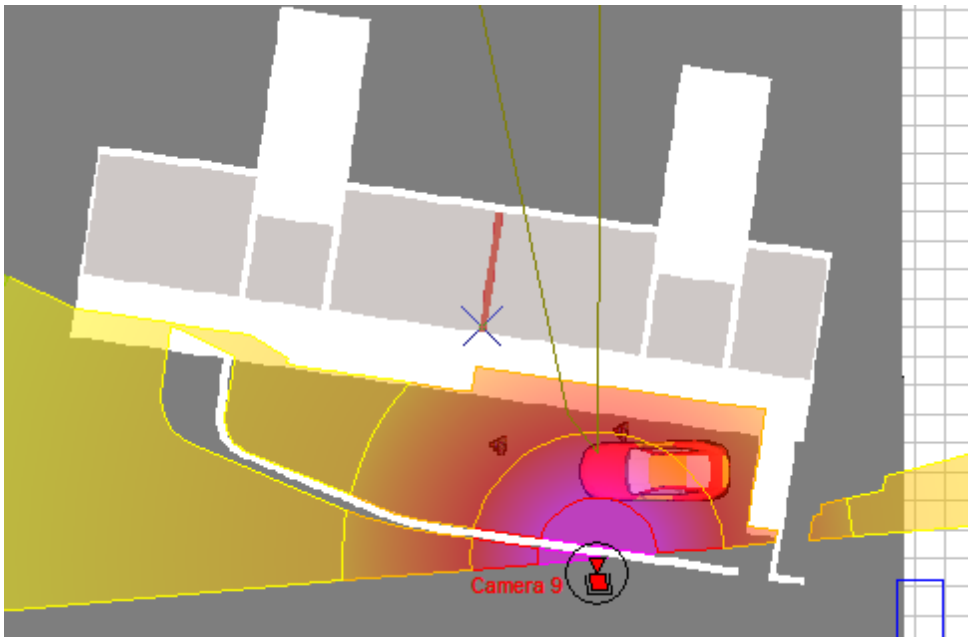


Constructions, 3D models and cameras can be distributed by layers 276. Each layer can have its own Base height 277. All constructions belong to the layer will be shifted in 3D by the Base height. This feature is useful in work with multilevel 3D constructions. In addition to the Base height, each layer has the following parameters 276: Active, Enabled, Visible, Hidden, Snap, Shadows, 3D Visible, Color.

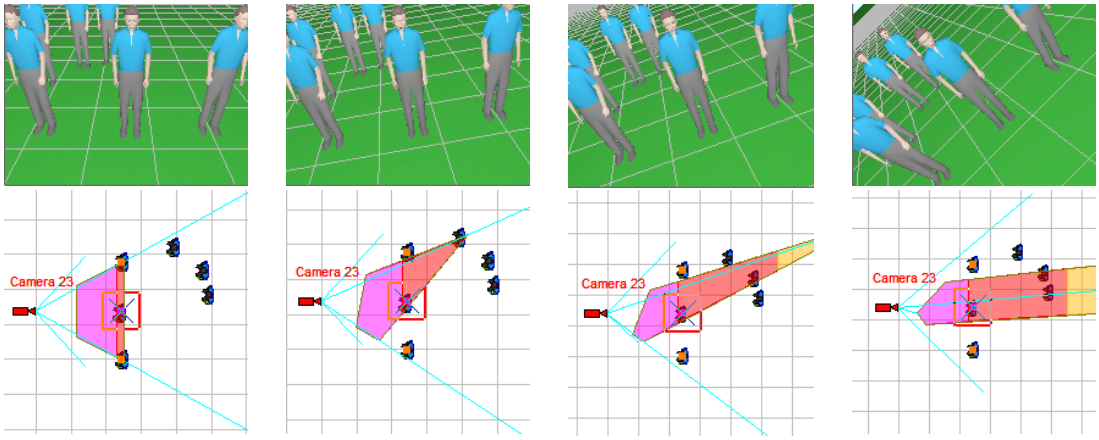


Display on the 2D layout results of calculations 3: person detection and identification areas, depth of field limits, test object, cables and luminaries.

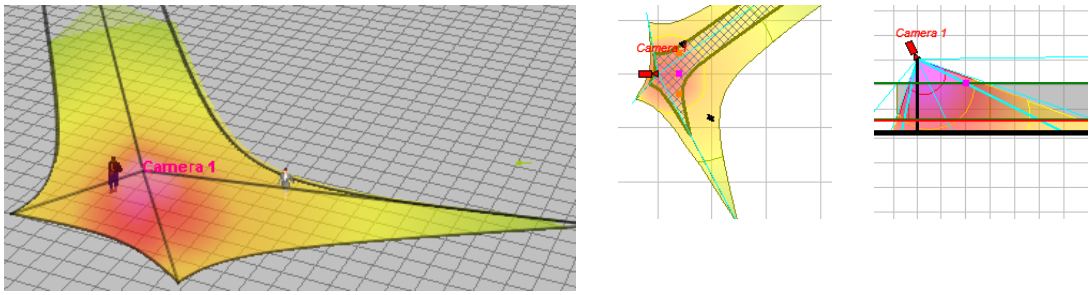
Construct the horizontal projection of camera control areas including shadows 178 from obstacles on the scene. In VideoCAD Lite obstacles can be constructions only. In VideoCAD Professional 3 3D models also can be obstacles.



Modeling camera rotation 297 around the main optical axis.

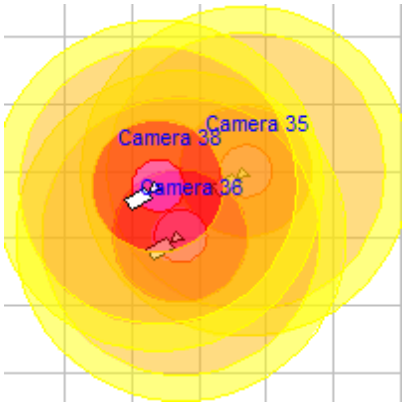


Modeling lens distortion 654. Modeling influence of the lens distortion on view area shape, on view area projection shape and spatial resolution distribution.Correct modeling wide-angle lenses with strong distortion.

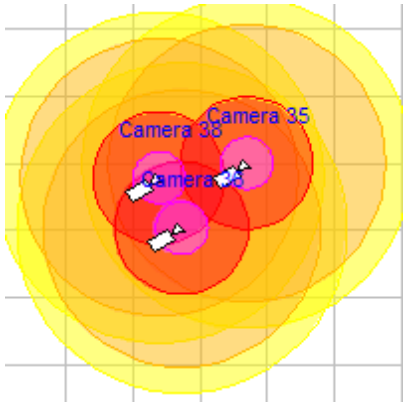


An option for drawing regions of spatial resolution in the Graphics windows in ascending resolution - High resolution on top 242. With this option enabled all cameras remain visible despite

the shading of projections of different cameras. While regions with higher spatial resolution are drawn on the top.



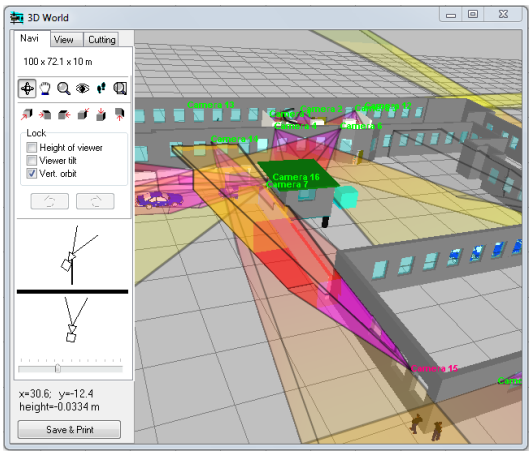
Usual drawing

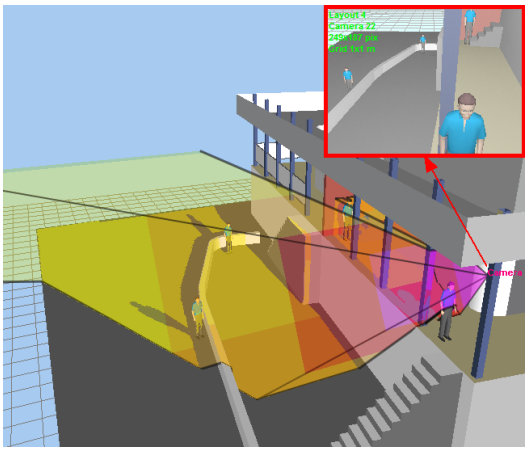


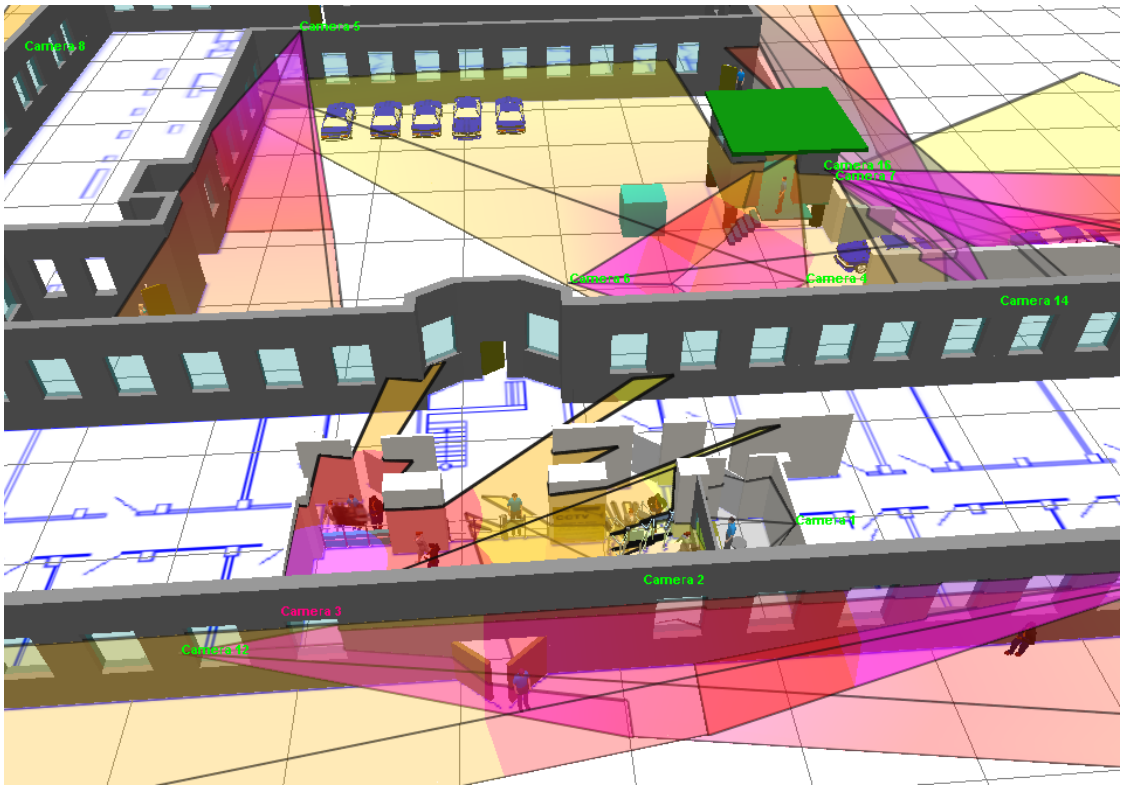
High resolution on top

3D modeling layout and camera view areas

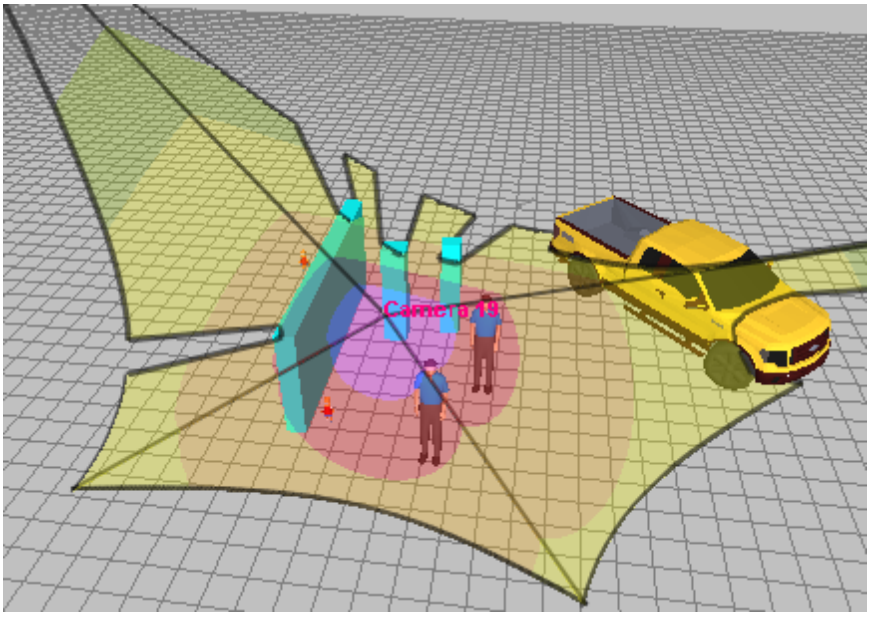
VideoCAD Professional has special 3D World 342 window with standard tools for 3D navigation 343 (**Orbit, Move, ZOOM, Walk, Look around, Zoom frame**). With the help of the window you can observe the layout in 3D representation. You can work on the project in usual 2D projections and watch it in 3D. You can "walk" on the floors of 3D models of buildings and study every detail.



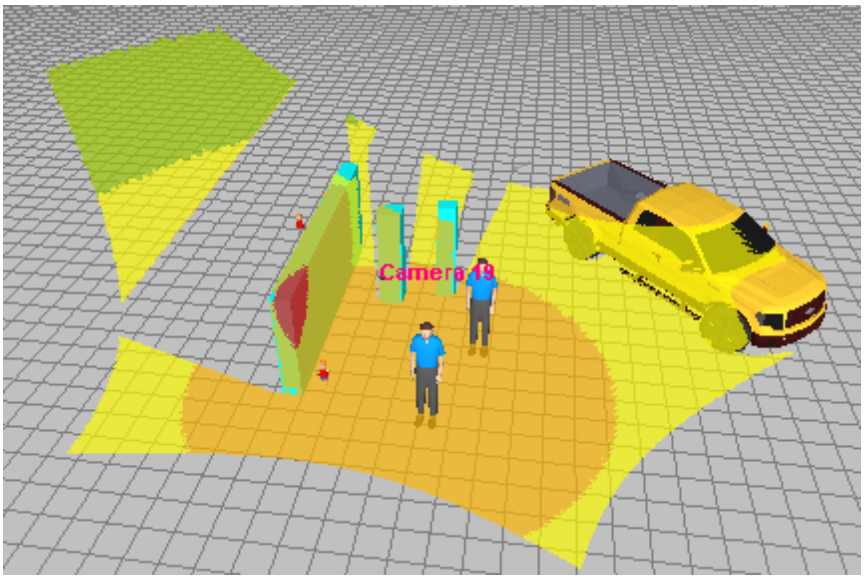




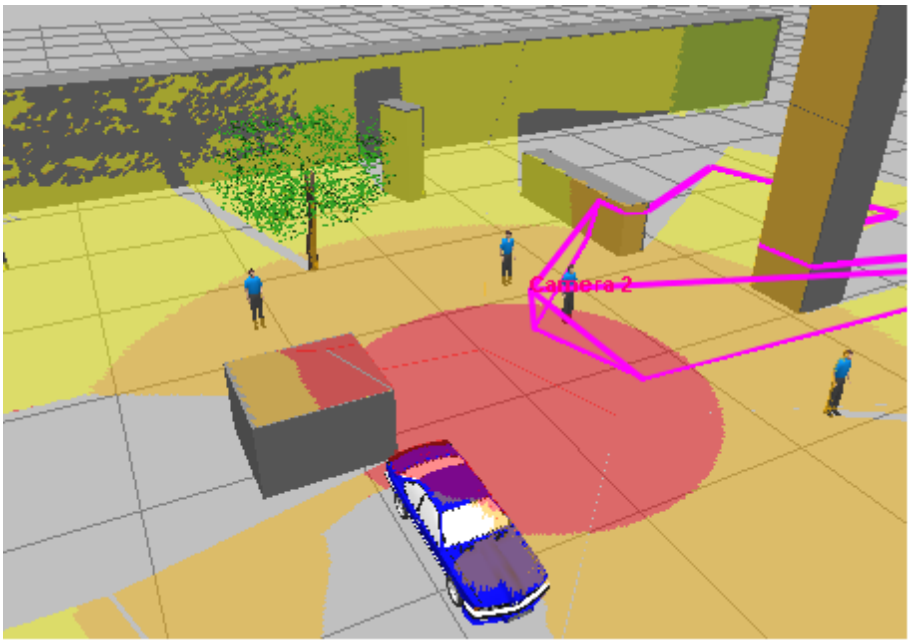
3D visualization of the camera view area surface 346 taking into account spatial resolution, shadows, lens distortion.



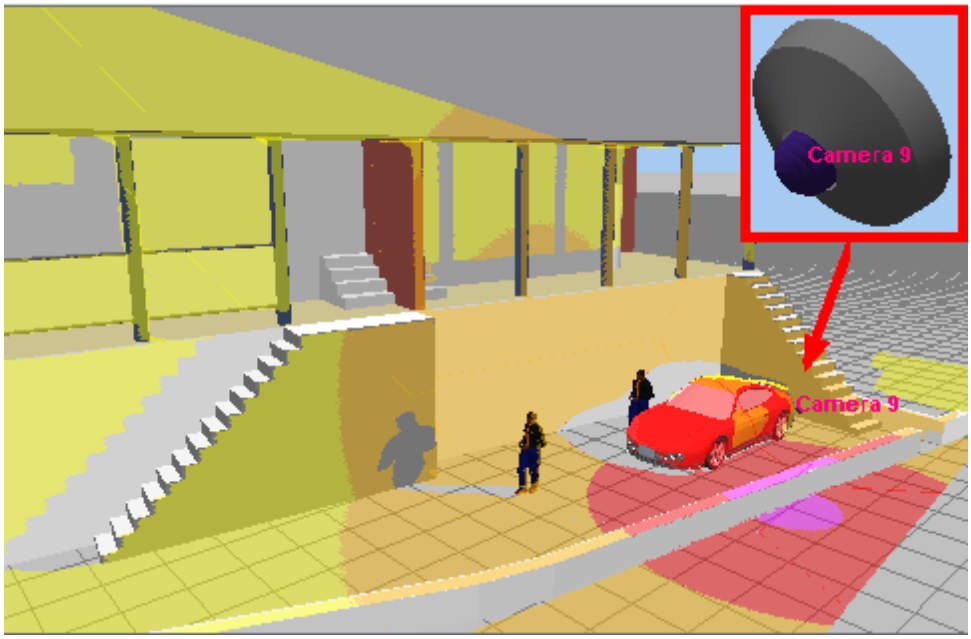
3D visualization of the active camera coverage 348 on the environment taking into account spatial resolution, shadows, lens distortion.



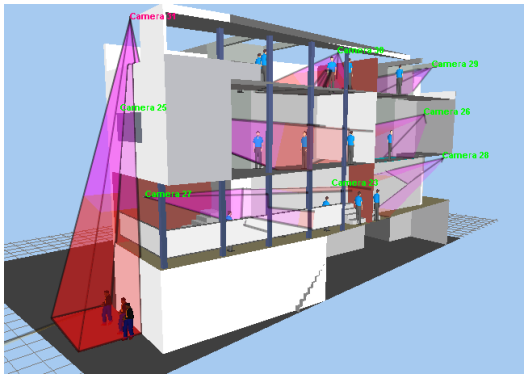
3D visualization of control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.

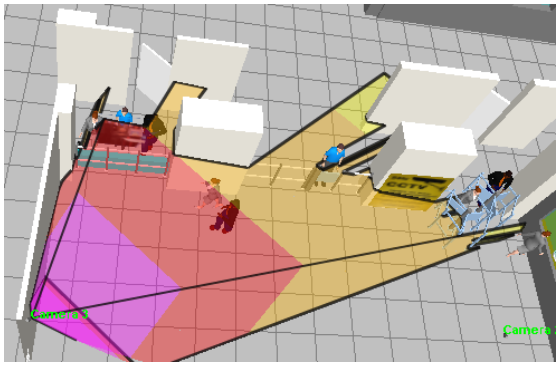


Visualization of camera coverage area and spatial resolution distribution on the surrounding objects of panoramic cameras 626 (fisheye, 360°/180°).

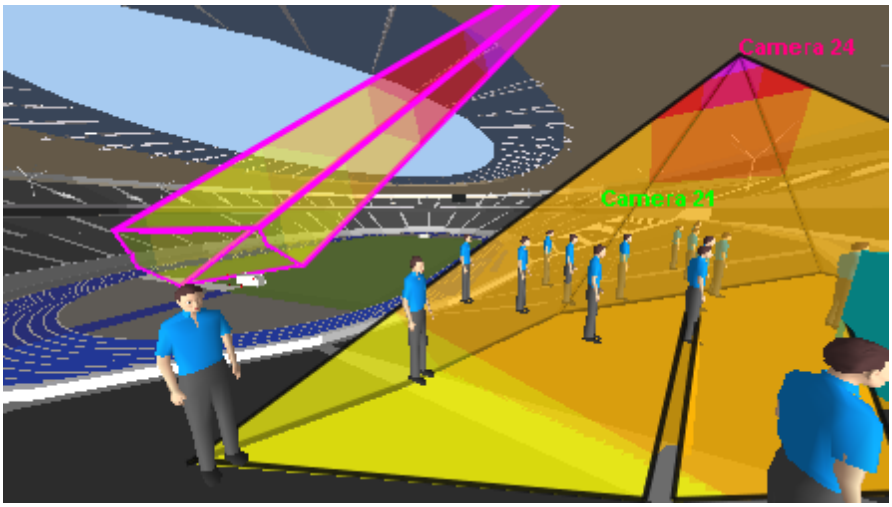


Free cutting 352 3D layout by six planes to provide access to any point of complex 3D buildings.

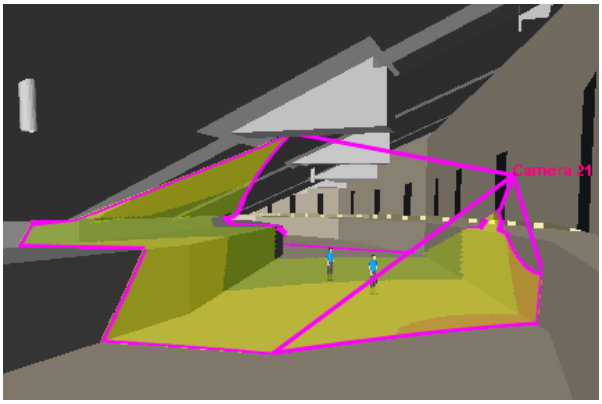


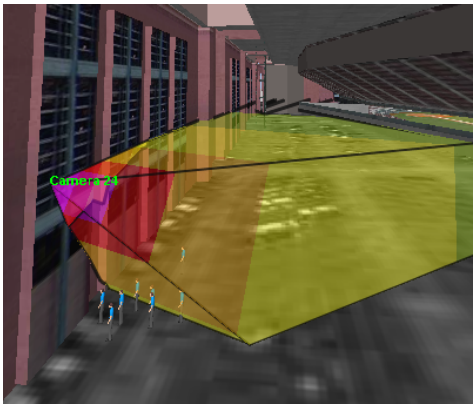


Working with multilevel 600 3D layouts and terrains with complicated vertical structure.

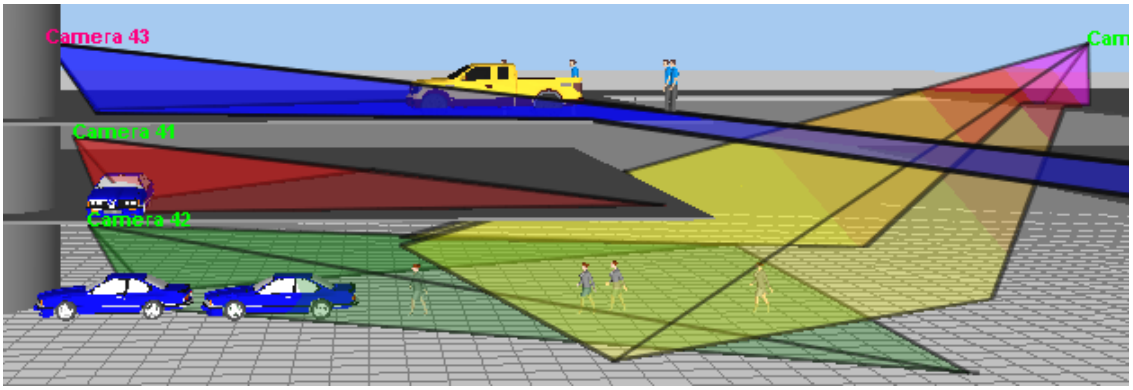


Possibility of using 3D models-territories 600, to place inside them cameras, constructions and other 3D models.

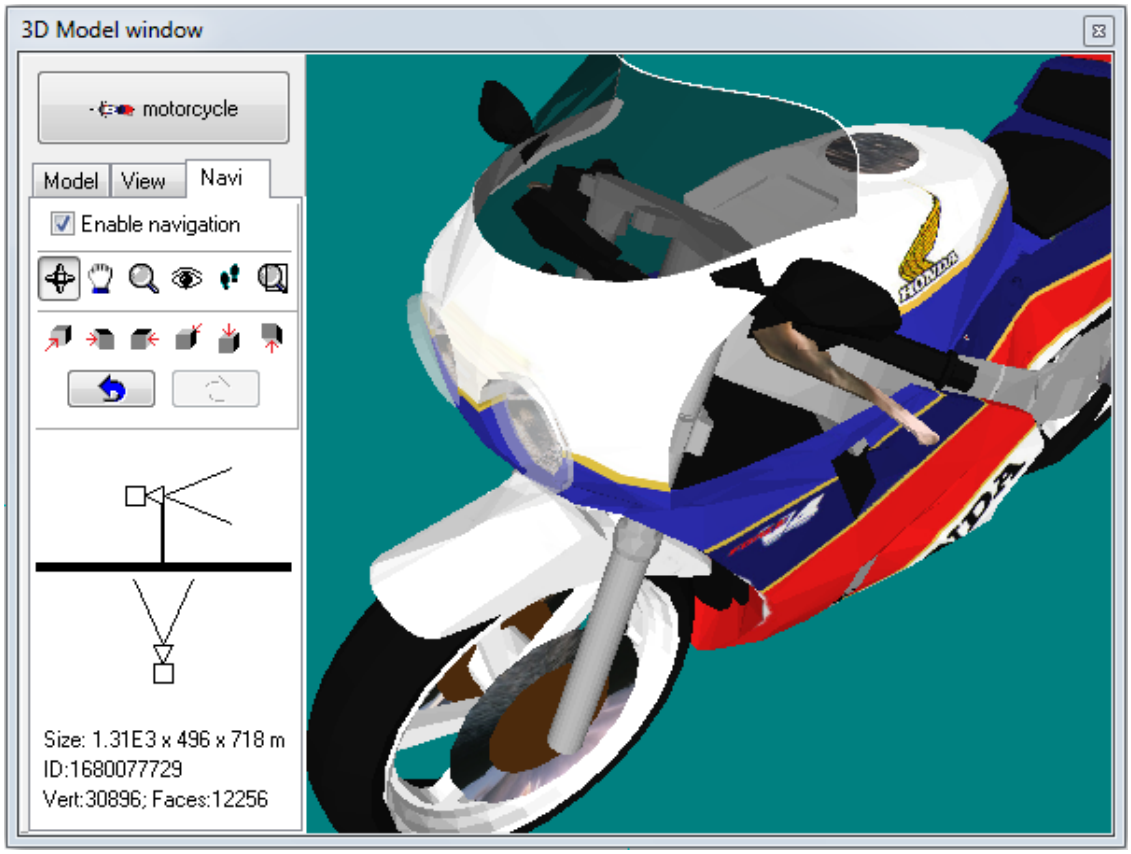




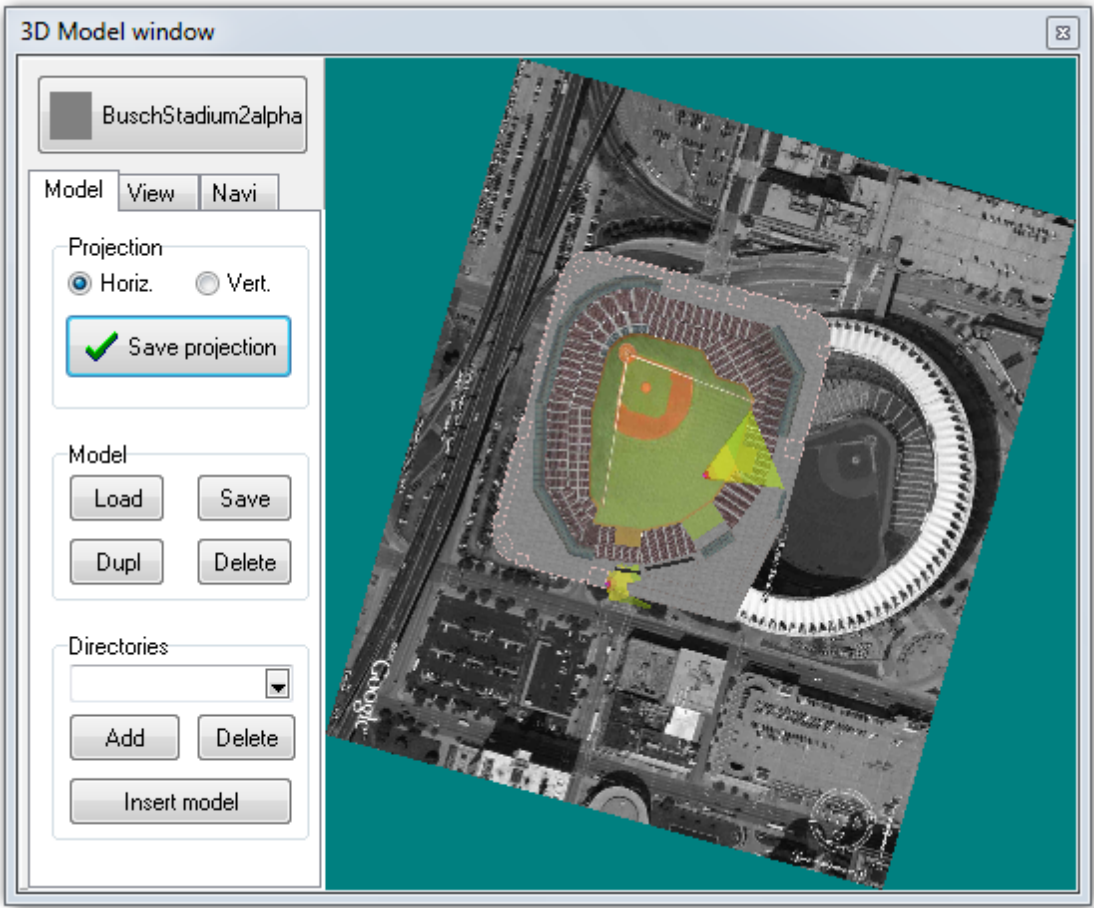
The Base height 298 in the camera geometry parameters. All heights related to a camera (height of installation, heights of the lower and upper bounds of view area, heights of person detection, identification, license plate reading areas) counted from the base height. The Base height together with layers 276 is used in work with multilevel 3D constructions.



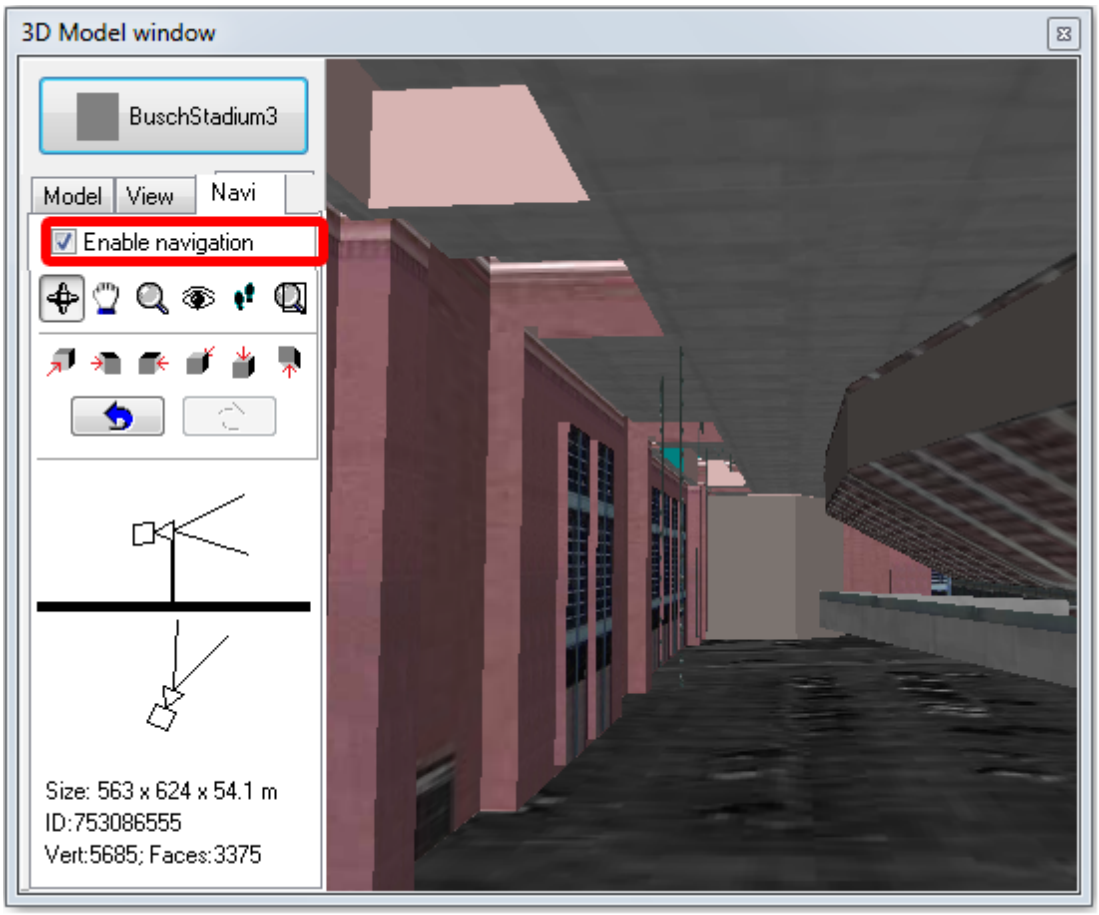
More capabilities of the 3D models 397 window. In the window you can create 3D model projections 401 with specified brightness, create projection in the form of faces, points and lines.



Ability to make projections in the form of sections of 3D models 401 at the specified range of heights. These projections of 3D models of buildings can be used as background for placing cameras in the Graphics window.



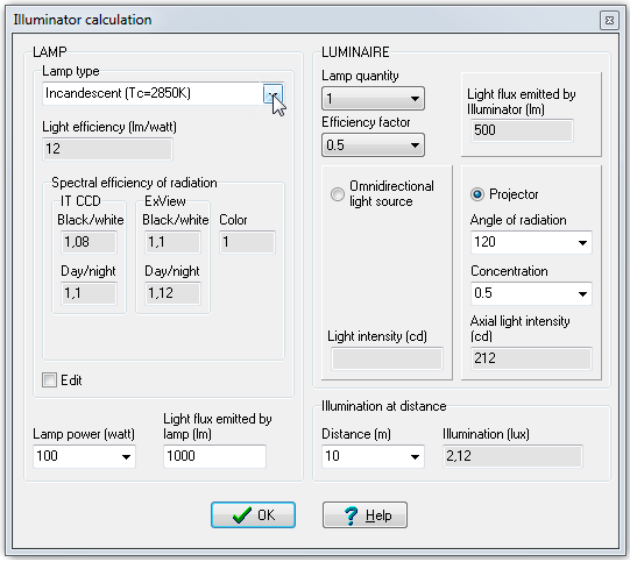
Ability to create 3D model projections with exceeding 401 Windows screen resolution.
Possibility to create a projection of individual area of 3D model with even higher resolution using PiP 402 (Picture in Picture) tool.
To use the 3D models as territories, and their projections as a background, a new ability to block 402 the projection of certain 3D models from selection by mouse click was added.
Ability to consider a 3D model as obstacle in the calculation of shadows 402.
In the 3D Models window you can also 399 earn 404 3D models using 3D interface similar to the 3D World 343 window.



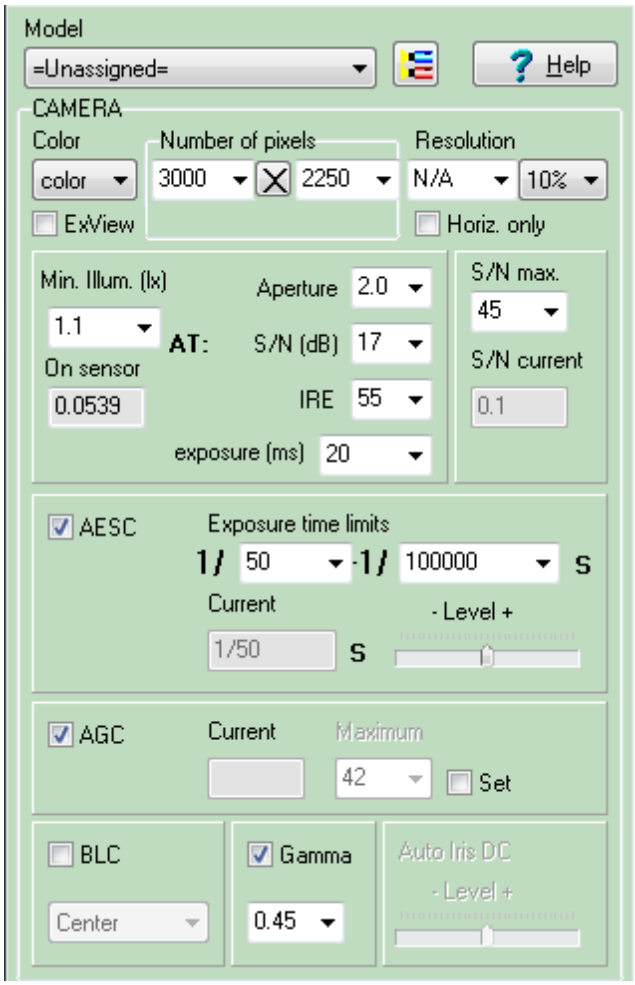
Modeling images from cameras based on camera parameters and scene conditions

Modeling observed scene 371 parameters (illumination, visibility limitations).

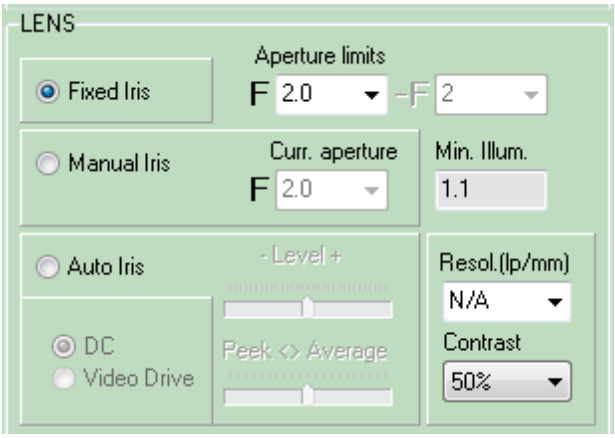
Model luminaires 461 considering spectrum of radiation and spectral sensitivity of image sensors, including discharge lamps with complex spectrum and infrared LED illuminators.



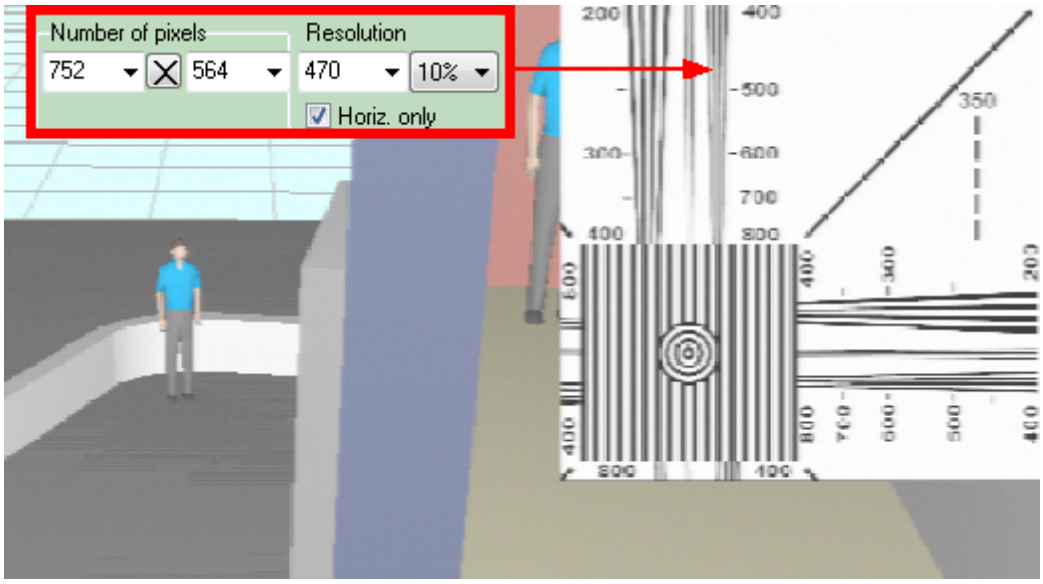
Model camera parameters 329 (spectral response, number of pixels, resolution, minimum illumination 334 at known signal/noise ratio, IRE and aperture, maximum signal/noise ratio, electronic shutter, AGC, BLC, gamma, day/night cameras, frame rate 375, interlace scan, global shutter and rolling shutter).



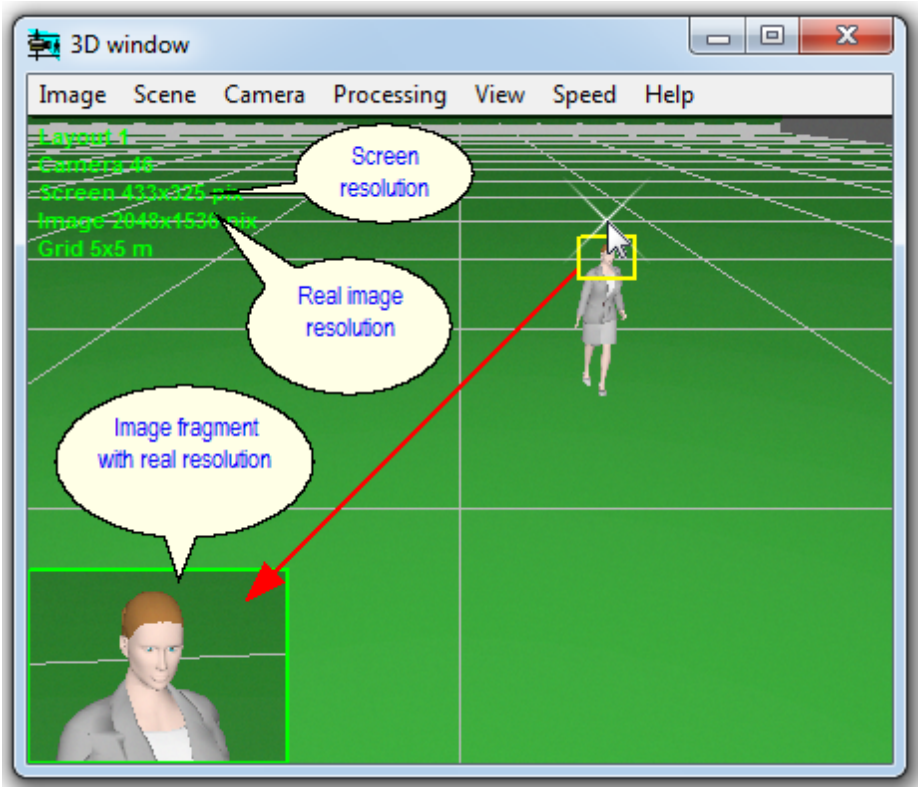
Model lens parameters 339 (aperture, auto iris DC and Video Drive, resolution).



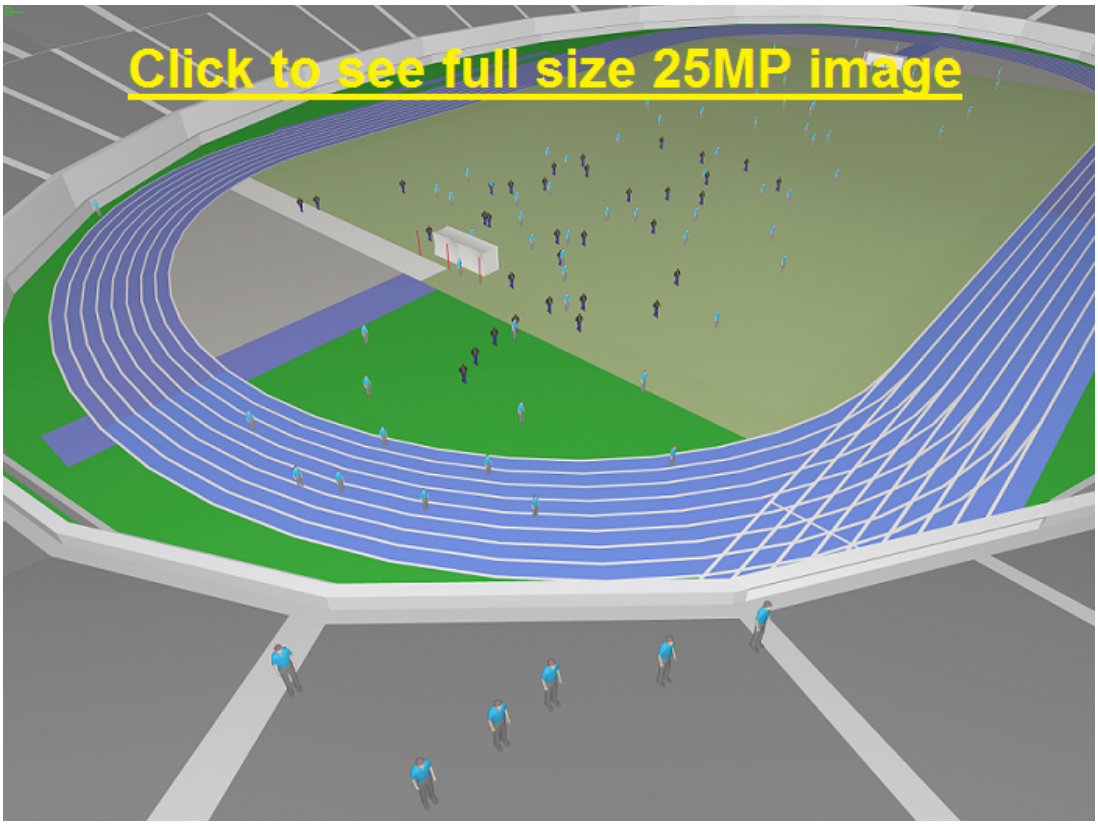
Visually control modeled resolution with the help of the Test chart 388



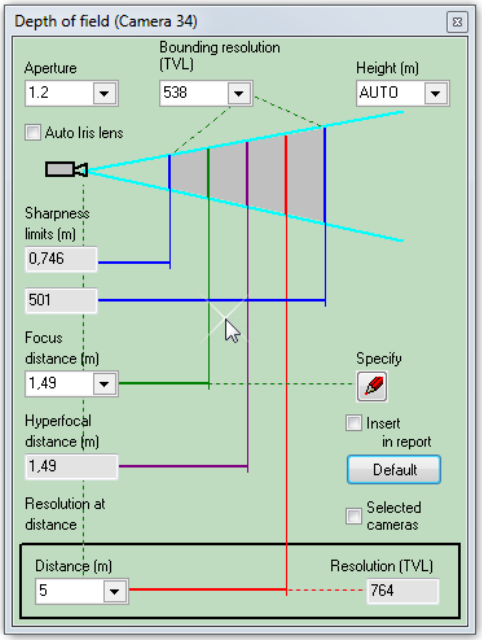
Model images from megapixel cameras 573 with number of pixels exceeds Windows screen number of pixels (Up to 100 megapixel and more!) with PiP 391 (Picture in Picture) and without PiP.

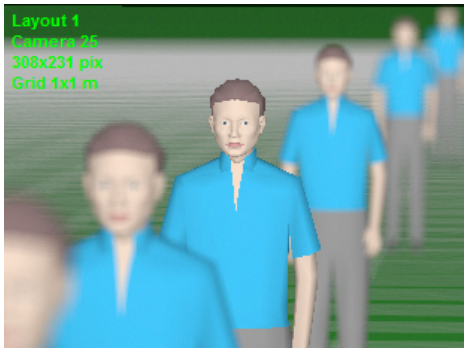


See examples: 5 megapixels,10 megapixels, 25 megapixels.



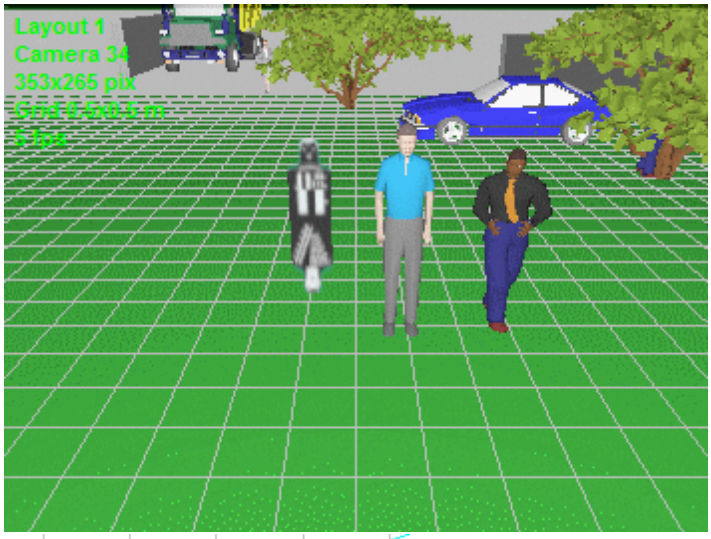
Calculate and model depth of field 454 of each camera in project.

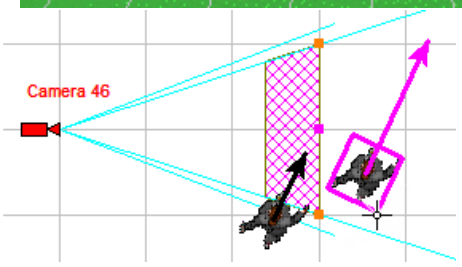




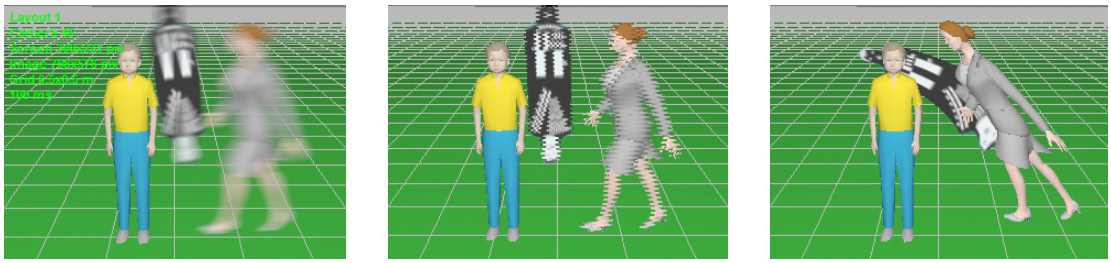
Model brightness 381, contrast, horizontal and vertical sharpness.

Model moving objects 203, camera frame rate 575, create animated images 386 with moving 3D models.

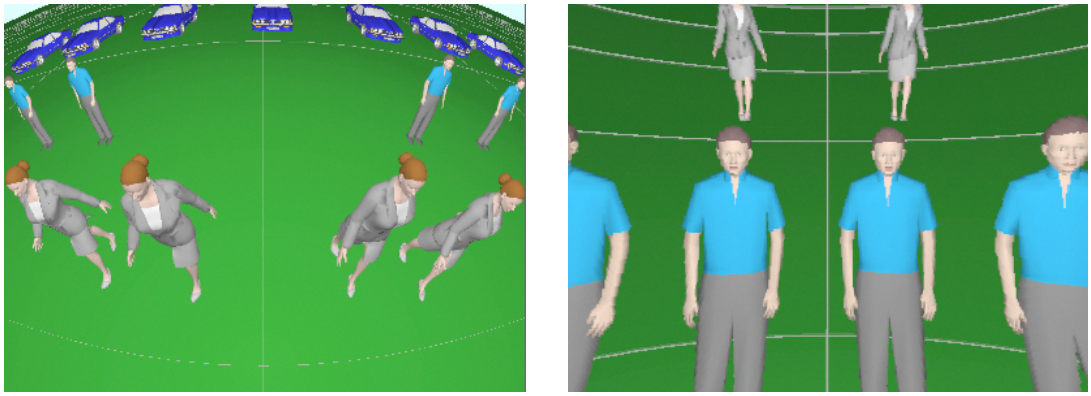




Model blur and distortion 585 of moving 3D models depending on camera parameters (exposure time, interlacing, rolling shutter).



Modeling images taking into account lens distortion 654 (barrel and pincushion). Correct modeling wide-angle lenses with strong distortion.

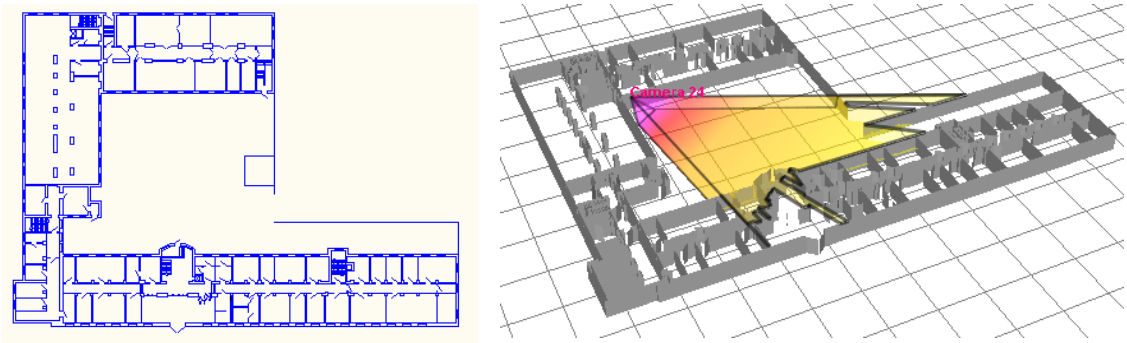


Design operator interface

Create animated monitor models 577 as html files with moving 3D models and different frame rates of each camera. See an example of animated monitor (file size about 4 Mb).

Import from other CAD programs

Import constructions 224 from a 2D background in AutoCAD formats to 3D VideoCAD constructions automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions.



Export

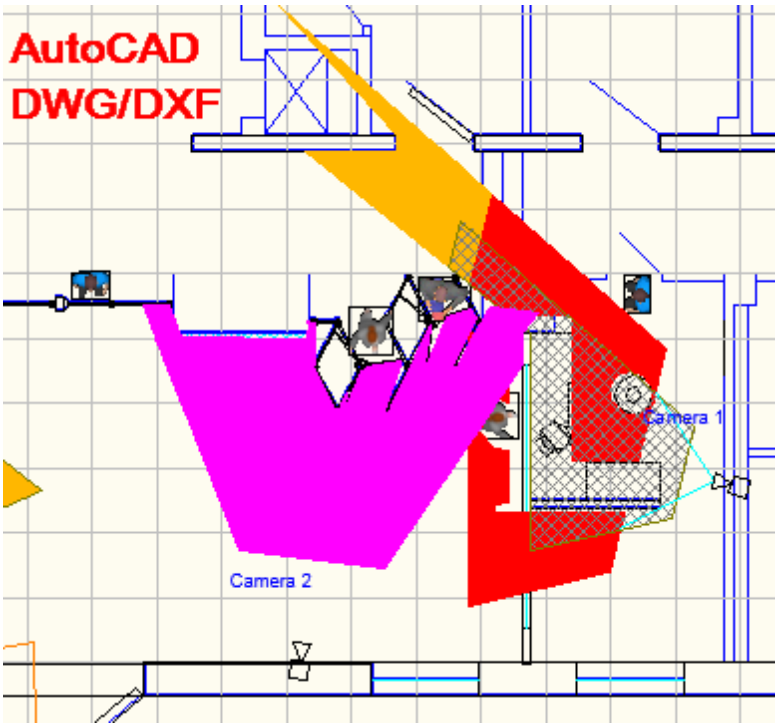
Export 219 the 2D drawing into any of the following formats: *.pdf (vector), **AutoCAD *.dwg,** PLT (HPGL/2), CGM (Computer Graphic Metafile), SWF (Adobe Flash).

Advanced export to AutoCAD formats. At exporting to AutoCAD DWG and DXF formats, cameras and illuminators are exported as blocks. The most important parameters of cameras and illuminators are recorded to the block attributes. VideoCAD layers, fonts and line types are exported.

When you export a drawing with a background in AutoCAD DWG/DXF format, VideoCAD constructions can be added to the background on separate layers 486 or the background can be added as an external links to the file of the background. In both cases the structure of the background is saved.

Possible scheme of the combining AutoCAD + VideoCAD:

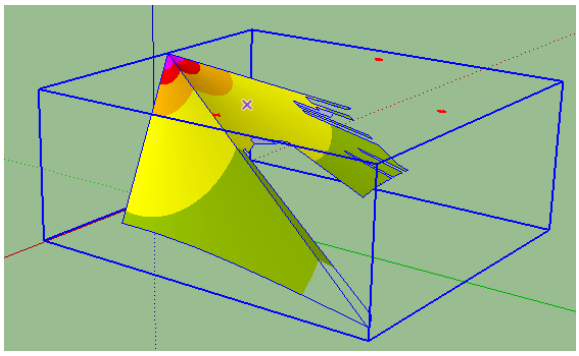
1. Load drawing 222 in AutoCAD format as a background;
2. Import 224 AutoCAD lines to VideoCAD 3D constructions automatically;
3. Adding cameras and constructions on special layers.
4. Export 219 the obtained drawing to AutoCAD format to work with it in AutoCAD.

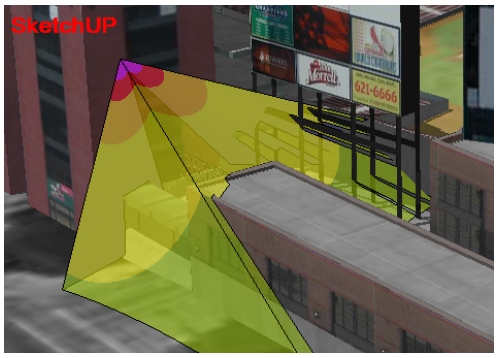


Export to DXF file 3D view areas 354 and camera coverage 355 taking into account lens distortion, spatial resolution, and shading.

This feature allows the convenient scheme of work with combination of 3D BIM Software (SketchUP) + VideoCAD.

1. Export layout as a 3D model-territory through SketchUP and loading it into VideoCAD.
2. Adding cameras with 3D view areas in VideoCAD.
3. Export 3D view areas in DXF format, loading them into 3D BIM Software and combining with the original layout in 3D.





Export images from the 3D World 342 window to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png. Size in pixels of the exported file can exceed 354 the Windows screen size.

During export 3D images 360 from cameras to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png, size in pixels of the exported file can exceed 573 the Windows screen size.

Export animated image models 360 with moving 3D models to **animated gif.** See an example of animated monitor (file size about 4 Mb).

Export images from monitors to animated monitor models 577 as html files, with moving 3D models, taking into account frame rate of each camera.

Get detailed adjustable table 443 of all initial and calculated parameters of cameras in project. Print the table or export it to *.txt, *.csv,*.rtf, *.xls, *.htm formats.

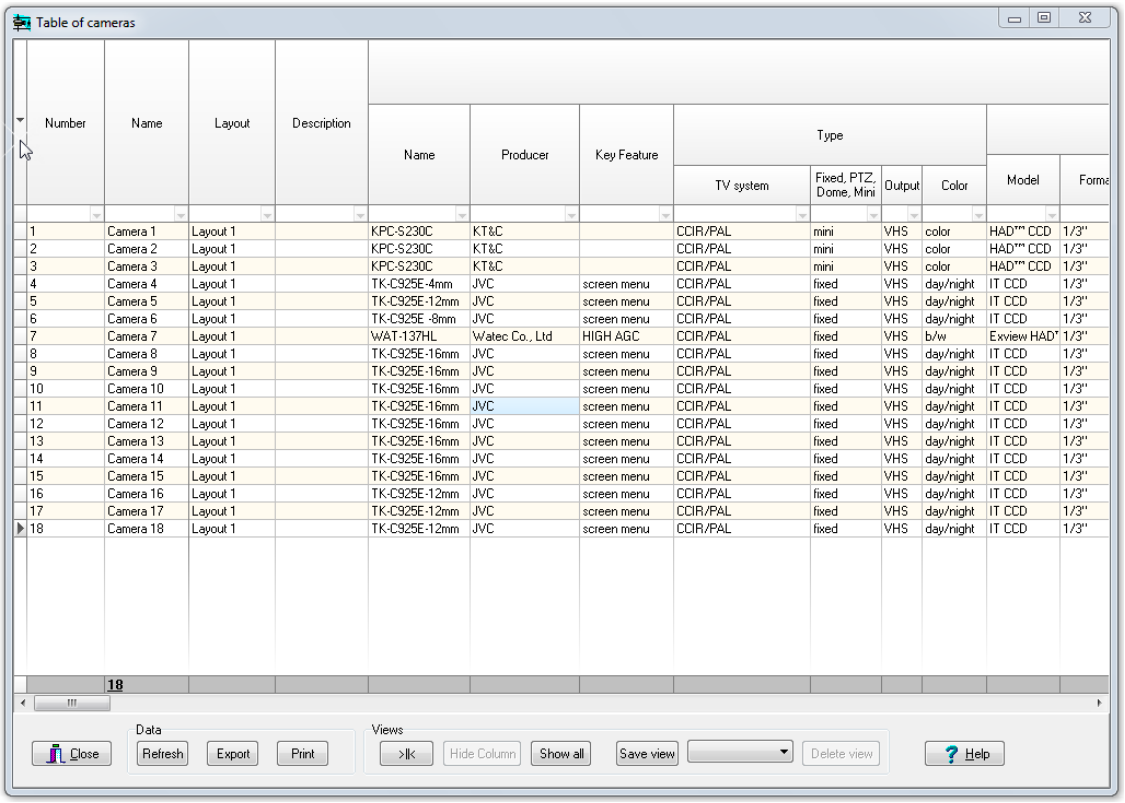


Table of cameras

Number	Name	Layout	Description	Name	Producer	Key Feature	Type				Model	Forma
							TV system	Fixed, PTZ, Dome, Mini	Output	Color		
1	Camera 1	Layout 1		KPC-S230C	KT&C		CCIR/PAL	mini	VHS	color	HAD"" CCD	1/3"
2	Camera 2	Layout 1		KPC-S230C	KT&C		CCIR/PAL	mini	VHS	color	HAD"" CCD	1/3"
3	Camera 3	Layout 1		KPC-S230C	KT&C		CCIR/PAL	mini	VHS	color	HAD"" CCD	1/3"
4	Camera 4	Layout 1		TK-C925E-4mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
5	Camera 5	Layout 1		TK-C925E-12mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
6	Camera 6	Layout 1		TK-C925E -8mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
7	Camera 7	Layout 1		WAT-137HL	Watec Co., Ltd	HIGH AGC	CCIR/PAL	fixed	VHS	b/w	Exview HAD'	1/3"
8	Camera 8	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
9	Camera 9	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
10	Camera 10	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
11	Camera 11	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
12	Camera 12	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
13	Camera 13	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
14	Camera 14	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
15	Camera 15	Layout 1		TK-C925E-16mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
16	Camera 16	Layout 1		TK-C925E-12mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
17	Camera 17	Layout 1		TK-C925E-12mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"
18	Camera 18	Layout 1		TK-C925E-12mm	JVC	screen menu	CCIR/PAL	fixed	VHS	day/night	IT CCD	1/3"

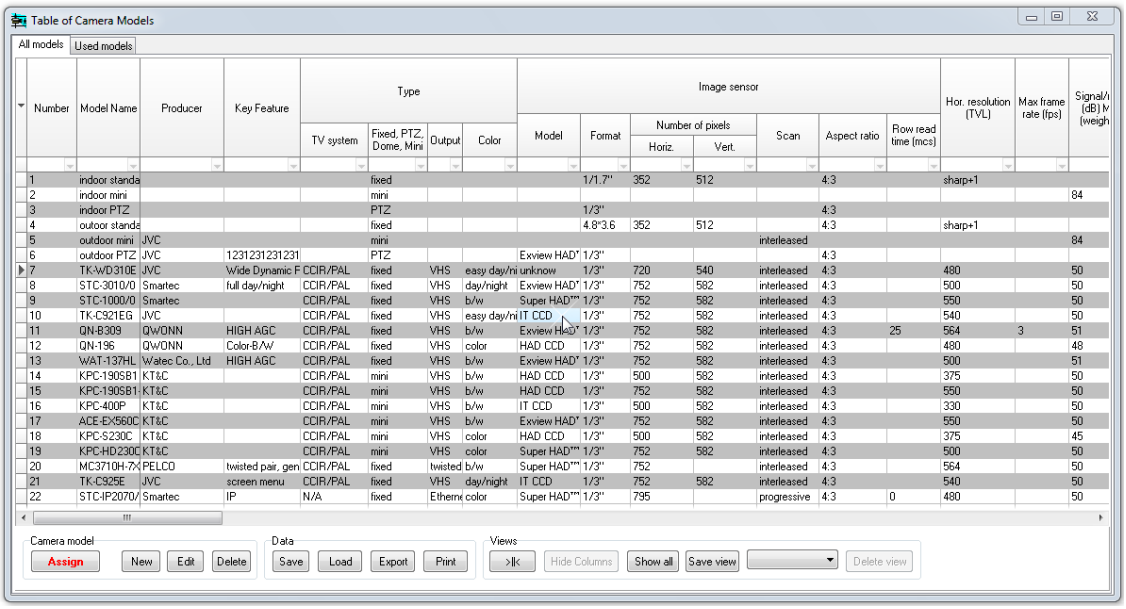
Printing

Printing 3D images from the 3D World 356 window.

Printing the Table of cameras 450 as a whole or by selected fragments.

Database of camera models

Maintain database of camera models 419 with extended parameters (up to 117 camera parameters), assign different models to cameras in project, compare models with each other.



Registration

VideoCAD 8 Professional is registered with USB dongle. All other VideoCAD versions are registered only by personal registration code. This code doesn't depend on computer hardware or a dongle. This code is valid on any computer.

You can install **VideoCAD 8.2 Professional** on many computers, but launch on one computer with dongle connected. One license of **VideoCAD 8 Lite**, purchased separately, allows to use the program on two workplaces nonsimultaneously (work and home computers) if both workplaces belong to one person - owner of the license.

Demo version

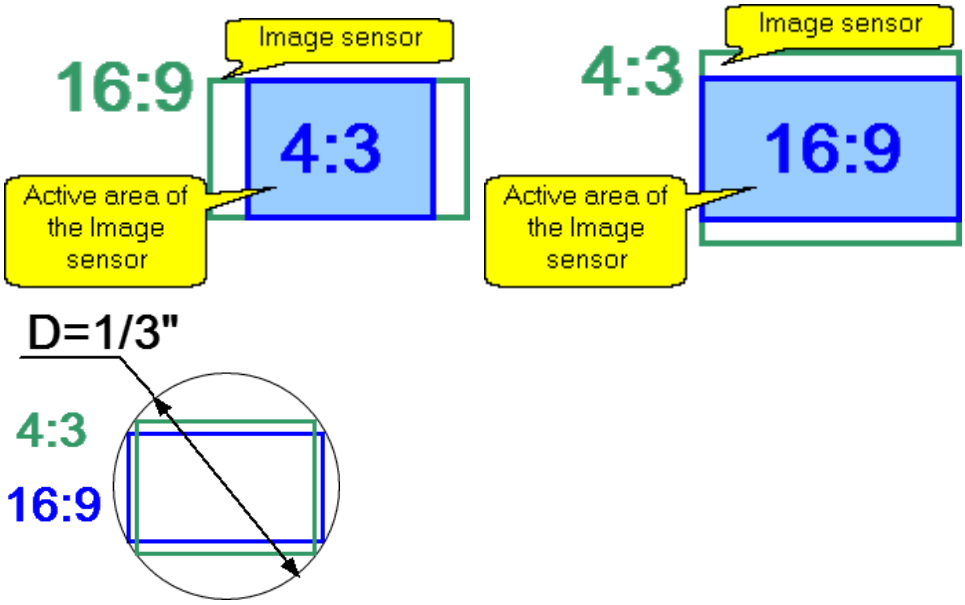
You can't change lens focal length, lens aperture, image sensor format, aspect ratio and light sensitivity in the demo-version of **VideoCAD Professional**. You may install the demo-version of VideoCAD Professional to test and evaluate it for 30 days; after this time you must either buy the license to use the VideoCAD Professional permanently or delete the demo version from your hard drive.

In the demo version of **VideoCAD 8 Lite** changing lens focal length and image sensor is allowed. Instead of this, saving working project to a file is prohibited and there is a limit on the maximum number of cameras (5) in one project.

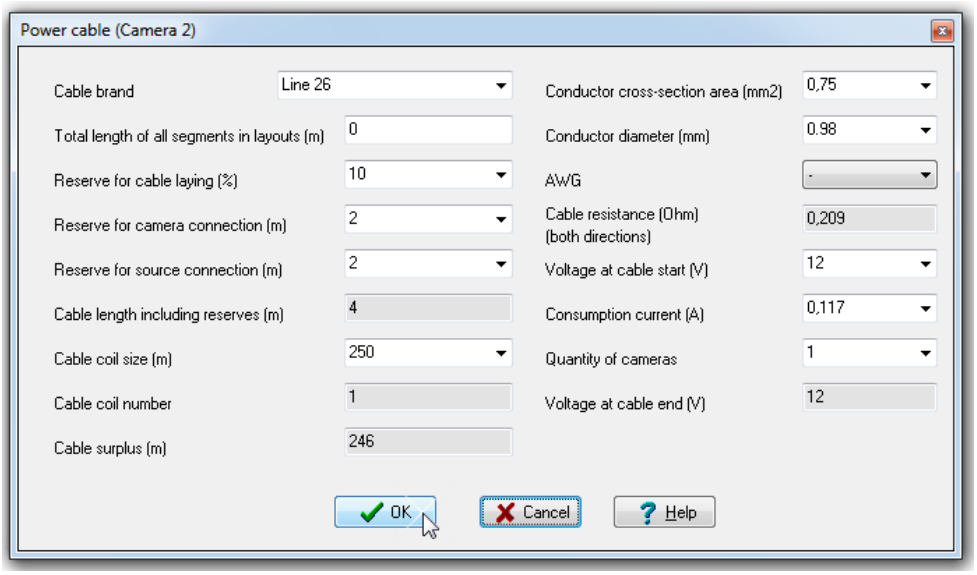
Differences between VideoCAD 8 Lite 31 and VideoCAD Starter II 45

Calculations

More accurate modeling cameras taking into account size of active area of the image sensor in dependence of the aspect ratio of the image sensor and the aspect ratio of the output image of the camera. Model cameras with non standard image sensor size 308 and aspect ratio.

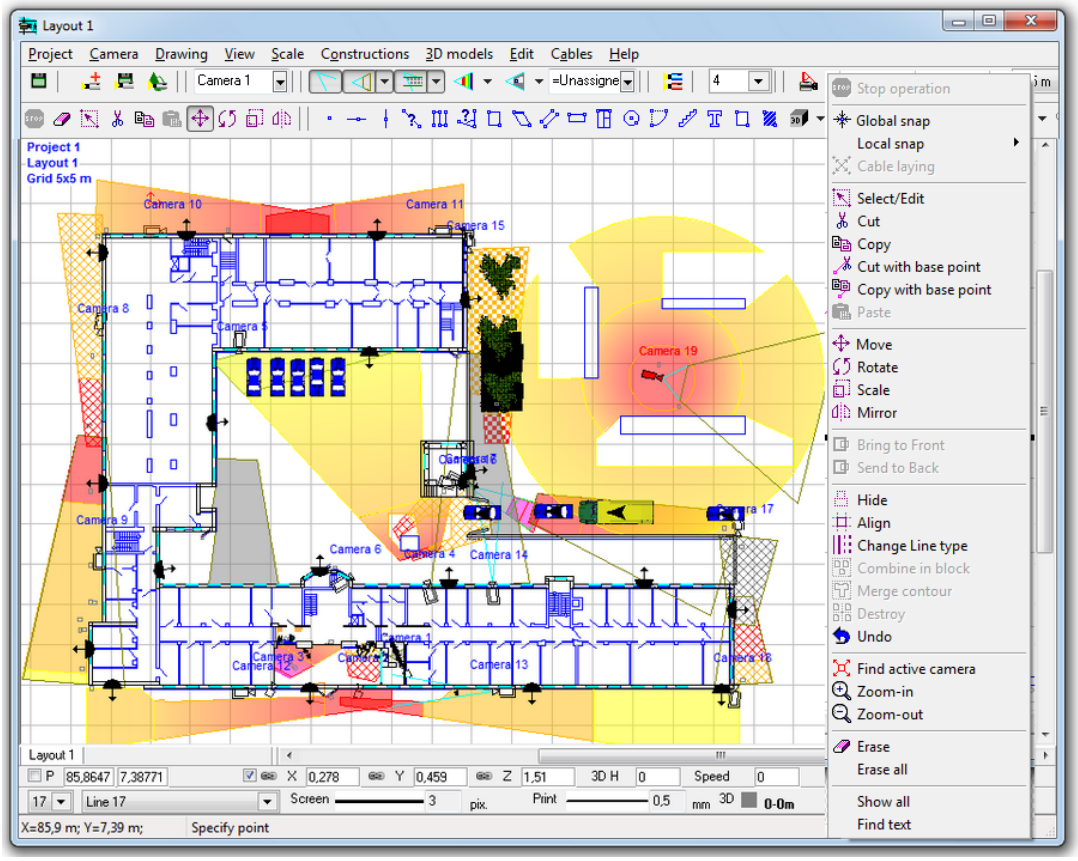


Calculate length 590 and electric parameters of cables 515.

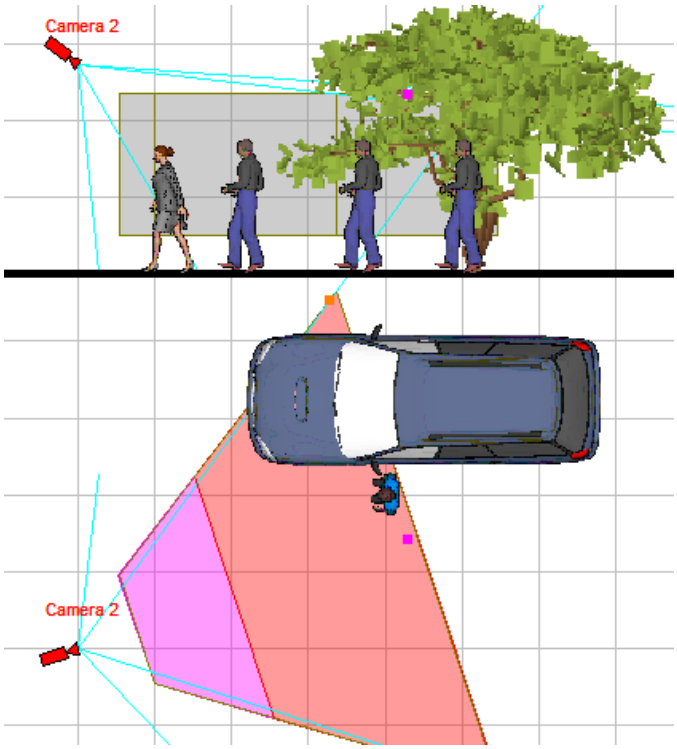


Working with 2D projections

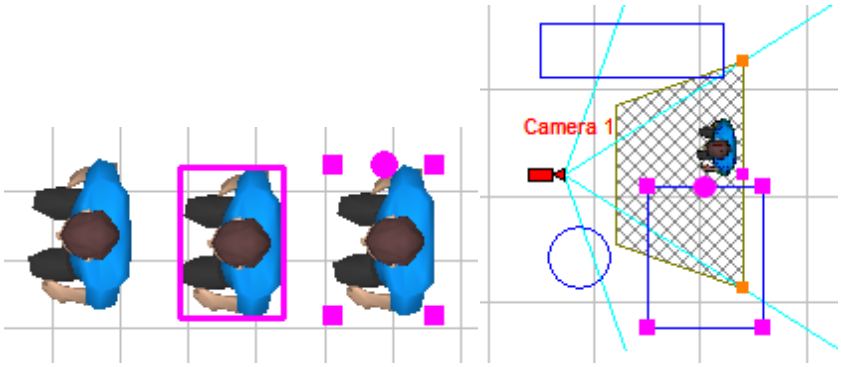
Use more than 30 additional constructions and CAD tools (Point, Horizontal line, Vertical line, Line segment, Angle, Double line, Arc, Mask, Filling, Text, 3D image, Inclined rectangle, Change installation height, Change view area upper bound, Change view area lower bound, Copy with base point, Cut with base point, Scale, Mirror, Change line type, Hide camera names, Cameras over constructions, Bring to front, Send to back, Hide, Align, Combine in block, Destroy block, Find text, Hidden state of objects, Numerate cameras, Length calculation of line segments,Merge contour, High resolution on top).



Work with vertical projection 187 of the site plan.



More convenience in editing on the layout 3D models, Rectangle, Wall, Aperture in wall, Stairs, Mask, Filling, 3D Image. You can scale them and rotate around its axis using the square grips and pink circle.

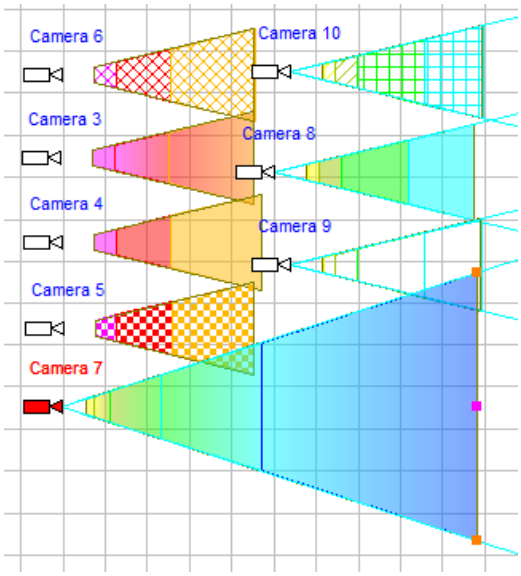


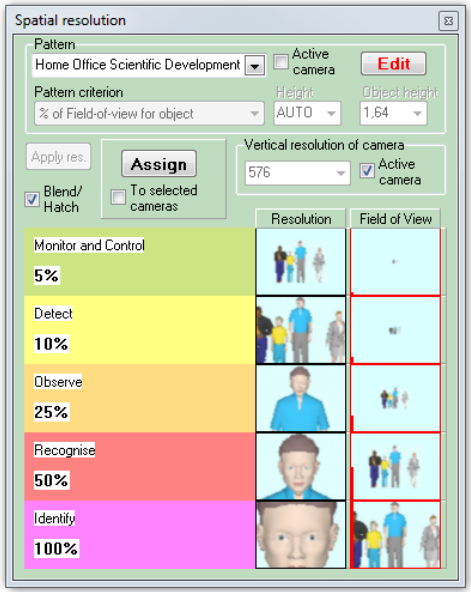
Use Titles 241 and texts 201 on the drawing. Different fonts 477 are supported.

Use up to 10 layouts 274 in each project.

Use up to 30 spatial resolution patterns 316 in each project. Each pattern can contain up to 10 regions. Adjust object height 320 in the patterns, height of measuring spatial resolution 320, direction (horizontal or vertical) of measuring spatial resolution. The Spatial resolution box contains models of field-of-view images 322 for each region in current pattern.

There are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch; Home Office Guidelines for identification; P 78.36.008-99, Australian Standard AS4806: Closed Circuit Television, European Standard EN50132-7, ISO/IEC 19794 Biometric data interchange formats.

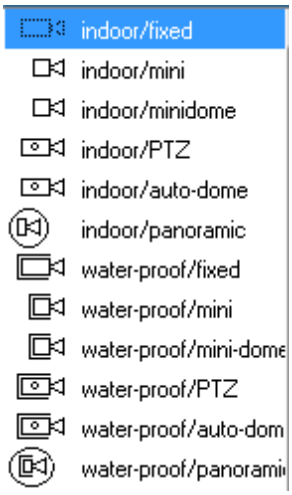




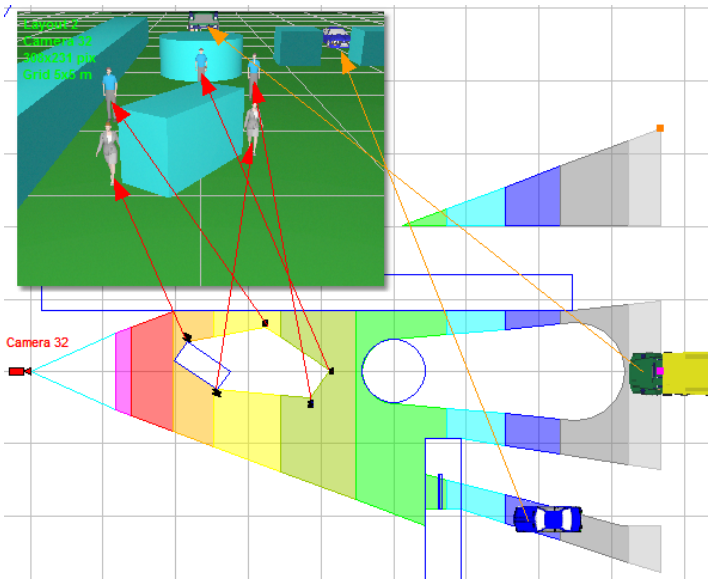
Use gradient color and hatching for visualization of spatial resolution.

Show view area projections by different colors and hatch styles, using different line types.

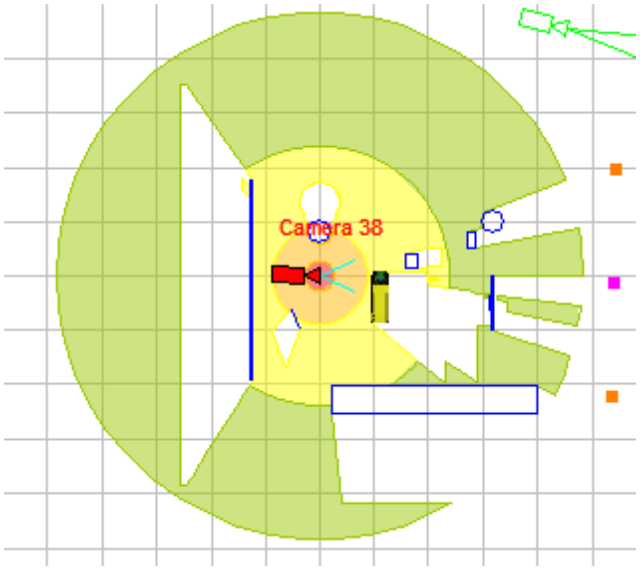
Use different camera icons (fixed, PTZ, outdoor..).



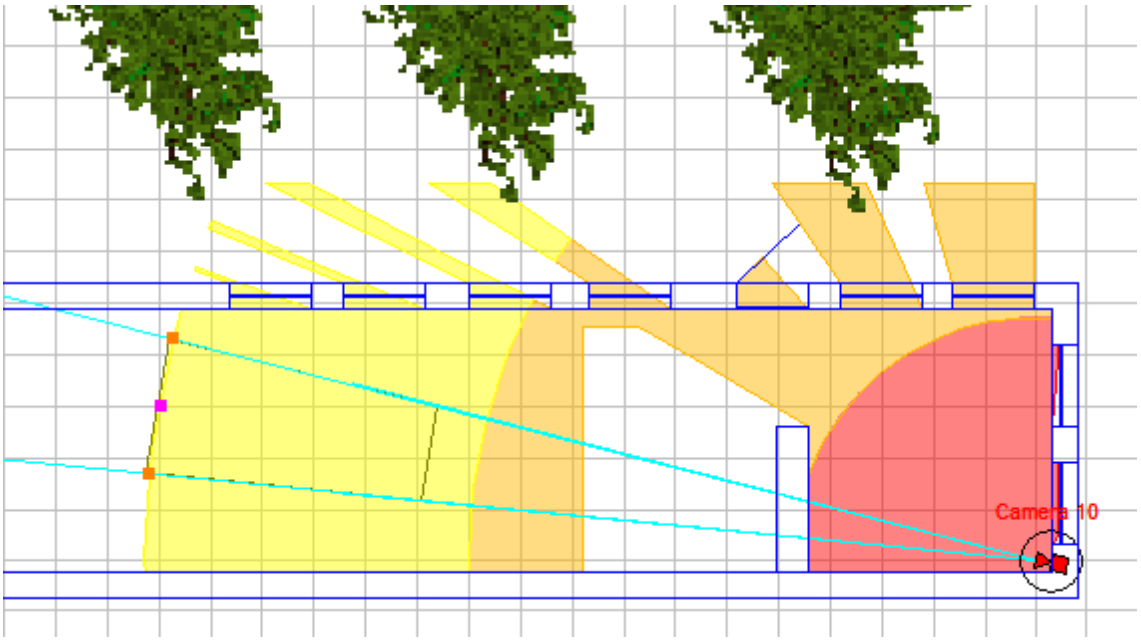
Construct the horizontal projection of camera control areas including shadows 178 from obstacles on the scene. In VideoCAD Lite obstacles can be constructions only. In VideoCAD Professional 3 3D models also can be obstacles.



Choose the best positions and calculate control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.



Simulation of the horizontal projection of the view area and visualization of the spatial resolution distribution of panoramic cameras 626 (fisheye, 360°/180°).

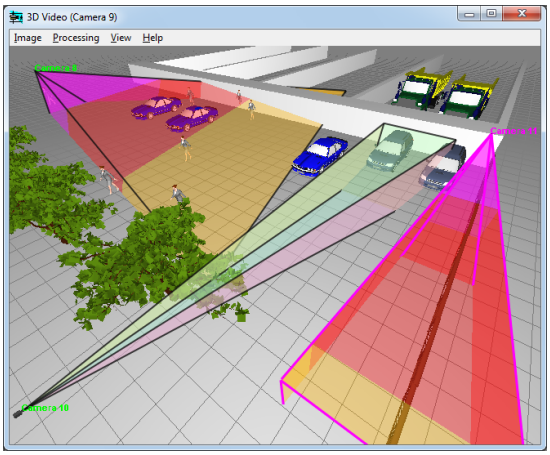


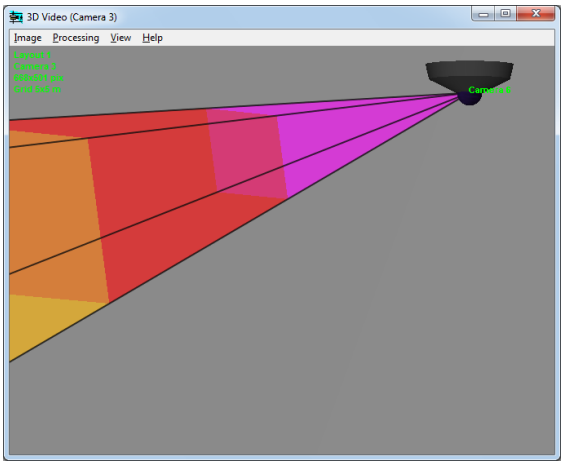
Adjust keyboard shortcuts 479 for each item in the Main menu.

Adjust visibility 489 of buttons on the Toolbar.

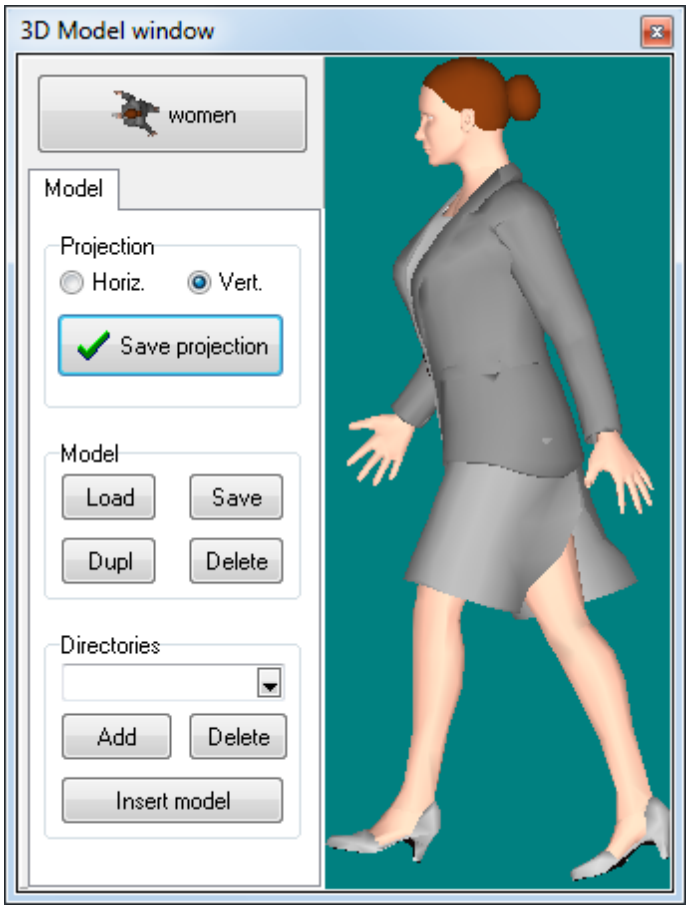
3D modeling layout and camera view areas

3D visualization of the location plan and camera view areas in the 3D Video 357 window by other cameras. Visualization of the spatial resolution. Flexible adjustment of displaying view areas from the side.





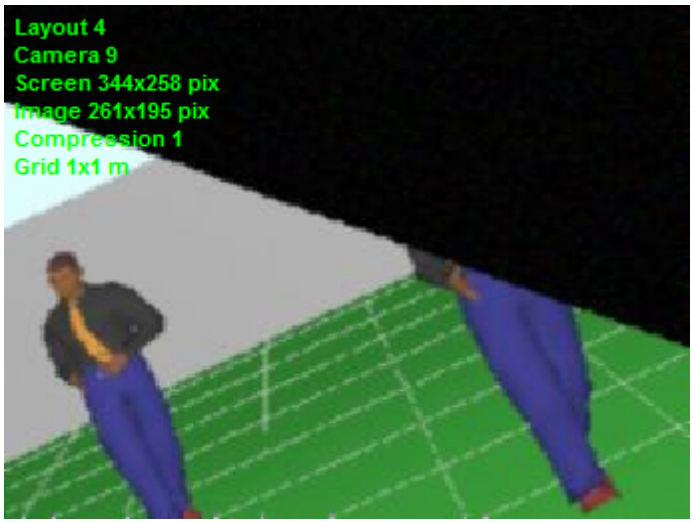
In special 3D models 397 window you can create 3D model projections 401 with specified resolution. You can load 3D models from files, save 3D models to files, create copies of 3D models



Support of 3D models with textures, transparent texture and opacity of materials. New version of **VideoCAD Plugin for SketchUP** with possibilities of export textures, transparent textures, opacity of materials and scaling.

Modeling images from cameras based on camera parameters and scene conditions

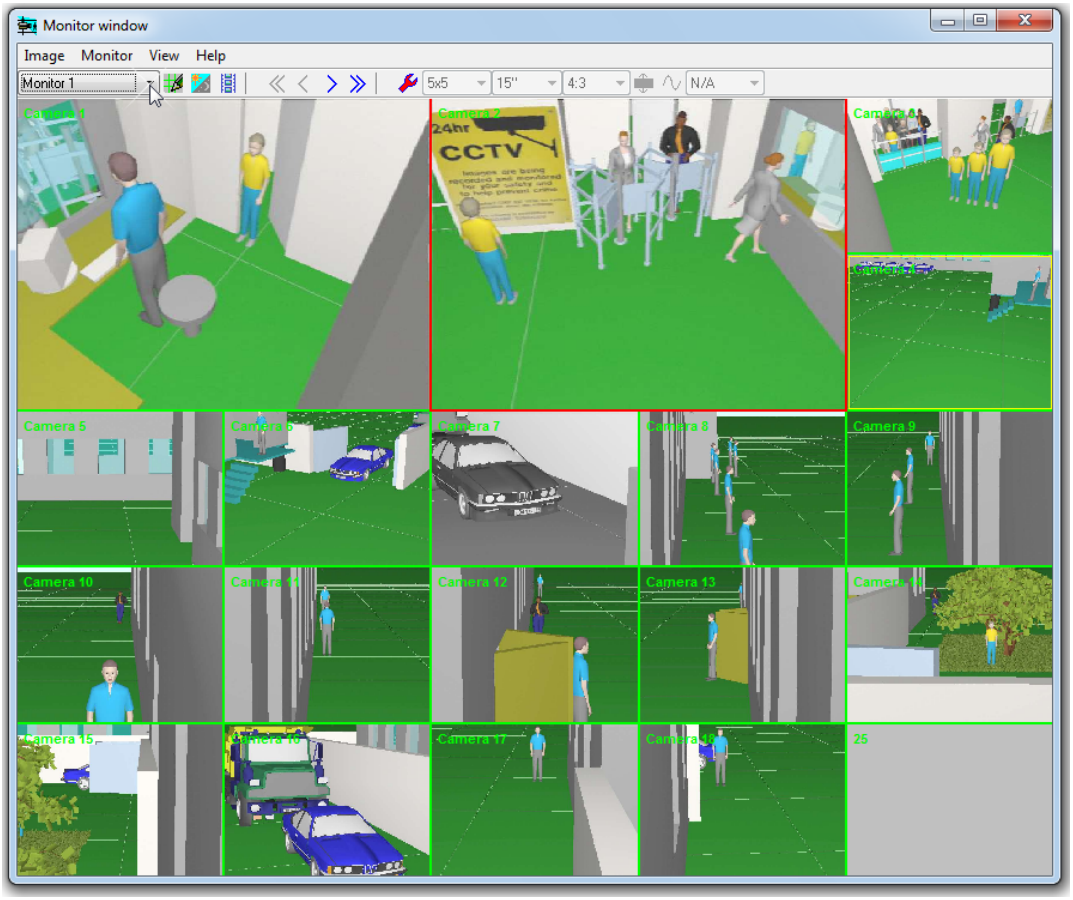
Simulation of image resolution and view area limits of panoramic cameras 312 (fisheye, 360°/180°).



Obtain Image Model 357 for each camera in the project based on models of scene and equipment.

Design operator interface

Design operator interface using the Monitor window 407.

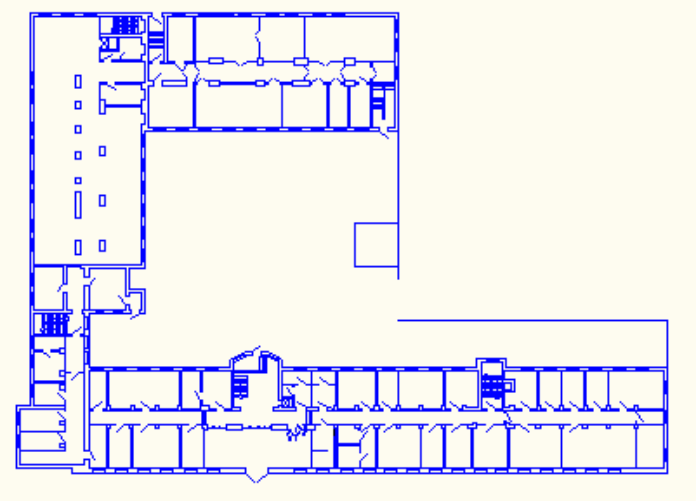


Modeling size and resolution 411 of monitors.

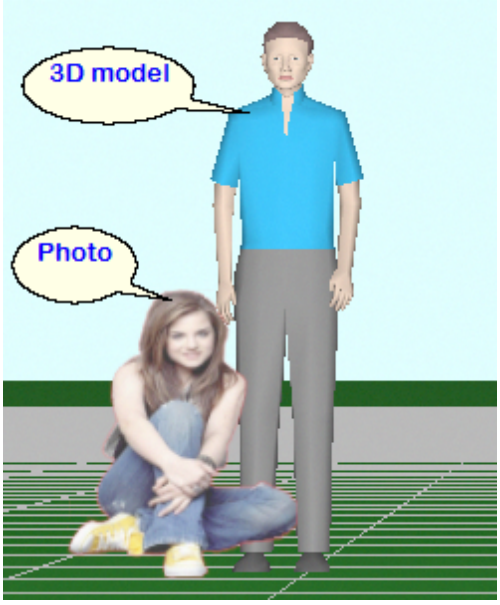
Import from other CAD programs

Locate cameras and cables on the prepared layouts 222 in formats ***.emf, *.wmf, *.png, *.gif, *.tif, *.pdf**. Upgraded AutoCAD import modules can read much more CAD files.

For backgrounds in **AutoCAD *.dxf *.dwg** formats you can choose Layout in the background, control visibility of layers, hide texts. For backgrounds in PDF format you can choose page and resolution of the background.



Import raster images 205 to display them in 3D.



Import camera model parameters to the **Table of camera models** via copying and pasting 428 from Excel.

Export

Export 219 the 2D drawing into any of the following formats: *.emf, *.wmf, *.png, *.gif, *.tif, *.pdf

(raster), **AutoCAD *.dxf**.

Export images from monitors 412 to *.bmp, *.jpg,*.gif,*.tif,*.png.

Obtain the text report 216 with full description of all cameras in the project, view areas and cables to be pasted into a project explanatory note or used as instruction for installation.

Get a report in PDF format 216, with full description of all cameras in the project, view areas and cables. The **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable. See example of PDF report.

Obtain the cable report 271.

Printing

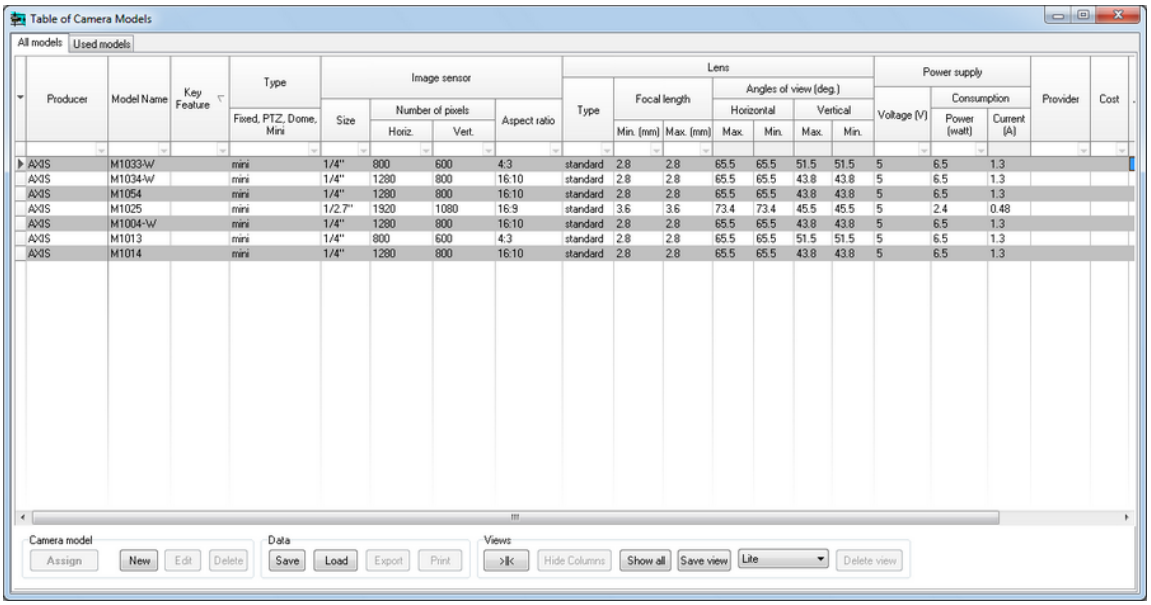
Printing 226 the obtained 2D drawing in raster or vector mode on one or several pages for pasting together. You can use prepared frames with standard title-block and logo. Sizes, colors styles of fonts and lines, weights of lines can be adjusted.

Printing image models from cameras 360 and monitors 412.

Printing the Table of camera models 429 as a whole or by selected fragments.

Database of camera models

Maintain database of camera models 419 with the most important parameters (22 fields 22 fields for each camera model). You can add your models, assign different models to cameras in project, compare models with each other.



Producer	Model Name	Key Feature	Type	Size	Number of pixels Horiz.	Number of pixels Vert.	Aspect ratio	Lens Type	Focal length Min. (mm)	Focal length Max. (mm)	Horizontal Max.	Horizontal Min.	Vertical Max.	Vertical Min.	Voltage (V)	Power (watt)	Current (A)	Provider	Cost
AXIS	M1033-W		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1034-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1054		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1025		mini	1/2.7"	1920	1080	16:9	standard	3.6	3.6	73.4	73.4	45.5	45.5	5	2.4	0.48		
AXIS	M1004-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1013		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1014		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		

Registration

One license of **VideoCAD Starter II** allows to use VideoCAD Starter II on one computer. One license of **VideoCAD 8 Lite**, purchased separately, allows to use the program on two workplaces nonsimultaneously (work and home computers) if both workplaces belong to one person - owner of the license.

Package contents

VideoCAD Starter II is offered only in a kit of three programs - **VideoCAD Starter II Kit**. This Kit includes:

VideoCAD Starter II;
IP Camera CCTV Calculator;
VideoCAD Plugin for SketchUp.

Demo version

In the demo version of **VideoCAD 8 Lite** there is a limit on the maximum number of cameras (5) in one project.

License of **VideoCAD 8 Lite** allows free use of the **demo version** for educational purposes, for research, theses, writing articles, etc. non-profit activities.

Differences between VideoCAD 7 Starter II 45 and VideoCAD 7 Starter 49

- Possibility of using 3D models 202 from version Lite (people, trees, cars etc.).
- Possibility of import 3D models and scenes from **SketchUp** and **Autodesk 3ds MAX**; *VideoCAD Plugin for SketchUp* is included in the **VideoCAD Starter II Kit**.
- Loading background 222 in **AutoCAD *.dxf** and ***.dwg** formats.
- Saving the drawing 219 in the Graphics windows with **resolution exceeding Windows screen resolution.**
- **Additional constructions and CAD tools:** Rotakin 205 (without modeling rotation), Copy 191 and Paste 191 constructions and cameras.
- Modeling number of pixels 359 and JPEG compression 364 in the 3D window.
- Displaying examples of images 323 in the **Spatial resolution box** (resolution only).
- Modeling cameras with any image sensor sizes and aspect ratio.
- Modeling images from cameras turned by 90 degrees 295.

***VideoCAD Starter II** is offered only in a kit of three programs - **VideoCAD Starter II Kit**. This Kit includes:*

- ***VideoCAD Starter II**;*
- *IP Camera CCTV Calculator;*
- *VideoCAD Plugin for SketchUp.*

Download VideoCAD 8 Professional demo version

Download VideoCAD 8_Lite demo version

Download VideoCAD 7 Starter II demo version

Download VideoCAD 7 Starter demo version

What is new in VideoCAD 89

Part VI

What is new in VideoCAD

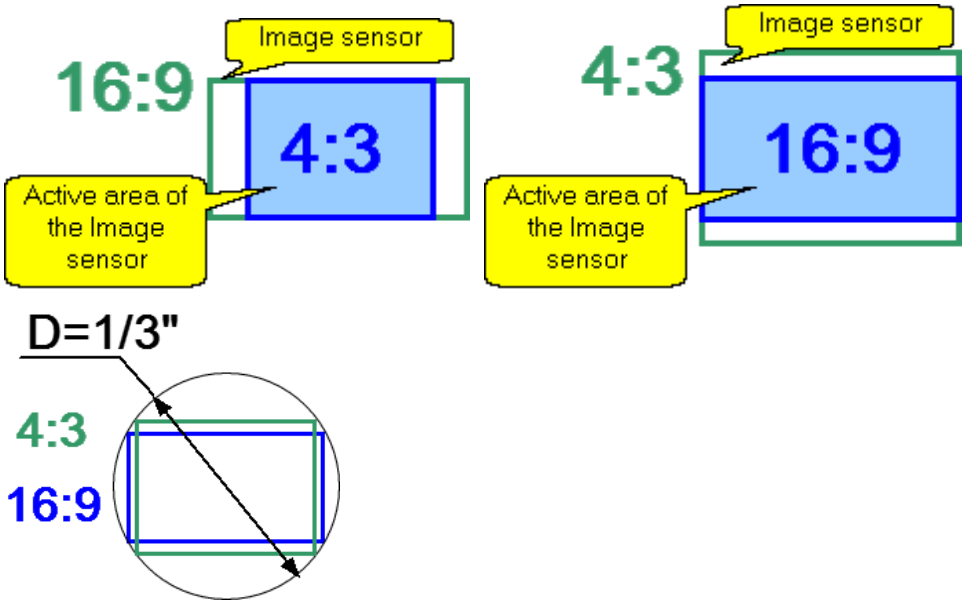
6 What is new in VideoCAD

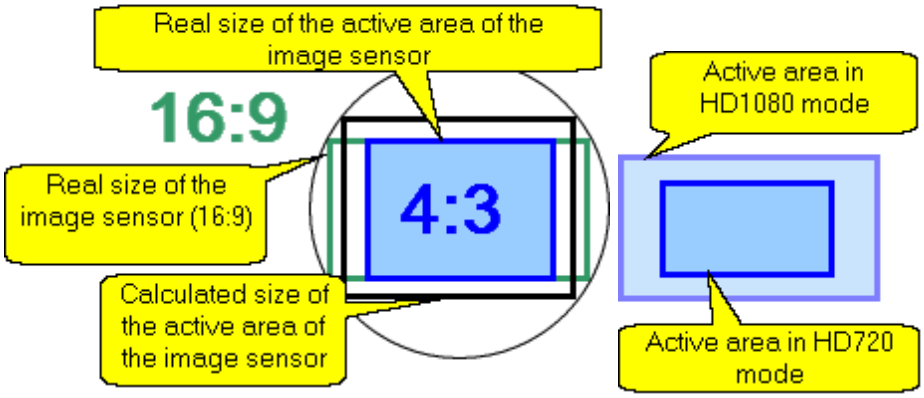
Information in the Help file can be outdated. Please see actual information on the cctvcad.com web site

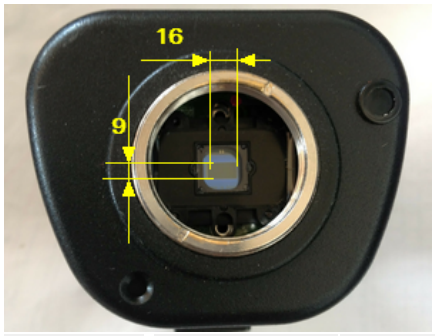
8.L. What is new in VideoCAD 8.2 Lite

New features of VideoCAD 8 Lite have been chosen from features, available in VideoCAD 8 Professional. In addition: The registration rules 100 have been simplified, Functional and license restrictions of the demo version 100 have been reduced, Upgrade 100 from VideoCAD Starter 49 and VideoCAD Starter II Kit 45 to VideoCAD Lite 31 and VideoCAD Professional 3 has been allowed.

MORE PRECISE MODELING IMAGE SENSOR SIZES AND ASPECT RATIO OF MODERN CAMERAS







8L.1 The following parameters have been separated:

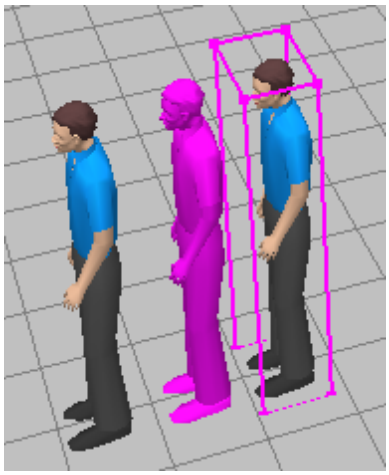
- **image sensor size** and size of active area of the image sensor;
- **aspect ratio of image sensor** and **aspect ratio of output image** of the camera.

8L.2 The **Image sensor format** box has been renamed to the Image sensor size 293.
8L.3 New abilities to specify the size of image sensor 308 through arbitrary sensor format (type) in inches or through the length of diagonal in millimeters, or through width and height in millimeters.
8L.4 New ability to set aspect ratio of image sensor separately from the aspect ratio of output image for a given **format in inches** or **length of diagonal** of the image sensor.
8L.5 New ability to set the Crop factor 641 to model image sensors with active area does not touch the edges of the image sensor.
8L.6 Detailed guide 636 of specifying the **active area size** of image sensors of modern cameras has been added.
8L.7 The **Sensor and Distortion** box has been renamed to Sensor and Lens 308. Its interface has been changed.
8L.8 The Image sensor calculator 523 was added.

IMPROVING USABILITY OF WORKING WITH 3D MODELS AND CONSTRUCTIONS IN EDITING STATE

8L.9 Switching 3D models 202 from the selected state 164 to the editing state 164 by double clicking on its projections was added (previously it was possible to switch a 3D model to the editing state only from the normal state 163).
8L.10 In the editing state 164, 3D models 202 are displayed with square grips and pink circle. You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.

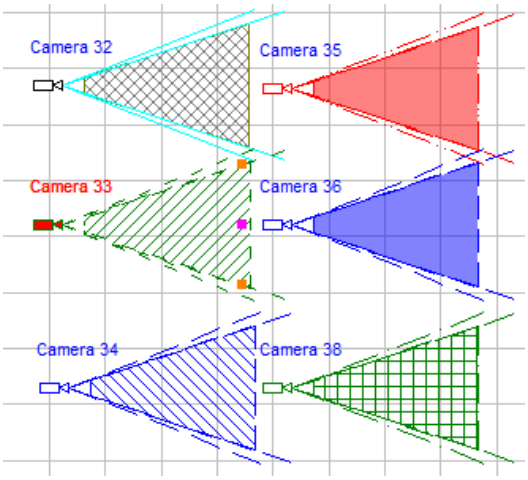
8L.11 In the 3D Video 357 views of 3D models in editing state and in the selected state differ.



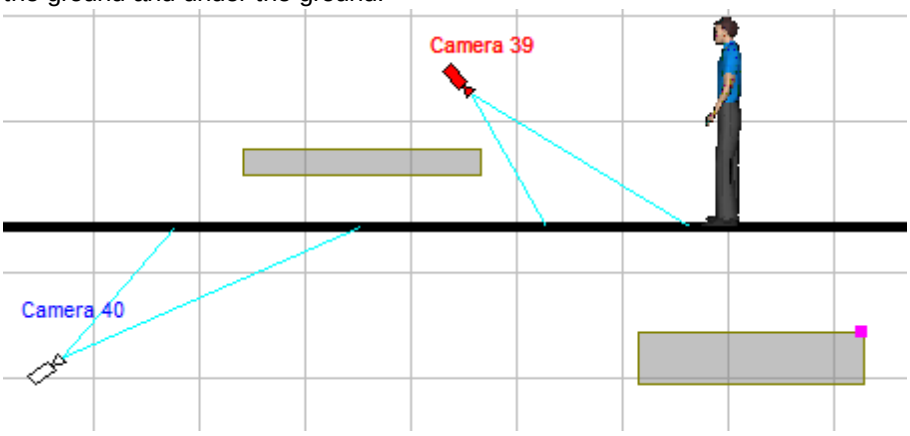
8L.12 New possibility to rotate around its axis in editing state Rectangle, Wall, Aperture in wall, Stairs, Mask, Filling, 3D Image.

MODELING VIEW AREA AND CAMERA POSITION

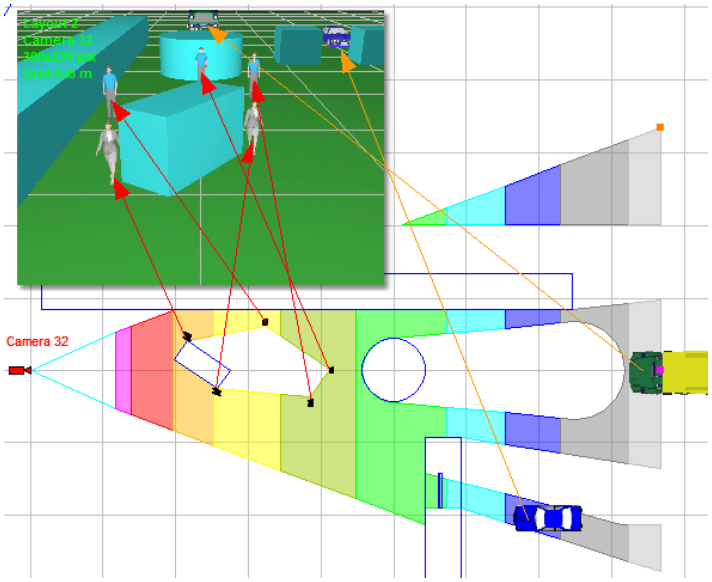
8L.13 The Style of line type 475 assigned to a camera determines not only style of lines, but hatching style of view area projection.



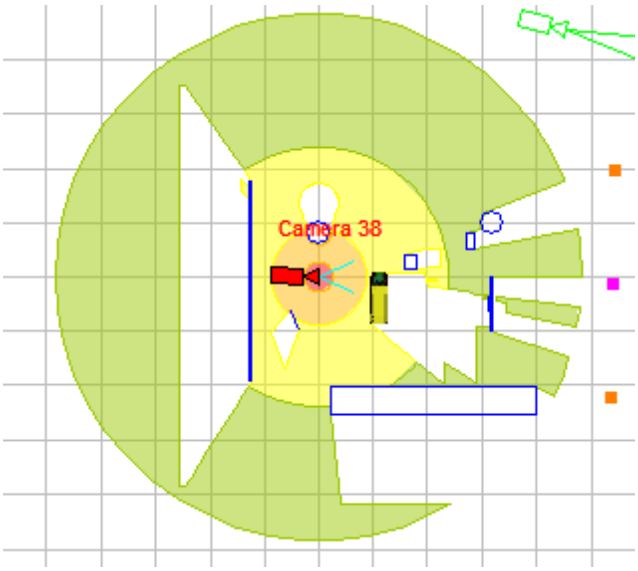
8L.14 The Maximum distance 307 of drawing view area is added to the camera geometry parameters. This distance limits view area in 2D and 3D drawings. It is convenient in case of infinite view areas.
8L.15 The ground is no longer the lowest possible height limiting view area. Height of installation, heights of the lower and upper bounds of view area can be negative. A camera can see from under the ground and under the ground.



8L.16 Constructing the horizontal projection of camera control areas including shadows 178 from obstacles on the scene. In VideoCAD Lite obstacles can be constructions only. In VideoCAD Professional 3 3D models also can be obstacles.

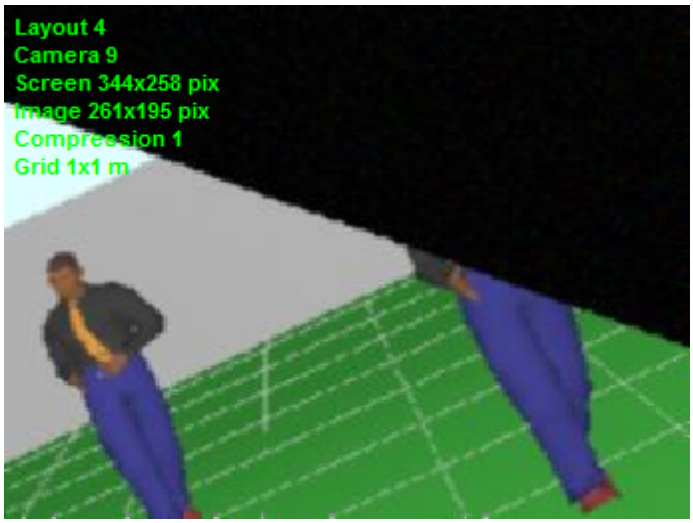


8L.17 Choosing the best positions and calculate control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.

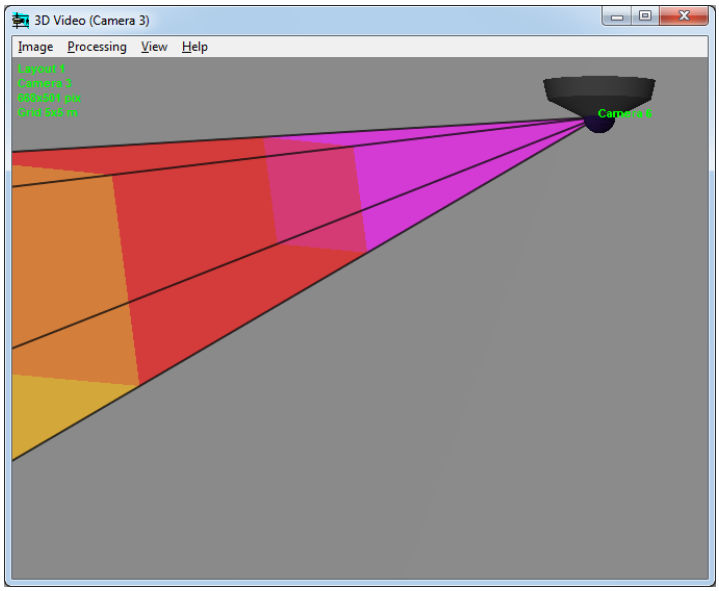


MODELING PANORAMIC CAMERAS (FISHEYE, 360°/180°)

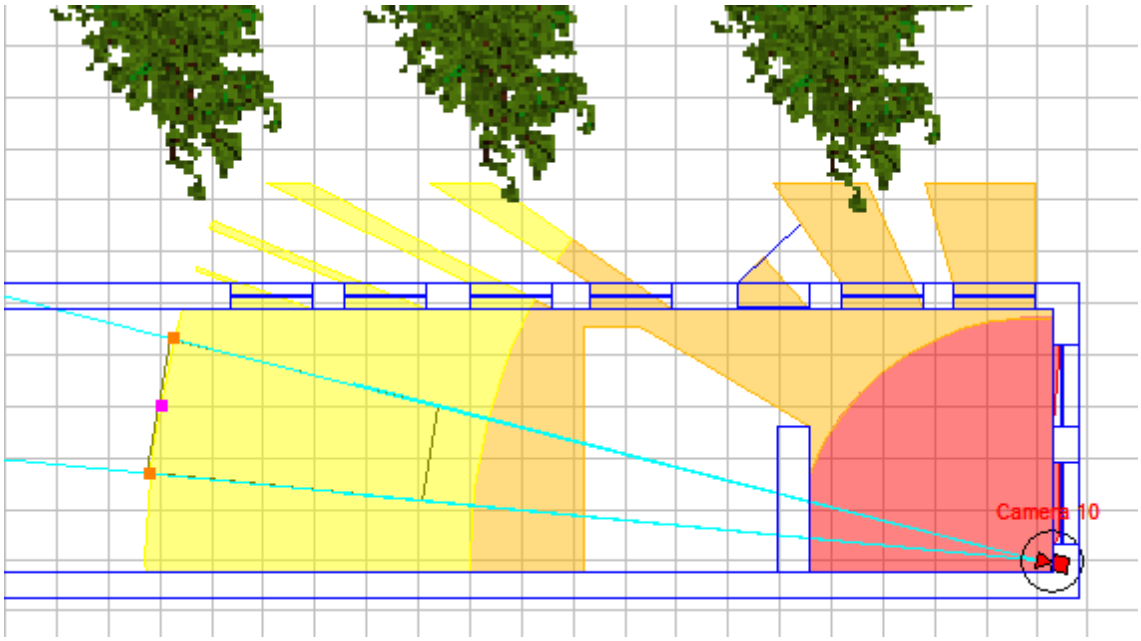
8L.18 Simulation of image resolution and view area limits of panoramic cameras 626 in the 3D Video.



8L.19 Model spatial resolution of panoramic cameras in the 3D Video window.



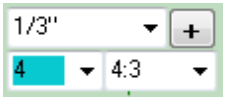
8L.20 Simulation of the horizontal projection of the view area and visualization of the spatial resolution distribution of panoramic cameras 312 in the Graphics window.



8L.21 New icons 509 for panoramic cameras were added and .

8L.22 In the Sensor and Lens 308 box a new Panoramic panel was added. On the panel the Pan and Tilt angles of panoramic camera installation can be specified.

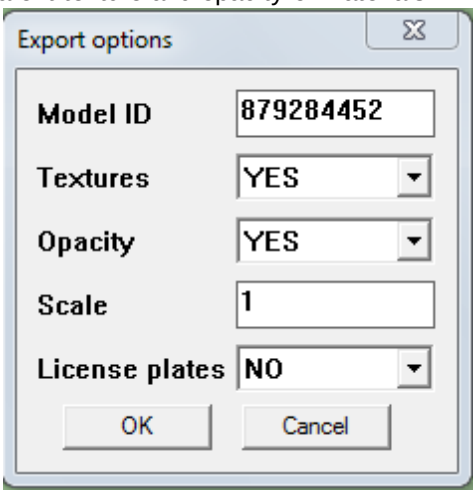
8L.23 To the list of camera model parameters 430: Type>Fixed, PTZ,Dome, Mini a new panoramic

item was added,
8L.24 To the list of camera model parameters: Lens>Type a new fisheye item was added,
8L.25 Lens focal length boxes in the Graphics window and the Camera geometry box are colored in Aqua when the active camera is panoramic. 

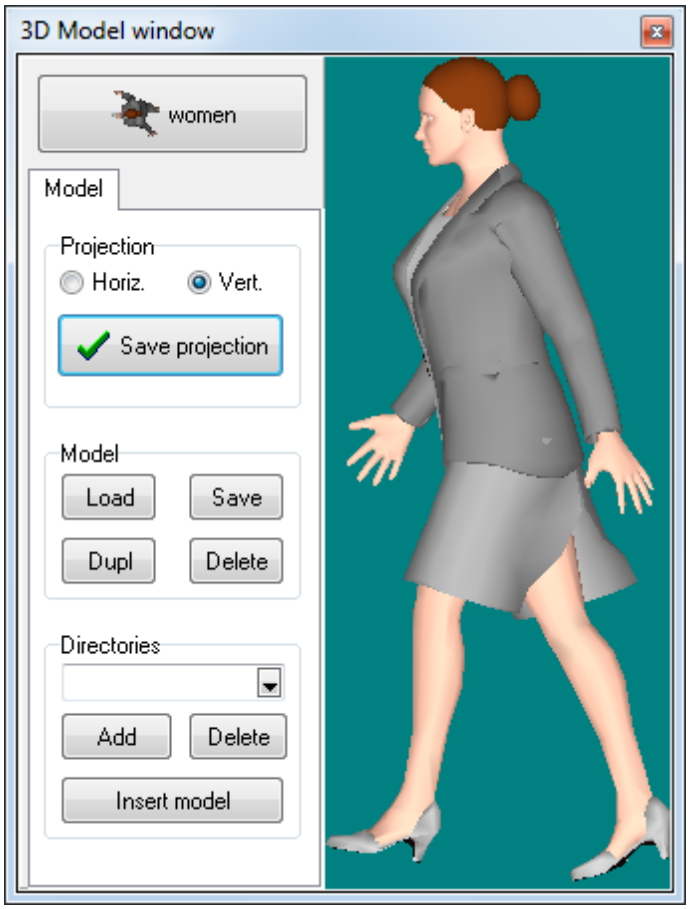
.
8L.26 In reports 519 panoramic cameras have *fisheye* word instead of lens focal length value;

WORK WITH 3D MODELS

8L.27 Support of 3D models with textures, transparent texture and opacity of materials.
8L.28 New version of **VideoCAD Plugin for SketchUP** was released with possibilities of export textures, transparent textures, opacity of materials and scaling.



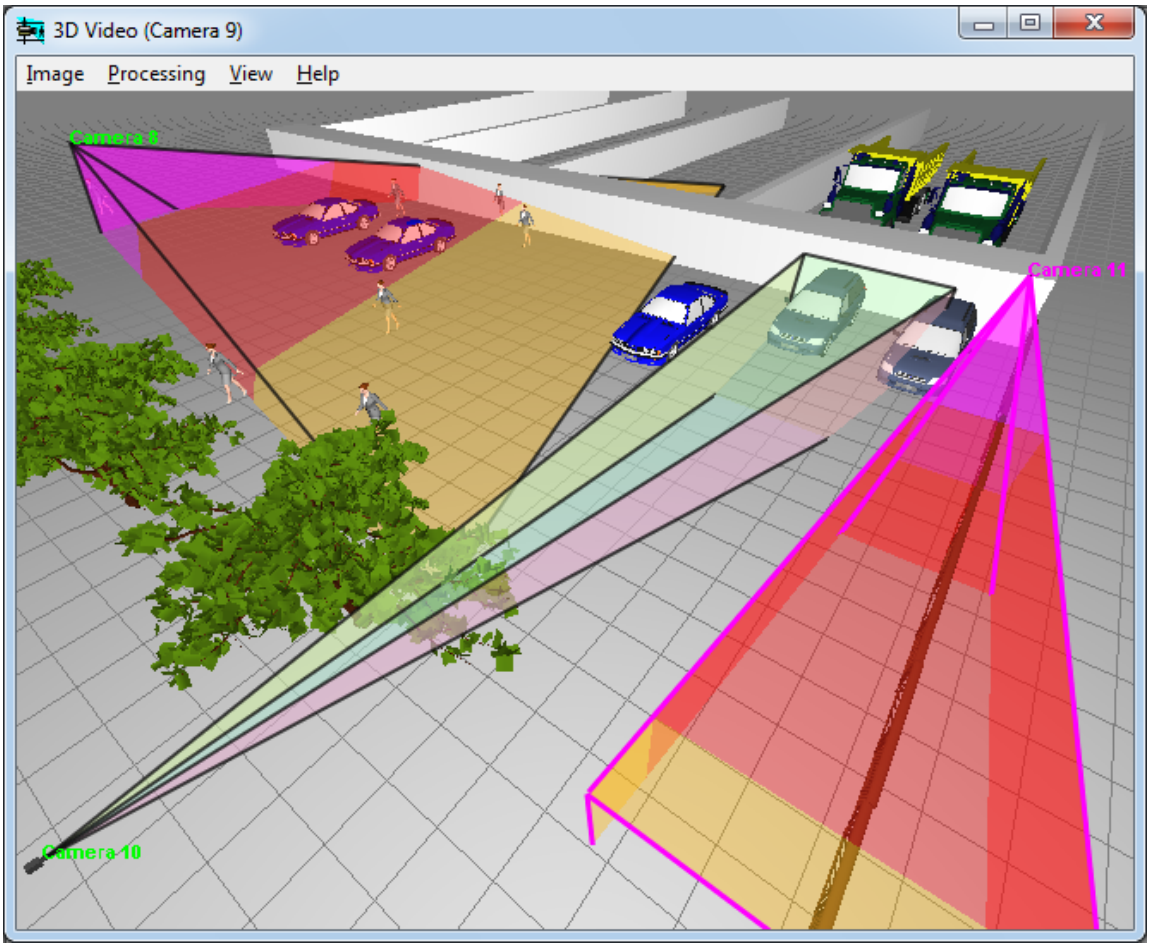
8L.29 Import of new 3D models was simplified. The special 3D models 397 window was added for creation of 3D model projections. In the window , you can create 3D model projections 401 with specified resolution. In the 3D Models window you can also 399: save 3D model to a file, make copy of the 3D model.



8L.30 Tools related to 3D models were moved to special branch 259 of the main menu.
8L.31 Ability to distribute 400 3D models by folders in the menu.
8L.32 Loading 262 files of 3D models via a dialog box.
8L.33 3D model file name can contain spaces.
8L.34 During placing or editing 3D models, on the Current construction parameter panel 283 the **3D Models** button appears to quick open the 3D Models window 397 .

3D VIDEO WINDOW

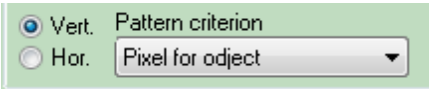
8L.35 A window, which shows models of camera images, named **3D Window** in the past, was renamed to the 3D Video 357 window.
8L.36 3D visualization of the location plan and camera view areas in the 3D Video 357 window by other cameras. Visualization of the spatial resolution. Flexible adjustment of displaying view areas from the side.



8L.37 In the main menu of the **3D Video** window, in View submenu, a new 3D view areas 367 item was added. It allows to enable visualization of view areas of other cameras.
8L.38 In the main menu of the **3D Video** window, in **View** submenu, a duplicating Ground 366 item was added for quick hiding the ground surface in the **3D Video** window.
8L.39 In the main menu of the **3D Video** window, in Image submenu, a new Copy to clipboard 360 item was added.
8L.40 In the PTZH 387 mode a camera is panned and tilted by moving mouse cursor on the image with left mouse button pressed..
8L.41 Background representation in the 3D Video window was improved.
8L.42 Ability to switch 481 image generation thread: in separated thread or in the main thread.

SPATIAL RESOLUTION

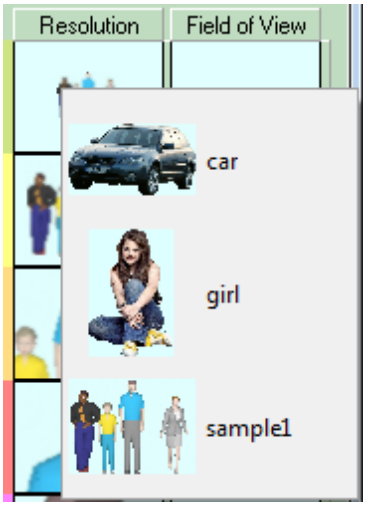
8L.43 Ability to specify spatial resolution in spatial resolution patterns not only vertically but also horizontally. To do this, a new switch 319 to the Spatial resolution box was added.



8L.44 Numbers of pixels horizontally and vertically can be specified.
8L.45 Additional Spatial resolution patterns 318 were added based on the Standards:

- Australian Standard AS4806: Closed Circuit Television;
- European Standard EN50132-7;
- ISO/IEC 19794 Biometric data interchange formats.

8L.46 As a result of right-click on the Pattern 318 combo box a pop up menu will appear. Selecting the **Default patterns** item, you can erase all changes in the patterns and return to the patterns set by default.
8L.47 To the Spatial resolution box 323 new test images were added.



IMPORT AND EXPORT TO AUTOCAD

8L.48 Import module was upgraded. Up to AutoCAD **DWG 2015** formats are supported.
8L.49 The dialog box **Scale background** was renamed to the Adjust background 223. For backgrounds in DWG or DXF formats, abilities to choose Layout in the background, control visibility of layers, hide texts were added. For backgrounds in PDF format you can choose page and resolution of the background.
8L.50 Export module 485 was updated.

IMPORT AND EXPORT TO OTHER FORMATS

8L.51 Supporting PDF files to use as background 222 including multi-page PDF files.
8L.52 Export 219 to PDF (raster).
8L.53 Export 485 tab in the **Options box** is divided into two sub-tabs: "DXF" and "BMP,WMF, EMF,GIF,TIFF,PNG,JPG,rPDF".
8L.54 To the options of export to BMP, JPG, EMF, WMF, GIF, TIFF, PNG, rPDF possibility to set hatch step factor 487 was added.
8L.55 In the 3D Image 205 you can load images in BMP, JPG, PNG, GIF TIF (early BMP and JPG). Transparency of PNG files is supported.
8L.56 New PDF report 216 was added. Unlike the Text report 216, the **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable. See example of PDF report.

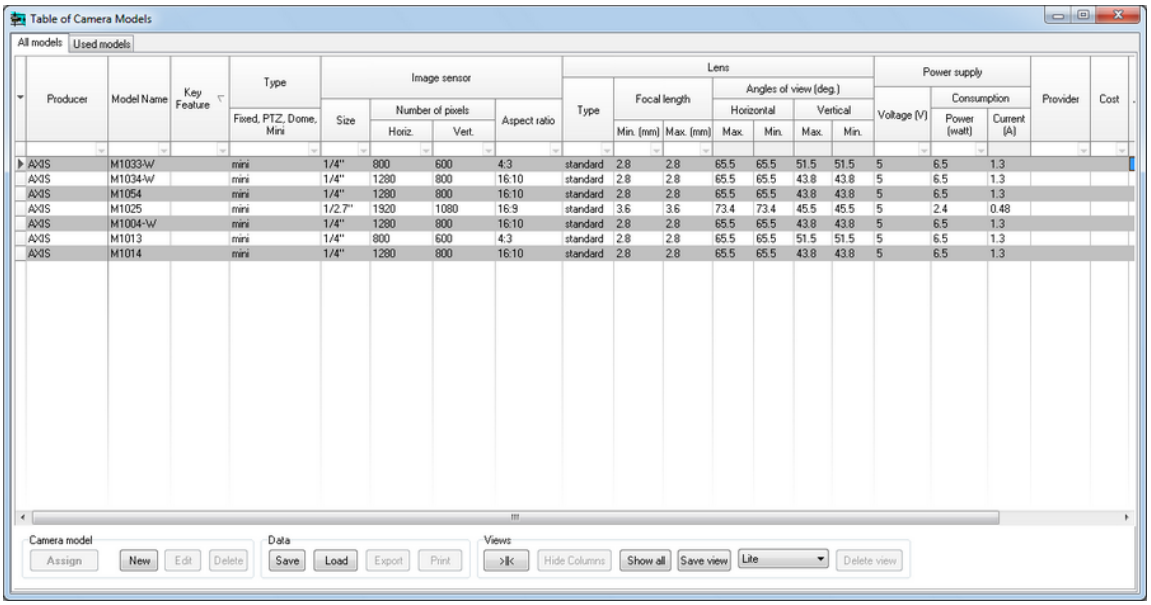
PRINTING

8L.57 New mode Use buffer 491 was added. Using this mode, you can get the correct results and print transparent gradient fills, projections of 3D models even on printers do not support these tools, including most of free virtual printer to print to PDF.
8L.58 New mode Scale Hatching 490 was added. Using this mode, you can get the correct hatching even on printers do not support scaling hatching.

8L.59 Menu item Print setup 226 remains enabled even VideoCAD can not get access to the current printer.

DATABASE OF CAMERA MODELS

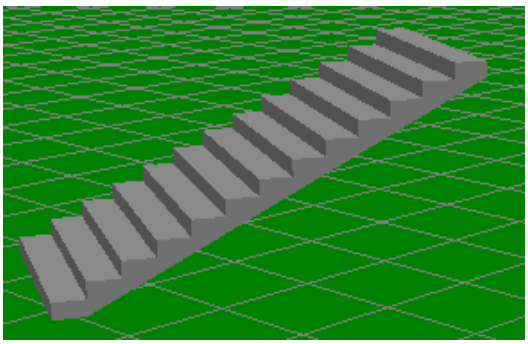
8L.60 Maintain database of camera models 419 with the most important parameters (22 fields for each camera model). You can add your models, assign different models to cameras in project, compare models with each other.



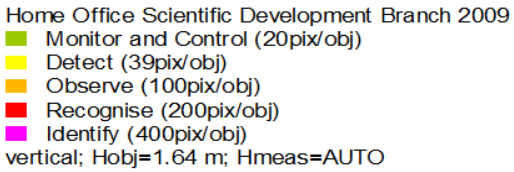
Producer	Model Name	Key Feature	Type (Fixed, PTZ, Dome, Mini)	Image sensor: Size	Number of pixels: Horiz.	Number of pixels: Vert.	Aspect ratio	Lens: Type	Focal length: Min. (mm)	Focal length: Max. (mm)	Angles of view (deg.): Horizontal Max.	Horizontal Min.	Vertical Max.	Vertical Min.	Power supply: Voltage (V)	Consumption: Power (watt)	Consumption: Current (A)	Provider	Cost
AXIS	M1033-W		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1034-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1054		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1025		mini	1/2.7"	1920	1080	16:9	standard	3.6	3.6	73.4	73.4	45.5	45.5	5	2.4	0.48		
AXIS	M1004-W		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		
AXIS	M1013		mini	1/4"	800	600	4:3	standard	2.8	2.8	65.5	65.5	51.5	51.5	5	6.5	1.3		
AXIS	M1014		mini	1/4"	1280	800	16:10	standard	2.8	2.8	65.5	65.5	43.8	43.8	5	6.5	1.3		

MISCELLANEOUS

8L.61 Ability to change the minimum and maximum heights of several objects at once through changing their line type. If during changing the line type of selected objects by the Change line type 268 tool, to press and hold **Ctrl**, then the selected objects will also change their minimum and maximum height according to the chosen line type . If **Ctrl** is not pressed, the heights remain unchanged.
8L.62 Autosaving 491 the project in specified intervals during running the program in a chain of files (up to 100 copies of the project are saved and rewritten in the regular intervals around the ring).
8L.63 Image update with lots of rotated projections of the 3D models was accelerated.
8L.64 New construction - Stairs 254.



8L.65 Added a possibility to draw legends 321 of Spatial resolution patterns on the layouts.



8L.66 New tool Merge contour 268 was added.
8L.67 New possibility to adjust transparence 483 of filling view area projections 175 in the Graphics window.
8L.68 A mode to improve visibility of thin lines 492 at scaling background in BMP, JPG, PDF formats.
8L.69 The cursor coordinates in the lower left corner of the **Graphics window** are displayed rounded to the second decimal place .
8L.70 The Export to Text 216 menu item was renamed to **Text report**.
8L.71 In the Text report 216 for each camera additional lines were added: layer, the base height , angle of rotation around its axis, number of pixels.
8L.72 Child windows "sticks" to the screen edges.
8L.73 An option of changing registration code 273 via the Main menu was added.
8L.74 Titles of the 3D video window includes camera resolution in pixels.
8L.75 Detected bugs were fixed.
8L.76 The Help system was updated.
8L.77 Examples of work with VideoCAD 527 in the Help were updated according to the new features. Several new examples were added.
8L.78 Project format of VideoCAD7 - ***.vc7 is** supported. There are possibilities of export 215 and import 215 of the previous project format ***.vmp**, supported by versions from 4 to 6.
8L.79 The program was tested under Windows 8 and Windows 10.

SIMPLIFYING REGISTRATION RULE

8L.80 ***VideoCAD 8 Lite is registered only by personal registration code as well as VideoCAD Starter. This code doesn't depend on computer hardware or a dongle. This code is valid on any computer.***
8L.81 One license of VideoCAD 8 Lite, purchased separately, allows the use of the program on two workplaces nonsimultaneously: work and home computers if both workplaces belong to one person.

CHANGING DEMO VERSION RESTRICTIONS

8L.82 In the demo version of VideoCAD 8 Lite changing lens focal length and image sensor is now allowed. Instead of this, saving working project to a file is prohibited and a limit on the maximum number of cameras (5) in one project is added.
8L.83 Licenses of **VideoCAD 8 Professional** and **VideoCAD 8 Lite** allows free use of the **demo versions** for educational purposes, for research, theses, writing articles, etc. non-profit activities.

RULES OF UPGRADE

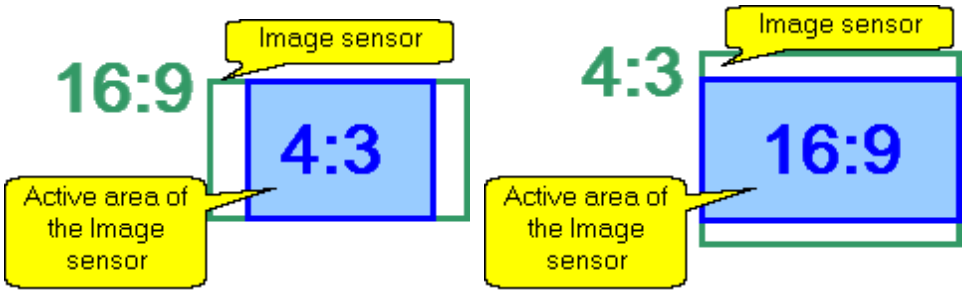
8L.84 The Rules of upgrade from previous VideoCAD versions to VideoCAD 8 Lite:

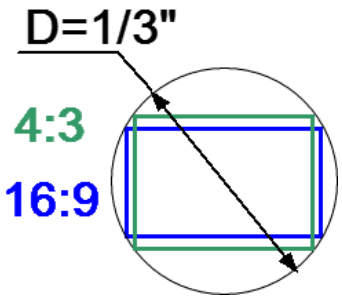
- For the customers who have purchased VideoCAD Lite (or upgraded to VideoCAD Lite) after **01 January 2016** upgrade to VideoCAD 8 Lite is free.

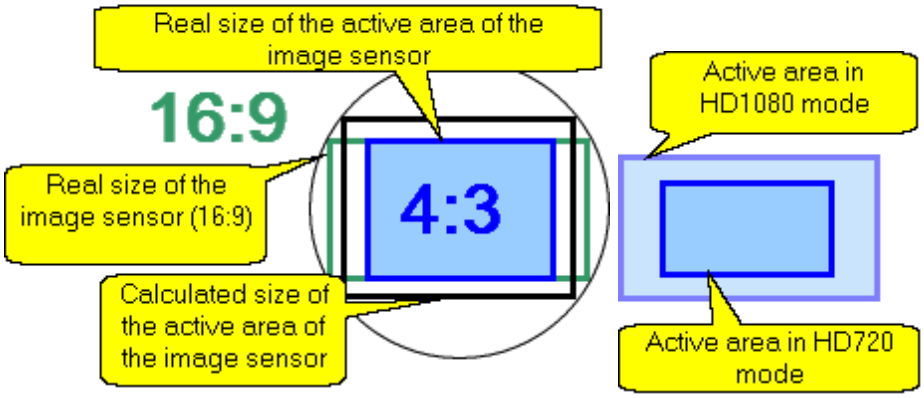
- For the customers who have purchased VideoCAD Lite (or upgraded to VideoCAD Lite) before **01 January 2016** updating cost makes half of the VideoCAD 8 Lite cost.
- For the customers who has VideoCAD3..VideoCAD6 and didn't upgrade to VideoCAD 7 Lite, updating cost makes 3/4 of VideoCAD 8 Lite cost.
- For the customers, whose original valuable suggestions have found application in VideoCAD 8.0, the additional discount for upgrade is given.
- Upgrade of **VideoCAD plugin for SketchUP** is free with upgrade to VideoCAD 8 Lite.

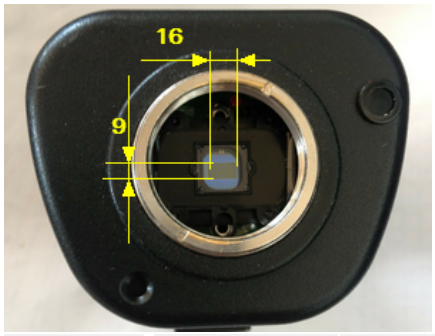
8.1. What is new in VideoCAD 8.1

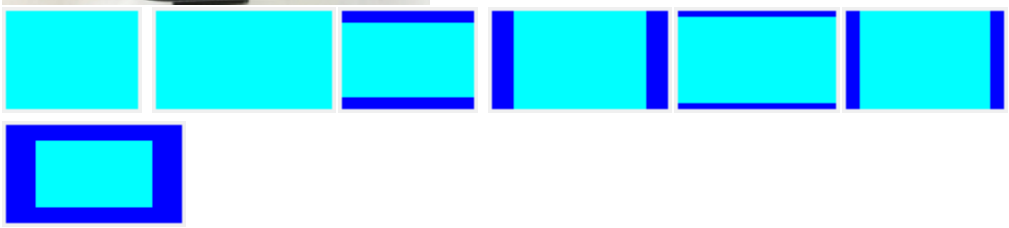
MODELING IMAGE SENSOR SIZES AND ASPECT RATIO OF MODERN CAMERAS











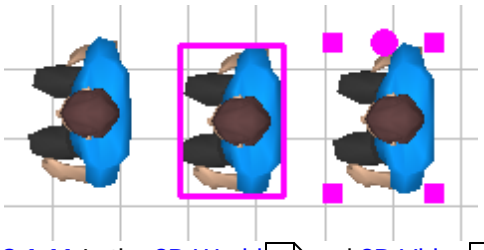
8.1.1 The following parameters have been separated:

- **image sensor size** and size of active area of the image sensor;
- **aspect ratio of image sensor** and **aspect ratio of output image** of the camera.

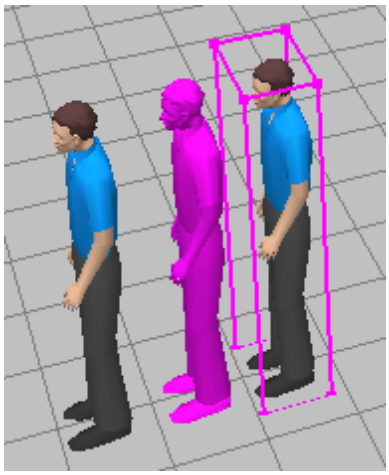
8.1.2 The **Image sensor format** box has been renamed to the Image sensor size 293.
8.1.3 New abilities to specify the size of image sensor 308 through arbitrary sensor format (type) in inches or through the length of diagonal in millimeters, or through width and height in millimeters.
8.1.4 New ability to set aspect ratio of image sensor separately from the aspect ratio of output image for a given **format in inches** or **length of diagonal** of the image sensor.
8.1.5 New ability to set the Crop factor 641 to model image sensors with active area does not touch the edges of the image sensor.
8.1.6 Detailed guide 636 of specifying the **active area size** of image sensors of modern cameras has been added.
8.1.7 The **Sensor and Distortion** box has been renamed to Sensor and Lens 308. Its interface has been changed.
8.1.8 The Image sensor calculator 523 was added.

IMPROVING USABILITY OF WORKING WITH 3D MODELS AND CONSTRUCTIONS IN EDITING STATE

8.1.9 Switching 3D models 202 from the selected state 164 to the editing state 164 by double clicking on its projections was added (previously it was possible to switch a 3D model to the editing state only from the normal state 163).
8.1.10 In the editing state 164, 3D models 202 are displayed with square grips and pink circle. You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.



8.1.11 In the 3D World 342 and 3D Video 357 views of 3D models in editing state and in the selected state differ.



8.1.12 New possibility to rotate around its axis in editing state Rectangle, Wall, Aperture in wall, Stairs, Mask, Filling, 3D Image.

OTHER

8.1.13 Import and export modules of AutoCAD were upgraded. Some improvements were added.
8.1.14 An inaccuracy of snap 209 operation during construction of walls and aperture in wall has been fixed.
8.1.15 New tool Merge contour 268.
8.1.16 Printing on some virtual PDF printers has been improved.

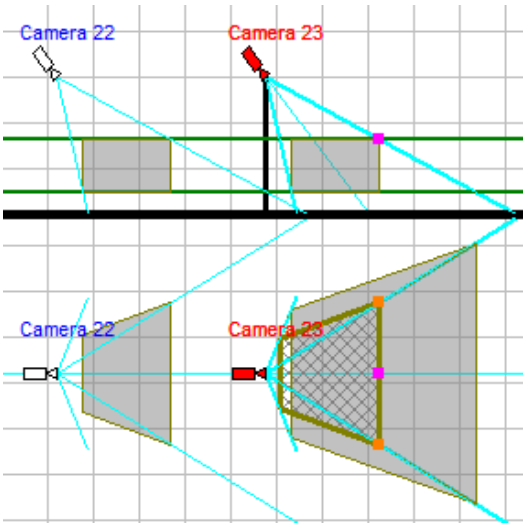
RULES OF UPGRADE

8.1.17 Upgrade from VideoCAD 8.0 is offered free-of-charge. Upgrade from earlier versions is performed according to rules 89 of upgrade up to VideoCAD 8.0

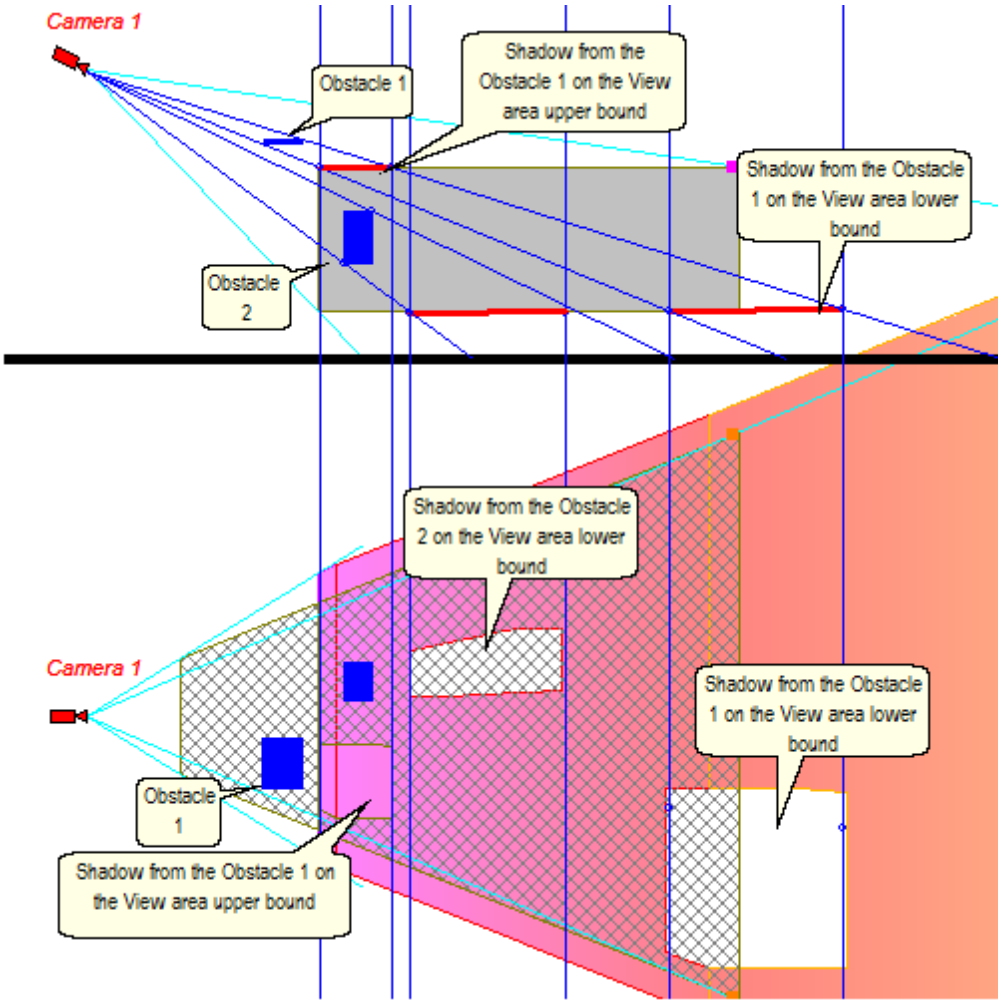
8. What is new in VideoCAD 8.0

MODELING VIEW AREA AND CAMERA POSITION

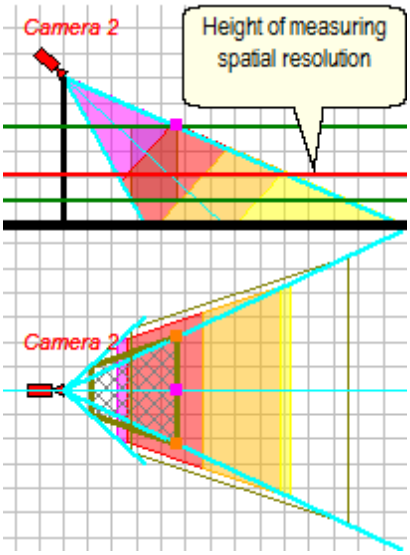
8.1 Ability to display horizontal projection of the view area as two sections 175 by planes on the minimum and maximum heights of the view area (Camera 23). One of the sections is drawn by a transparent filling, the other in the form of hatching. In many camera positions such representation is more informative than standard volume projection (Camera 22).



8.2 When the projection of the view area is displayed as two sections 179 by horizontal planes located at height of *lower* 300 and *upper* 298 bounds, the shading from obstacles appears as shadows from objects on these planes.



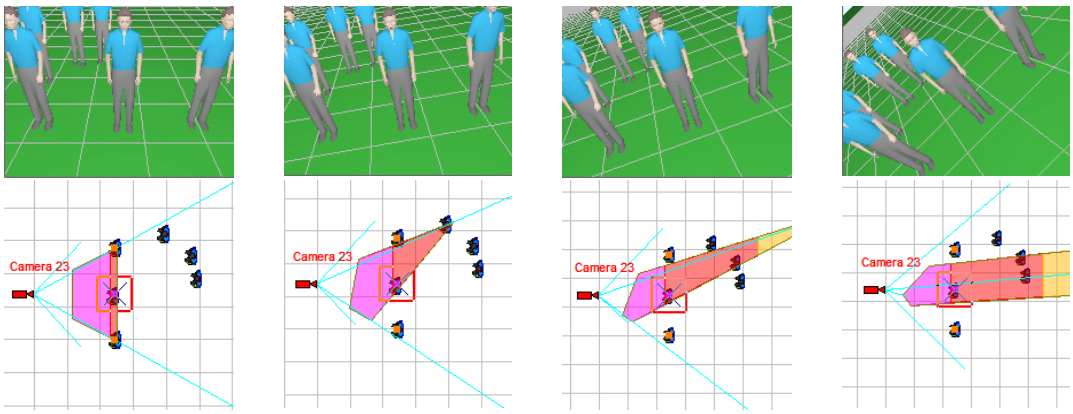
8.3 When visualizing spatial resolution with two levels, lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



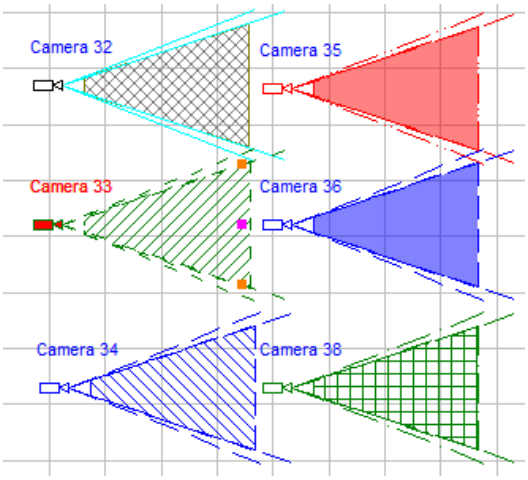
8.4 If the height 320 of measuring spatial resolution is set to AUTO, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in previous versions).

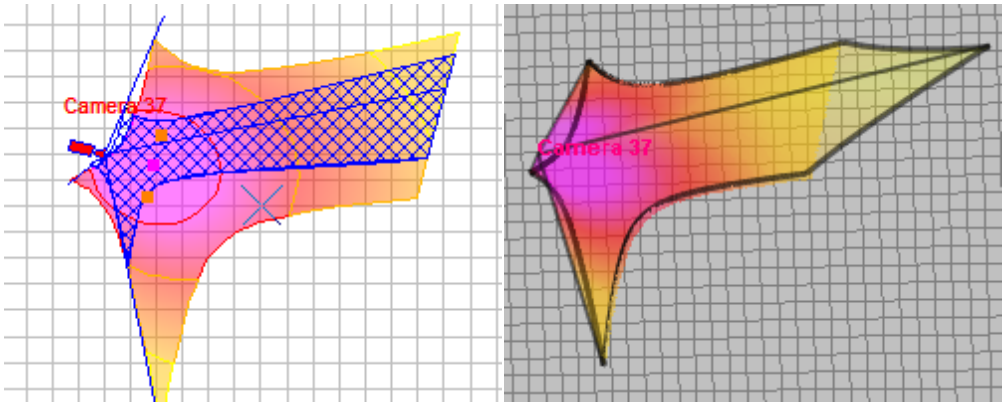
8.5 Simulation of camera rotation 297 around the main optical axis. Even a slight turn significantly changes the view area projection.



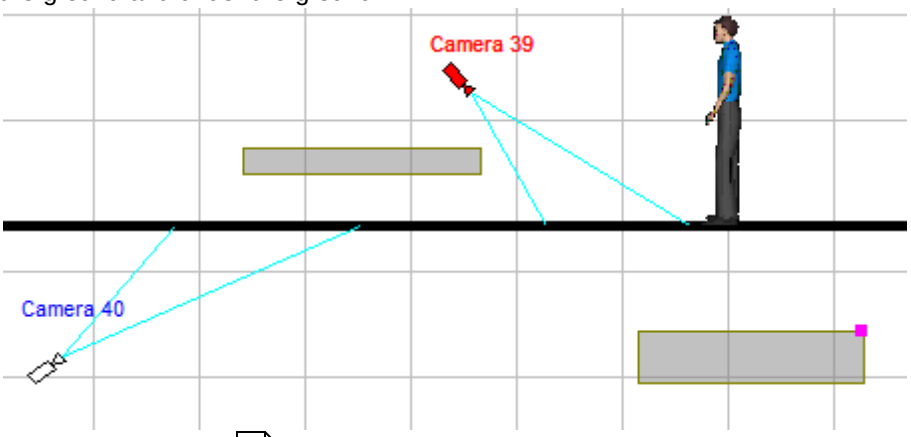
8.6 The Style of line type 475 assigned to a camera determines not only style of lines, but hatching style of view area projection.



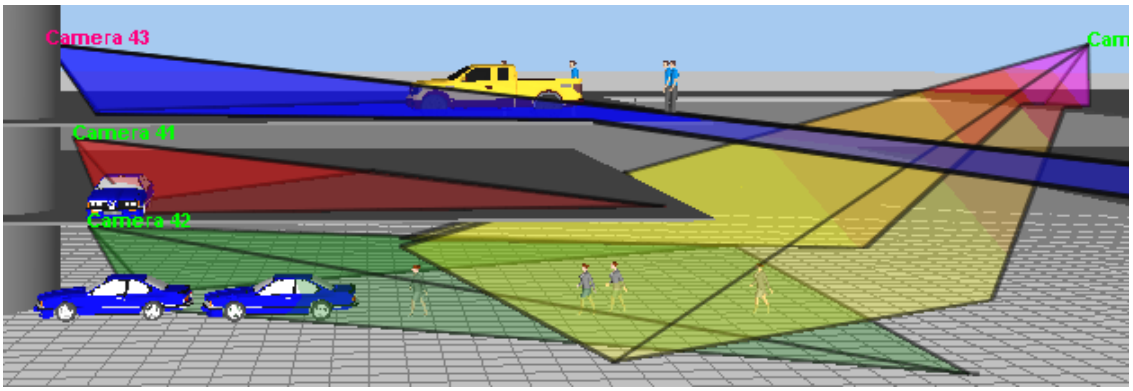
8.7 The Maximum distance 307 of drawing view area is added to the camera geometry parameters. This distance limits view area in 2D and 3D drawings. It is convenient in case of infinite view areas.



8.8 The ground is no longer the lowest possible height limiting view area. Height of installation, heights of the lower and upper bounds of view area can be negative. A camera can see from under the ground and under the ground.

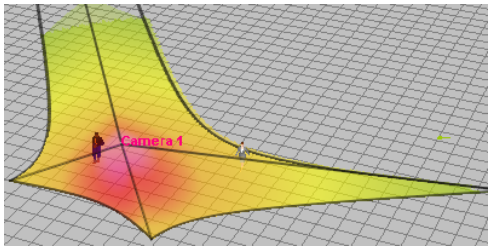


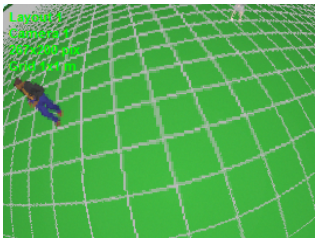
8.9 The Base height 298 is added to the camera geometry parameters. All heights related to a camera (height of installation, heights of the lower and upper bounds of view area, heights of person detection, identification, license plate reading areas) counted from the base height. The Base height together with layers 276 is used in work with multilevel 3D constructions.

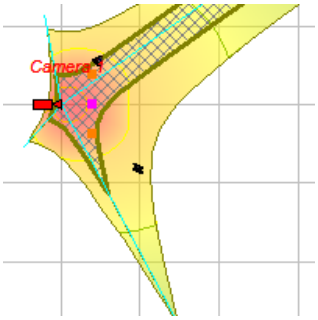


MODELING LENS DISTORTION

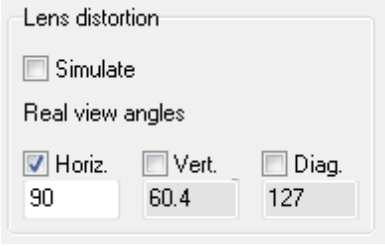
8.10 Simulating lens distortion 654. Distortion is especially pronounced in the short-focus lenses and may lead to significant deviation of form of view area of real cameras from regular pyramid.
8.11 Modeling the influence of lens distortion on a 3D image model (pincushion and barrel distortion), the shape of the view area and its projections, on the distribution of spatial resolution.



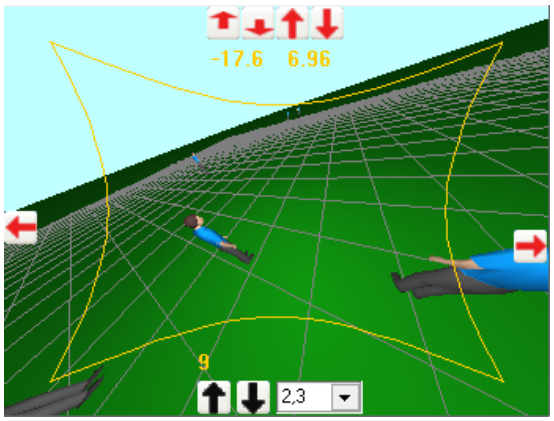




8.12 Correct modeling wide-angle lenses with strong distortion.
8.13 The **Special sensor size** box was renamed to the Sensor and Distortion 308.
8.14 The order of calculation in the **Sensor and distortion** box was changed. You can enter any image sensor size, then from it the calculated view angles and the aspect ratio are calculated.
8.15 To the **Sensor and distortion** box a box with a calculated diagonal angle was added..
8.16 To the the **Sensors and distortion** box new Distortion 310 panel was added. On the panel you can specify Real view angles from the camera and lens specifications. Distortion is calculated from the ratio between the calculated and real angles.



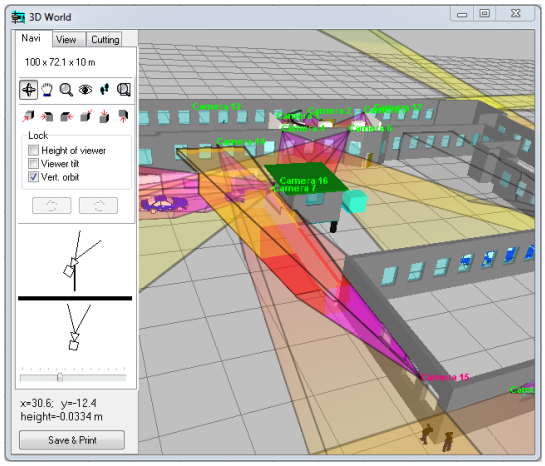
8.17 In the PTZH 365 mode, FOV frame is drawn taking into account lens distortion.

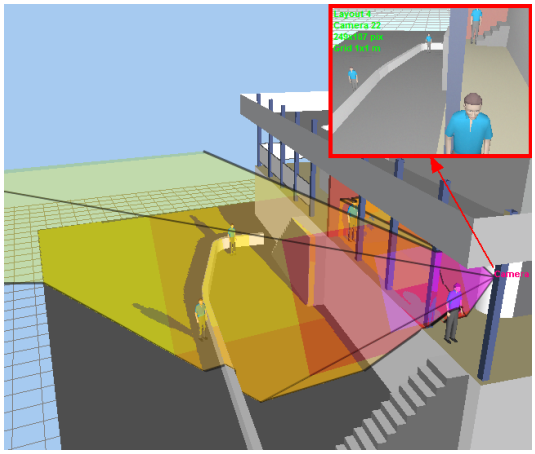


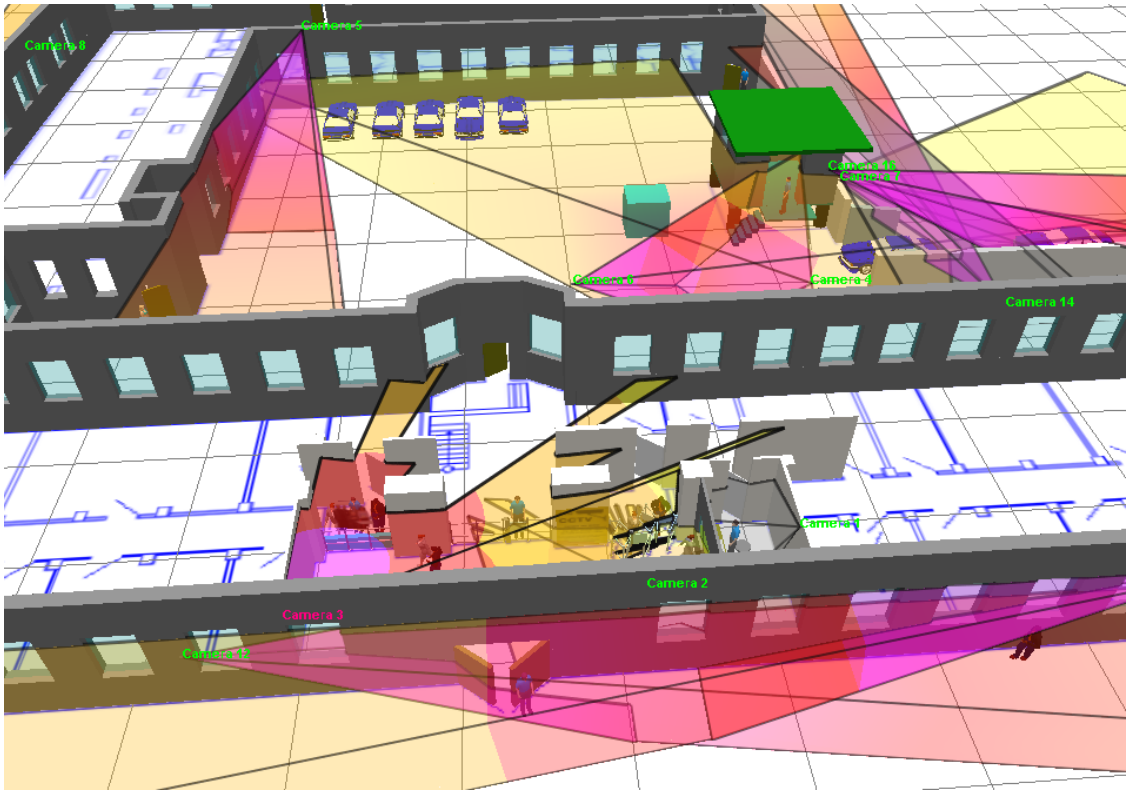
8.18 The following **camera model parameters** were added: Distortion>ON 439, horizontal, vertical, diagonal real angles 439.
8.19 Using PiP 391 and Real frame size 359 for simulating real camera number of pixels with distortion.

3D WORLD WINDOW

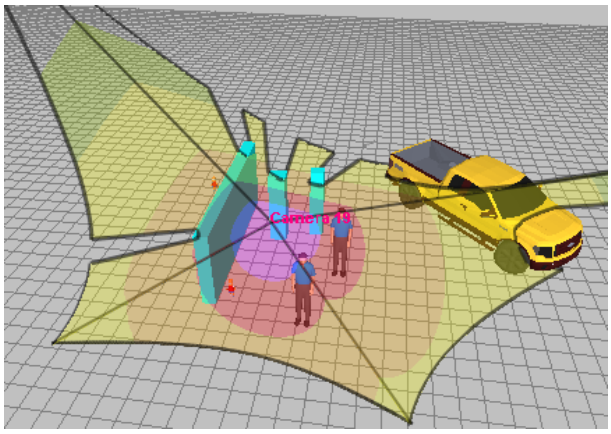
8.20 New 3D World 342 window with 3D navigation 343. There are the main tools for 3D navigation (**Orbit, Move, ZOOM, Walk, Look around, Zoom frame**). In the window you can observe the layout in 3D representation. You can work on the project in usual 2D projections and watch it in 3D. You can "walk" on the floors of 3D models of buildings and study every detail.



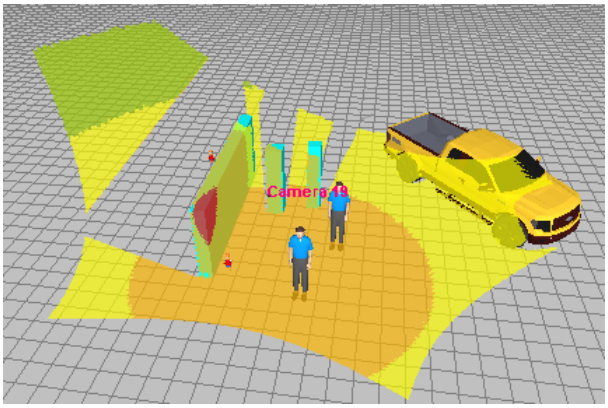




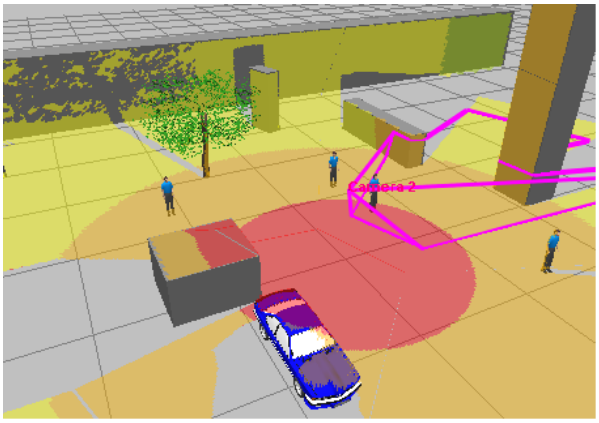
8.21 3D visualization of the camera view area surface 346 taking into account spatial resolution, shadows, lens distortion.



8.22 3D visualization of the active camera coverage 348 on the environment taking into account spatial resolution, shadows, lens distortion.

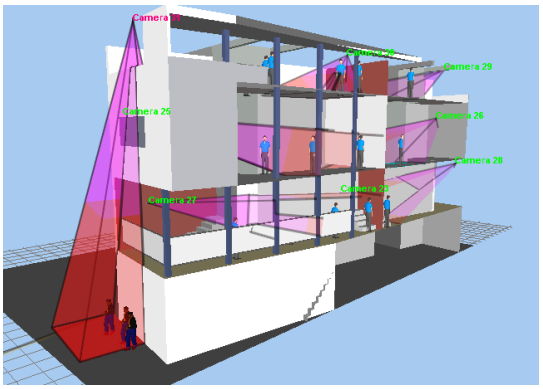


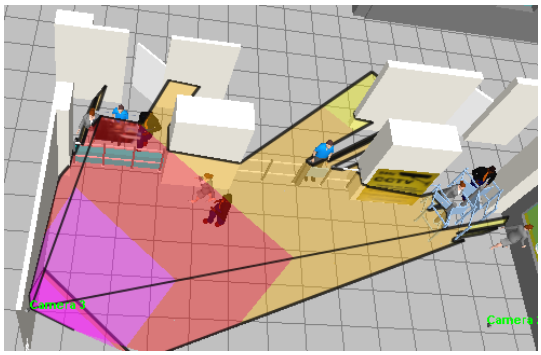
8.23 3D visualization of control areas of PTZ cameras 583, Dome cameras and 360 degree cameras.



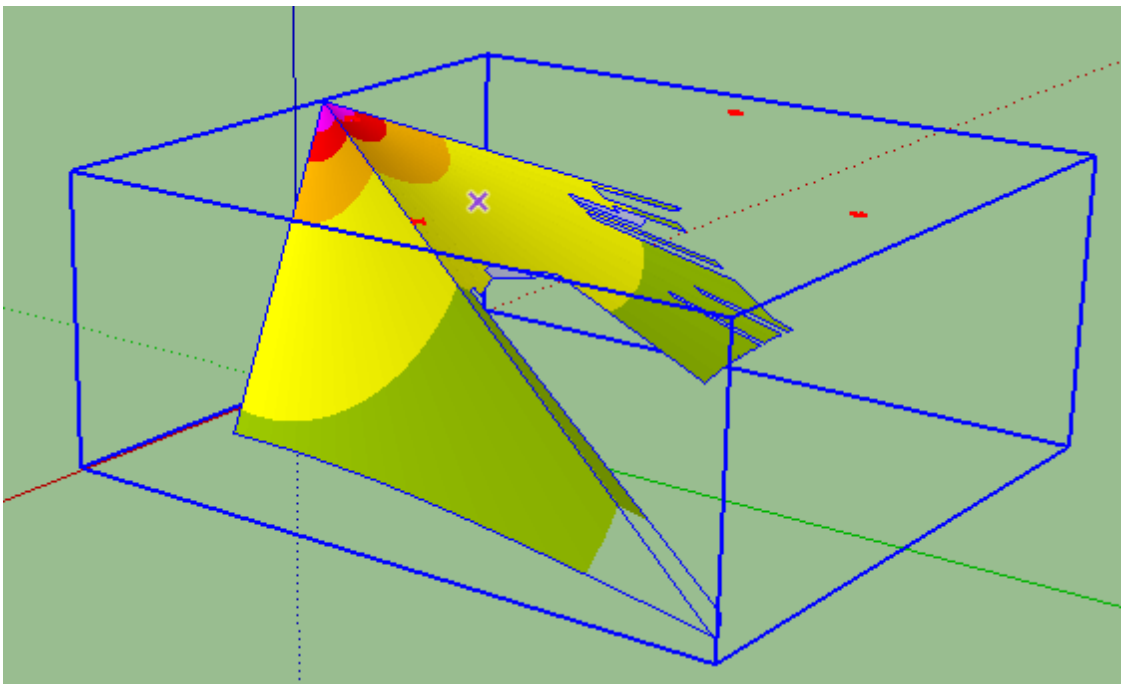
8.24 Free cutting 352 3D layout by six planes to provide access to any point of complicated 3D

buildings.



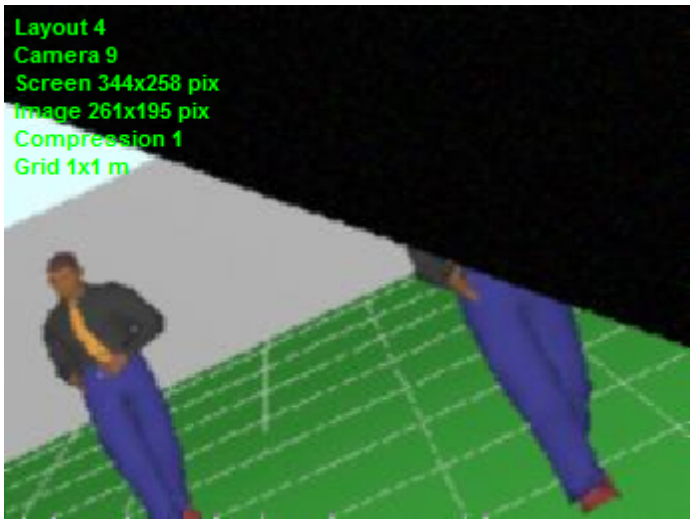


8.25 Export images from the 3D World 342 window to any of the following formats: *.bmp, *.jpg,*.gif,*.tif,*.png. Size in pixels of the exported file can exceed 354 the Windows screen size.
8.26 3D camera view area and camera coverage constructed in the **3D World** taking into account distortion, spatial resolution and shading can be exported to a DXF file 354 for insertion into a 3D project processed in another 3D program. This important feature makes possible to use VideoCAD to build 3D models of the view areas for designers working with any 3D design software that support import DXF files, including SketchUP 611.

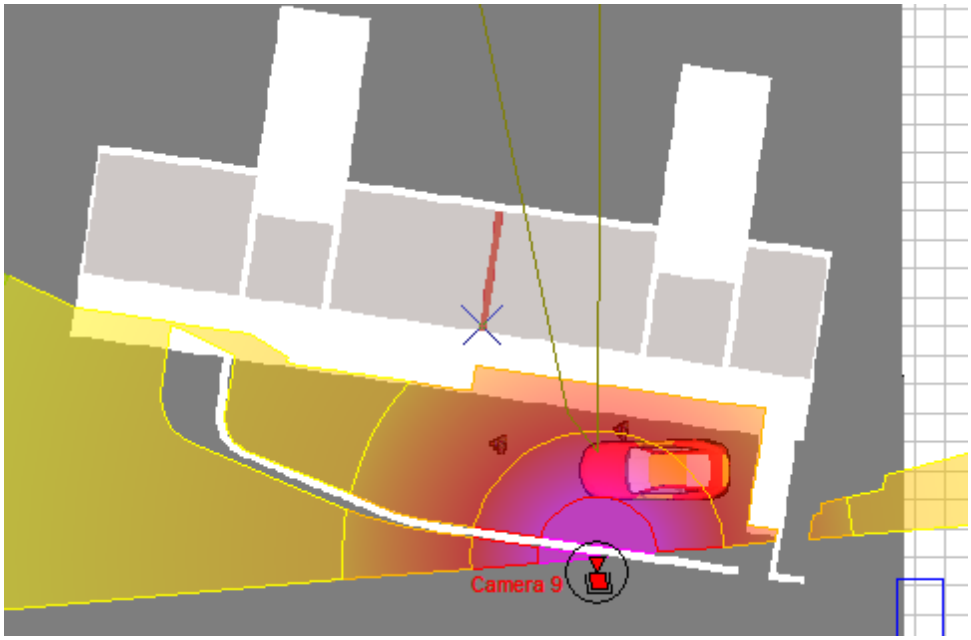


MODELING PANORAMIC CAMERAS (FISHEYE, 360°/180°)

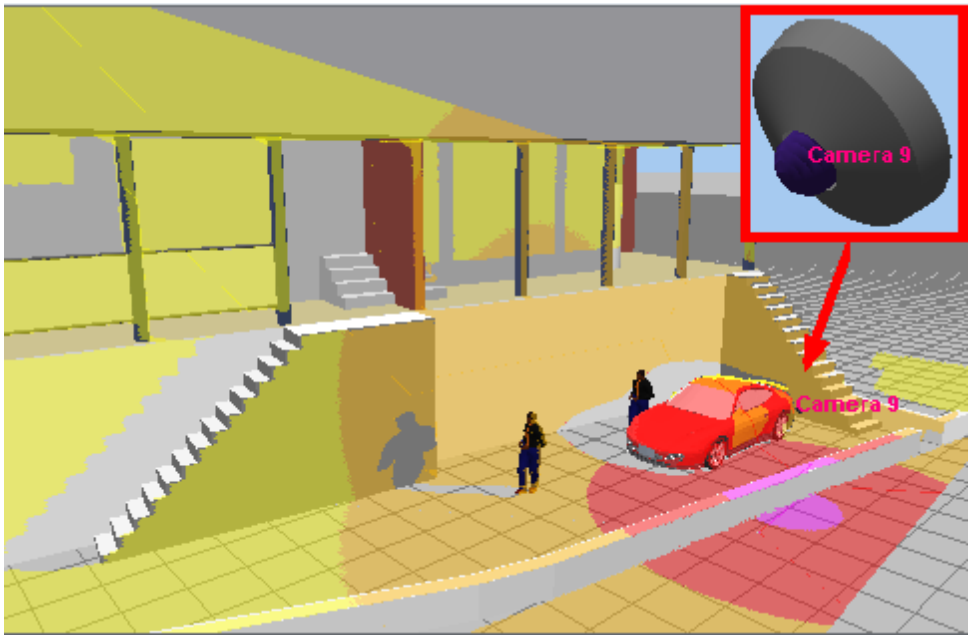
8.27 Simulation of image resolution and view area limits of panoramic cameras 626 in the 3D Video.



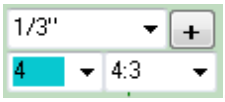
8.28 Simulation of the horizontal projection of the view area and visualization of the spatial resolution distribution of panoramic cameras 312 in the Graphics window.



8.28 Visualization of camera coverage area and spatial resolution distribution of panoramic cameras 626 on the surrounding objects in the 3D World window.



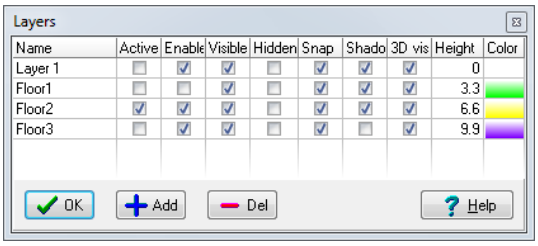
8.30 New icons 509 for panoramic cameras were added and .
8.31 In the Sensor and Distortion 308 box a new Panoramic panel was added. On the panel the Pan and Tilt angles of panoramic camera installation can be specified.

8.32 To the list of camera model parameters 430: Type>Fixed, PTZ,Dome, Mini a new panoramic item was added,
8.33 To the list of camera model parameters: Lens>Type a new fisheye item was added,
8.34 Lens focal length boxes in the Graphics window and the Camera geometry box are colored in Aqua when the active camera is panoramic. 

.
8.35 In reports 519 panoramic cameras have *fisheye* word instead of lens focal length value;

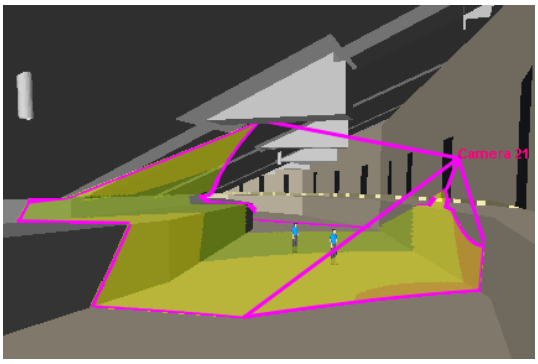
LAYERS

8.36 Constructions, 3D models and cameras can be distributed by layers 276.
8.37 Each layer can have its own Base height 277. All constructions belong to the layer will be shifted in 3D by the Base height. This feature is useful in work with multilevel 3D constructions.
8.38 In addition to the Base height, each layer has the following parameters 276: Active, Enabled, Visible, Hidden, Snap, Shadows, 3D Visible, Color.
8.39 To the main and pop-up menus of the Graphics window the Move to Active layer 268 item was added to move constructions and cameras between layers.

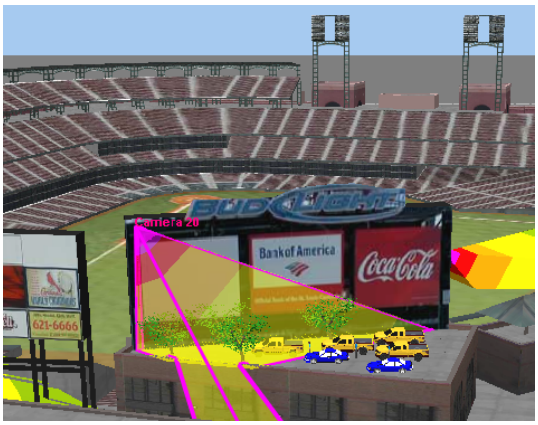


WORK WITH 3D MODELS

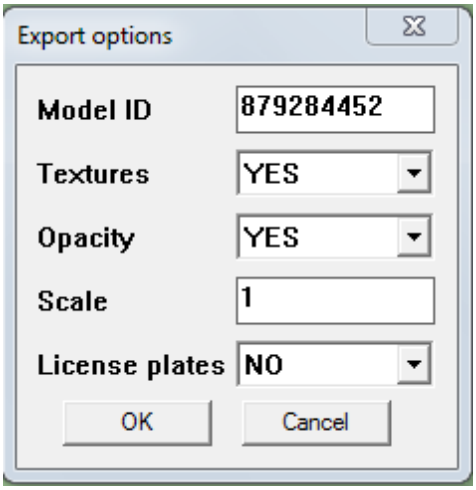
8.40 Possibility of using 3D models-territories 600, to place inside them cameras, constructions and other 3D models.



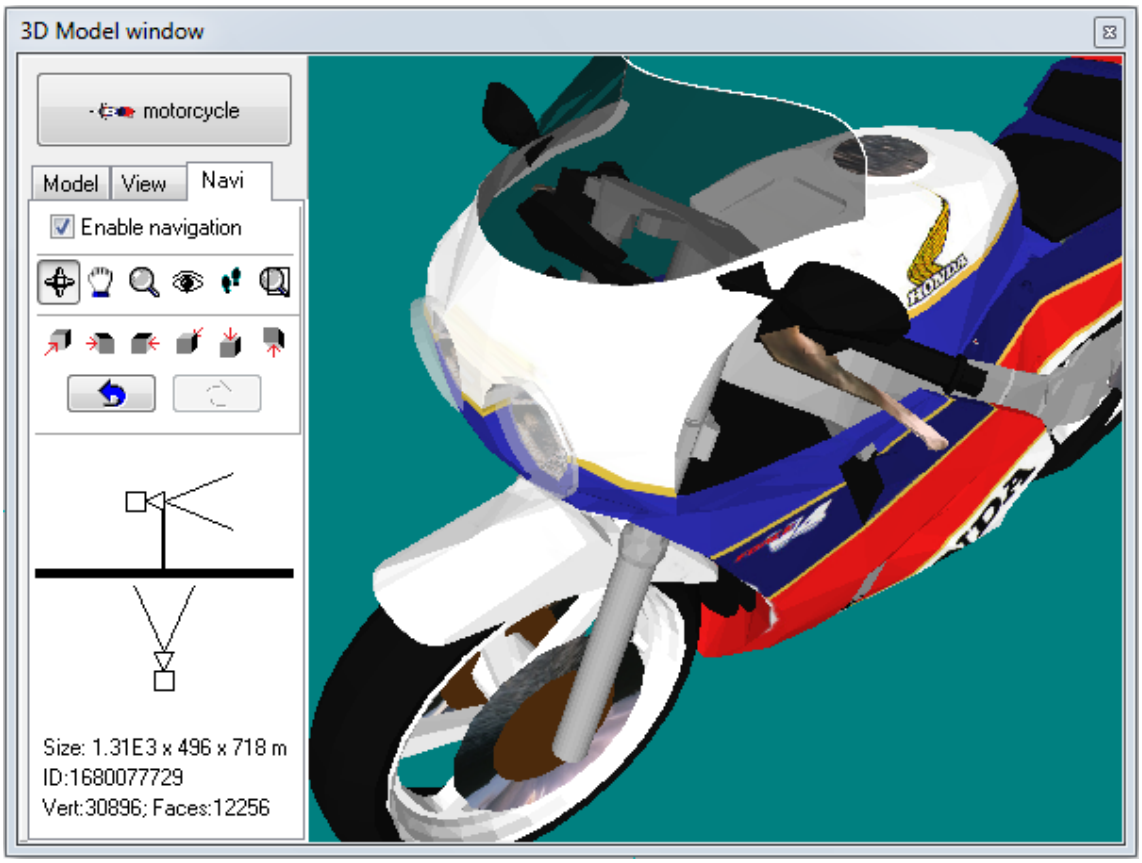
8.41 Support of 3D models with textures, transparent texture and opacity of materials.



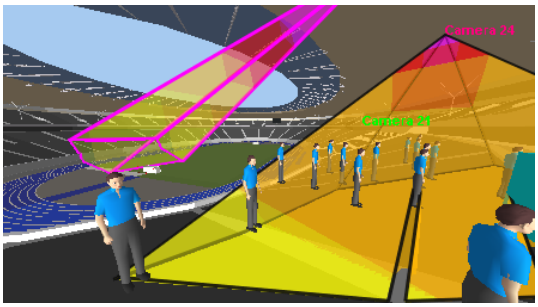
8.42 New version of **VideoCAD Plugin for SketchUP** was released with possibilities of export textures, transparent textures, opacity of materials and scaling.



8.43 Import of new 3D models was simplified. The special 3D models 397 window was added for creation of 3D model projections. In the window , you can create 3D model projections 401 with specified resolution, brightness, create projection in the form of faces, points and lines.

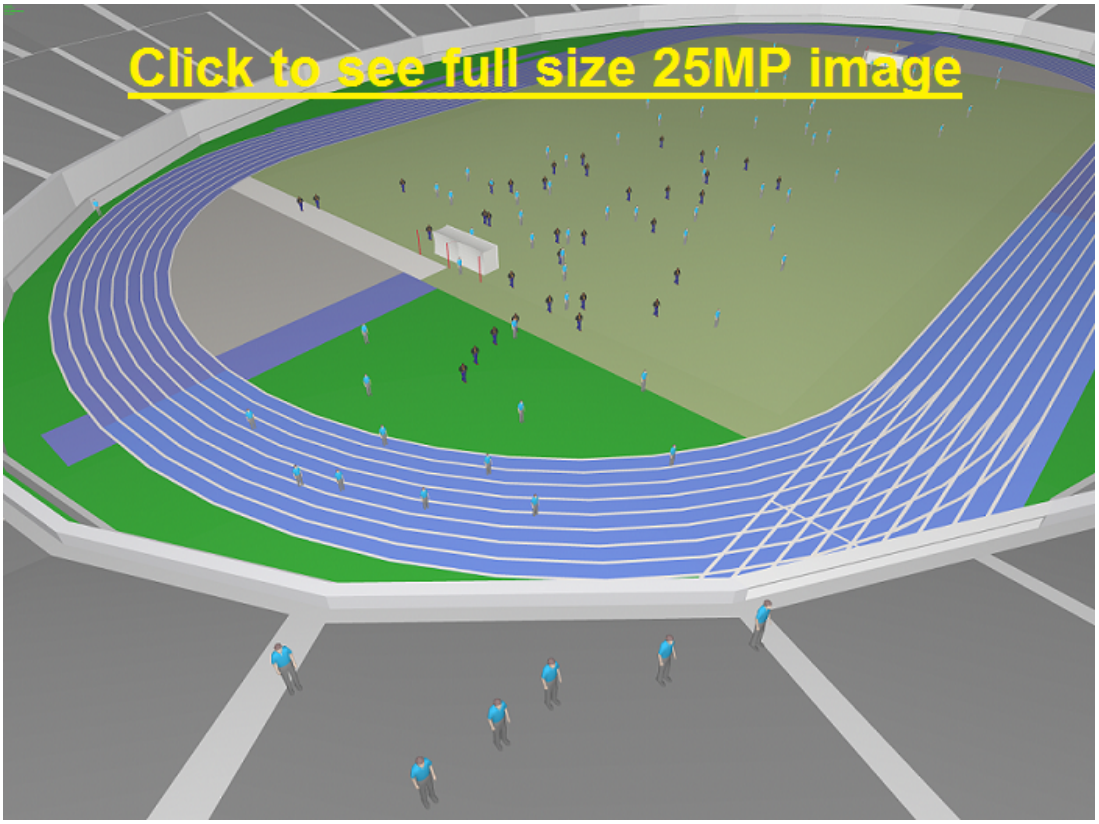


8.44 Ability to make projections in the form of sections of 3D models 401 at the specified range of heights. These projections of 3D models of buildings can be used as background for placing cameras in the Graphics window.
8.45 Ability to create 3D model projections with exceeding 401 Windows screen resolution.
8.46 Possibility to create a projection of individual area of 3D model with even higher resolution using PiP 402 (Picture in Picture) tool.
8.47 To use the 3D models as territories, and their projections as a background, a new ability to block 402 the projection of certain 3D models from selection by mouse click was added.
8.48 Ability to consider a 3D model as obstacle in the calculation of shadows 402.
8.49 In the 3D Models window you can also 399: save 3D model to a file, make copy of a 3D model, earn 404 3D models using 3D interface similar to the 3D World 343 window.
8.50 Tools related to 3D models were moved to special branch 259 of the main menu.
8.51 Ability to distribute 400 3D models by folders in the menu.
8.52 Loading 262 files of 3D models via a dialog box.
8.53 3D model file name can contain spaces.
8.54 During placing or editing 3D models, on the Current construction parameter panel 283 the **3D Models** button appears to quick open the 3D Models window 397 .

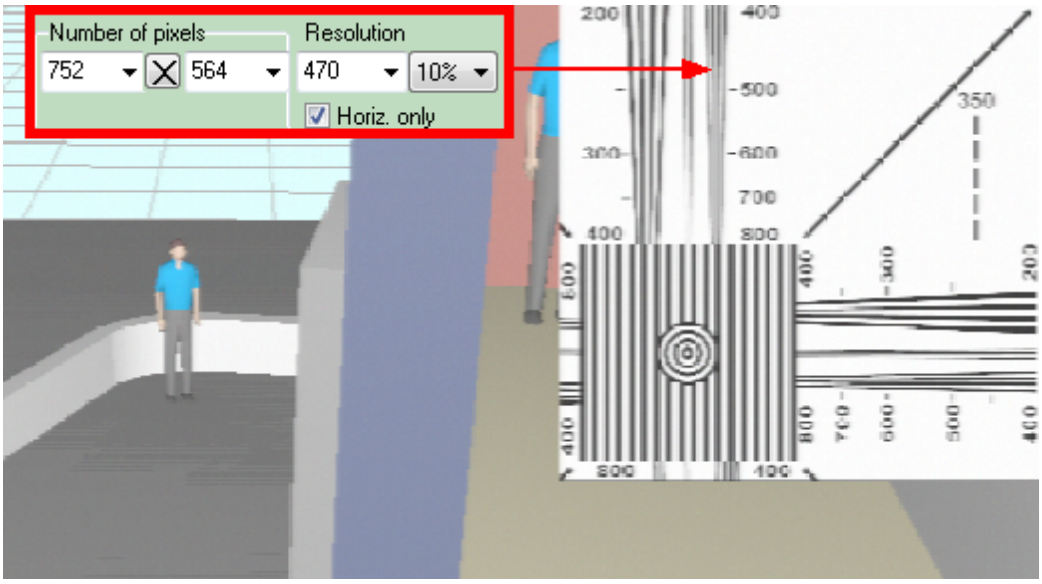


MODELING RESOLUTION OF CAMERAS AND LENSES

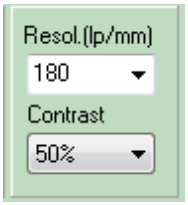
8.55 Ability to obtain full-size 359 image models of cameras with number of pixel exceeding Windows screen size, without using PiP. See examples of exported files: 5 megapixels, 10 megapixels, 25 megapixels.
This feature can be useful to model real resolution model of images with distortion 654.



8.56 Resolution modeling algorithms were reworked.
8.57 As an unit of measuring resolution instead of actually ambiguous **TVL (TV lines)**, the **Lines per Picture Height (LPH)** is used. For analog cameras the **LPH** is the same as "actual" TV lines, ie the number of vertical lines fit within the part of picture width equals to the picture height.
8.58 Accuracy of modeling resolution in LPH was increased. When you set the image resolution in LPH, you can also set the drop of contrast in % 333.
8.59 In modeling the camera resolution in LPH, it is possible to model as only horizontally resolution (for analog cameras) as the resolution in both directions 333 (for IP cameras).
8.60 The Test chart 388 EIA1956 is tied to the frame height and saves equal aspect ratio regardless of the aspect ratio of the simulated images that allows you to watch resolution of the simulated images in LPH (lines per picture height) in any aspect ratios of the frame.
8.61 Size in pixels of the Test chart 388 EIA1956 is increased twice.
8.62 Ability to display the Test chart EIA1956 in reduced-size 388 (up to 64 times), what extends the range of estimates resolution using the test chart up to **100 000 LPH**.



8.63 Simulating lens resolution 341 in **line pair per millimeter** at specified contrast drop by MTF (10%, 20%, 30%, 50%).

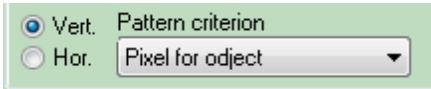


8.64 The following **camera model parameters** were added: Rolling shutter>Up (scan direction) 433; Resolution>LPH 434 (lines per picture height); Resolution>Contrast % 434; Resolution>Horizontal only 434; Lens>Resolution>lp/mm 439 (line pair per mm); Lens>Resolution>Contrast % 439.

3D VIDEO WINDOW

8.65 A window, which shows models of camera images, named **3D Window** in the past, was renamed to the 3D Video 357 window.
8.66 In the main menu of the **3D Video** window, in Image submenu, a new Real frame size 359 item was added. If it is checked, then saving the image in the **3D video** window will be with the number of pixels of the camera, which can exceed the screen size in Windows. This item is also used to simulate resolution of image with lens distortion 654.
8.67 In the main menu of the **3D Video** window, in **View** submenu, a duplicating Ground 366 item was added for quick hiding the ground surface in the **3D Video** window.
8.68 In the main menu of the **3D Video** window, in Image submenu, a new Copy to clipboard 360 item was added.
8.69 View area faces of cameras are invisible in the **3D Video** window, they are visible in the 3D World 346 window.
8.70 In the PTZH 387 mode a camera is panned and tilted by moving mouse cursor on the image with left mouse button pressed..
8.71 Background representation in the 3D Video window was improved.
8.72 Ability to switch 481 image generation thread: in separated thread or in the main thread.
8.73 Ability to model Rolling Shutter 378 with line scan order from up to down was added.
8.74 Accuracy of positioning PiP 391 and accuracy of working PiP together with Rolling Shutter was increased.

SPATIAL RESOLUTION

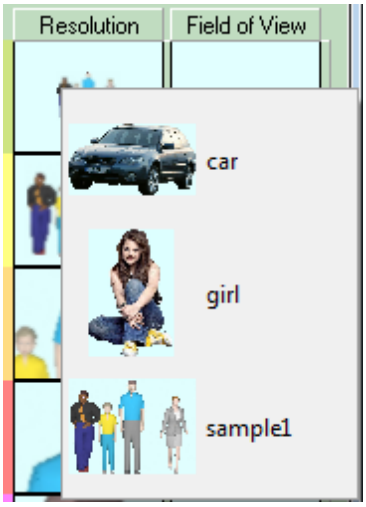


8.75 Ability to specify spatial resolution in spatial resolution patterns not only vertically but also horizontally. To do this, a new switch 319 to the Spatial resolution box was added.

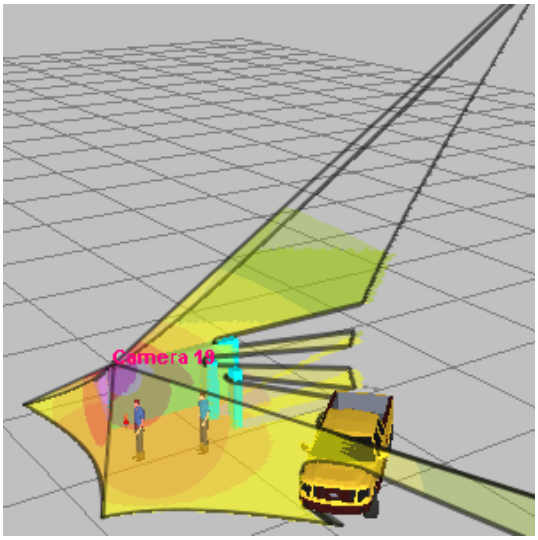
8.76 To the Option box an option of switching 493 direction of the spatial resolution calculation in dependence of the camera rotation around its optical axis was added.
8.77 Additional Spatial resolution patterns 318 were added based on the Standards:

- Australian Standard AS4806: Closed Circuit Television;
- European Standard EN50132-7;
- ISO/IEC 19794 Biometric data interchange formats.

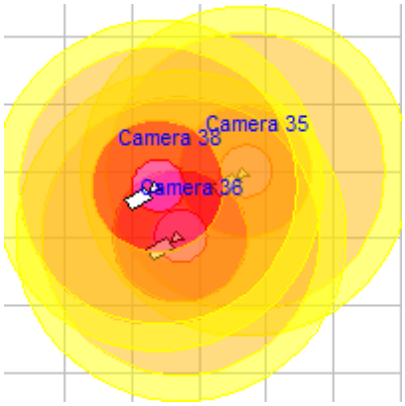
8.78 As a result of right-click on the Pattern 318 combo box a pop up menu will appear. Selecting the **Default patterns** item, you can erase all changes in the patterns and return to the patterns set by default.
8.79 The Vertical resolution of camera 321 field in the Spatial resolution box was renamed to the Vert. (Horiz) number of pixels 321.
8.80 To the Spatial resolution box 323 new test images were added.



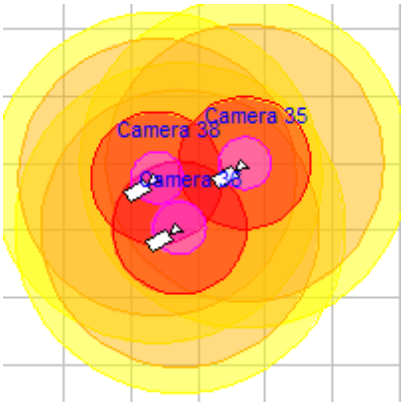
8.81 Spatial resolution visualization on the view area faces and on the active camera coverage in the 3D World 346 window.
8.82 Spatial resolution visualization taking into account lens distortion 654.



8.83 A new option for drawing regions of spatial resolution in the Graphics windows in ascending resolution - High resolution on top 242 was added. With this option enabled all cameras remain visible despite the shading of projections of different cameras. While regions with higher spatial resolution are drawn on the top.



Usual drawing



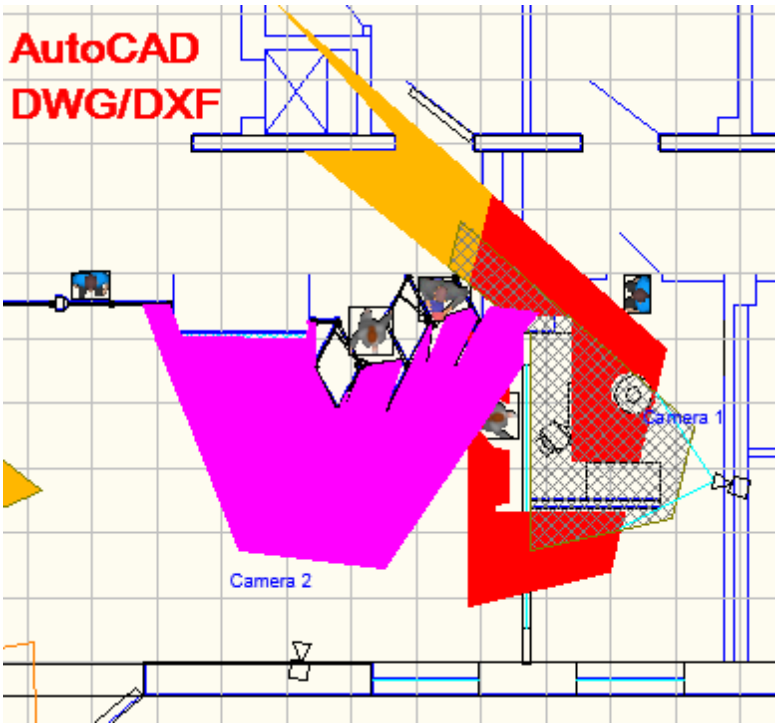
High resolution on top

IMPORT AND EXPORT TO AUTOCAD

8.84 Import module was upgraded. Up to AutoCAD **DWG 2015** formats are supported.
8.85 The dialog box **Scale background** was renamed to the Adjust background 223. For backgrounds in DWG or DXF formats, abilities to choose Layout in the background, control visibility of layers, hide texts were added. For backgrounds in PDF format you can choose page and resolution of the background.
8.86 Export module 485 was updated and reworked. Export to AutoCAD was improved. Export accuracy was increased.
8.87 Cameras with view areas are exported as AutoCAD blocks, view area bounds are exported as polylines. In attributes of the block the most important parameters of the camera are recorded: Name, Model, Lens focal length, Height of installation, Base height, Heights of view area lower and upper bounds, View angles, Number of pixels, Spatial resolution pattern, Quality level.
8.88 Illuminators are exported as AutoCAD blocks. In attributes of the block the most important parameters of the illuminator are recorded: Lamp type, Number and power of lamps, Height of installation.
8.89 Distribution by layers 276, set in VideoCAD is saved.
8.90 Hatching and filling of shadows 178 are saved.
8.91 Styles and weights of lines 475 set in VideoCAD are saved.
8.92 Point of origin is saved.
8.93 Grid is exported as AutoCAD block with attributes.
8.94 In the exported file the references to raster insertions are saved: background and 3D model projections. Raster images are exported along with DXF or DWG file into a separate directory.
8.95 In addition to the DXF format, export to the following vector formats was added: DWG, vector PDF, PLT (HPGL/2), CGM (Computer Graphic Metafile), SWF (Adobe Flash).
8.96 When you export a drawing with the background in AutoCAD DWG/DXF format, VideoCAD constructions can be added to the background on separate layers 486 or the background can be added as an external links to the file of the background. In both cases the structure of the background is saved.
8.97 Possible scheme of the combining AutoCAD + VideoCAD:

1. Load drawing 222 in AutoCAD format as a background;
2. Import 224 AutoCAD lines to VideoCAD 3D constructions automatically;
3. Adding cameras and constructions on special layers.

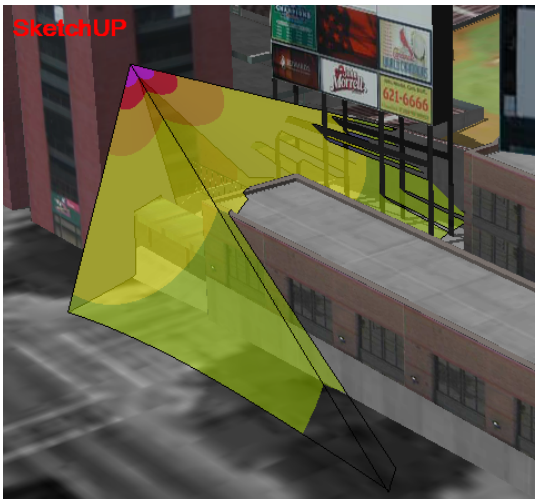
4. Export 219 the obtained drawing to AutoCAD format to work with it in AutoCAD.



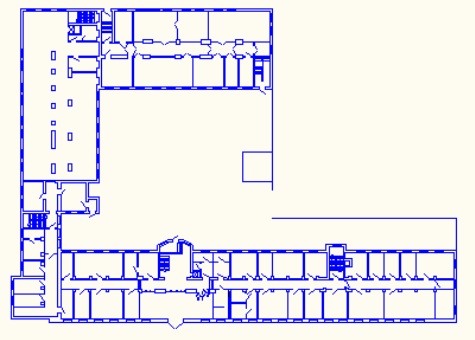
8.99 Export to DXF file 3D view areas 354 and camera coverage 355 taking into account lens distortion, spatial resolution, and shading.

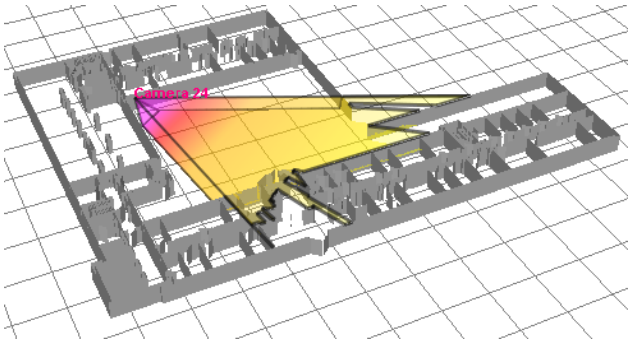
This feature allows the convenient scheme of work with combination of 3D BIM Software (SketchUP) + VideoCAD.

1. Export layout as a 3D model-territory through SketchUP and loading it into VideoCAD.
2. Adding cameras with 3D view areas in VideoCAD.
3. Export 3D view areas in DXF format, loading them into 3D BIM Software and combining with the original layout in 3D.



8.99 Import constructions 224 from a 2D background in AutoCAD formats to 3D VideoCAD constructions automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions.





IMPORT AND EXPORT TO OTHER FORMATS

8.100 Supporting PDF files to use as background 222 including multi-page PDF files.
8.101 Export 219 to PDF (raster and vector), AutoCAD DWG, PLT (HPGL/2), CGM (Computer Graphic Metafile), SWF (Adobe Flash).
8.102 Because of the increased number of export options, Export 485 tab in the **Options box** is divided into two sub-tabs: "DXF,DWG,PLT,CGM,SWF,vPDF" and "BMP,WMF,EMF,GIF,TIFF, PNG,JPG,rPDF".
8.103 To the options of export to BMP, JPG, EMF, WMF, GIF, TIFF, PNG, rPDF possibility to set hatch step factor 487 was added.
8.104 In the 3D Image 205 you can load images in BMP, JPG, PNG, GIF TIF (early BMP and JPG). Transparency of PNG files is supported.
8.105 New PDF report 216 was added. Unlike the Text report 216, the **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable. See example of PDF report.

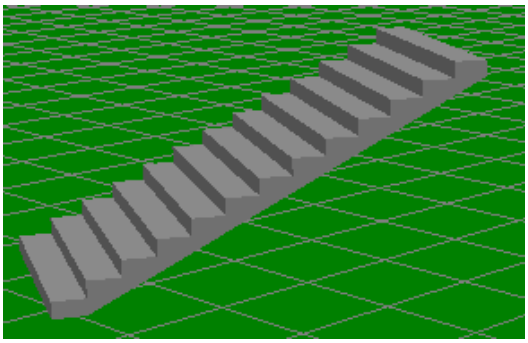
PRINTING

8.106 New mode Use buffer 491 was added. Using this mode, you can get the correct results and print transparent gradient fills, projections of 3D models even on printers do not support these tools, including most of free virtual printer to print to PDF.
8.107 New mode Scale Hatching 490 was added. Using this mode, you can get the correct hatching even on printers do not support scaling hatching.
8.108 Menu item Print setup 226 remains enabled even VideoCAD can not get access to the current printer.

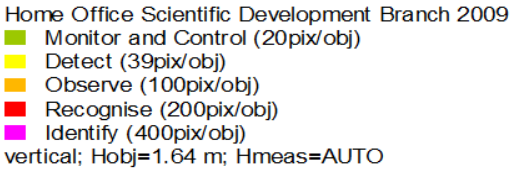
MISCELLANEOUS

8.109 Ability to change the minimum and maximum heights of several objects at once through changing their line type. If during changing the line type of selected objects by the Change line type 268 tool, to press and hold **Ctrl**, then the selected objects will also change their minimum and maximum height according to the chosen line type . If **Ctrl** is not pressed, the heights remain unchanged.
8.110 Autosaving 491 the project in specified intervals during running the program in a chain of files (up to 100 copies of the project are saved and rewritten in the regular intervals around the ring).
8.111 Image update with lots of rotated projections of the 3D models was accelerated.

8.112 New construction - Stairs 254.



8.113 Added a possibility to draw legends 321 of Spatial resolution patterns on the layouts.



8.114 New possibility to adjust transparence 483 of filling view area projections 175 in the Graphics window.
8.115 A mode to improve visibility of thin lines 492 at scaling background in BMP, JPG, PDF formats.
8.116 In the Test object box 507 at calculation of the part of frame occupied by the test object, tvl (TB- lines) and p (pixels) are not used.
8.117 The **Quality level** combo box with a list of quality level was removed from the **Camera geometry box**. You can assign a **quality level** to the active camera in the Quality levels 505 box.
8.118 The item **Assign to active camera** was removed from the pop up menu of the Quality levels table 505. A quality level is assigned when you select a line with the quality level name. To save your selection, click **Save**. To cancel - click **Cancel**.
8.119 In the graphical editing state 167 of the active camera, selection and rotation of the active camera is blocked to prevent displacement of the background, constructions and cameras relative to each other on other layouts.
8.120 The cursor coordinates in the lower left corner of the **Graphics window** are displayed rounded to the second decimal place .
8.121 The Export to Text 216 menu item was renamed to **Text report**.
8.122 In the Text report 216 for each camera additional lines were added: layer, the base height , angle of rotation around its axis, number of pixels.
8.123 When lens distortion 310 is modeled, the exported text file 216 contains real angles taking into account the distortion and in parentheses calculated angles.
8.124 Child windows "sticks" to the screen edges.
8.125 Maximum number of lamp in a illuminator 465 was increased up to 250 for modeling LED illuminators.
8.126 An option of changing registration code 273 via the Main menu was added.
8.127 An option of typing sensor size 293 in millimeters was described in the Help system. Checking invalid sensor sizes was added.
8.128 Detected bugs were fixed.
8.129 The Help system was updated.
8.130 Examples of work with VideoCAD 527 in the Help were updated according to the new features. Several new examples were added.

8.131 Project format of VideoCAD7 - ***.vc7 is** supported. There are possibilities of export 215 and import 215 of the previous project format ***.vmp**, supported by versions from 4 to 6.
8.132 The program was tested under Windows 8.

RULES OF UPGRADE

8.133 The Rules of upgrade from previous VideoCAD versions to VideoCAD8:

- For the customers who have purchased VideoCAD7 (or upgraded to VideoCAD7) after **01 July 2014** upgrade cost makes a difference between cost of VideoCAD8 and VideoCAD7.
- For the customers who have purchased VideoCAD7 (or upgraded to VideoCAD7) before **01 July 2014** updating cost makes half of the VideoCAD8 cost.
- For the customers who has VideoCAD3..VideoCAD6 and didn't upgrade to VideoCAD7, updating cost makes 3/4 of VideoCAD8 cost.
- Upgrade Lite version to Professional is paid in addition.
- For the customers, whose original valuable suggestions have found application in VideoCAD 8.0, the additional discount for upgrade is given.
- Upgrade of **VideoCAD plugin for SketchUP** is free with upgrade to VideoCAD 8.

- **VideoCAD 8 Professional** can work **only with USB Senselock 670 dongle**. HID registration with the Professional version is not applied. Senselock dongles from VideoCAD 6.XX and VideoCAD 7.XX are supported. In case of absence of USB Senselock dongle it is necessary to purchase it. Guardant dongles are not supported by VideoCAD 8.0.
- **VideoCAD 8 Lite** 31 can work with USB Senselock dongle 669 and with the HID registration.
- **VideoCAD 8 Starter** 49 and **VideoCAD 8 Starter II** 45 are registered only by personal registration code, without dongle, without hardware locking.

7. What is new in VideoCAD 7.0

NEW PROJECT FORMAT

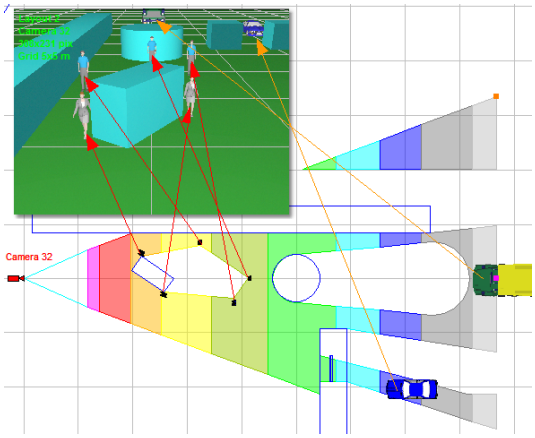
7.1 New project file format ***.vc7**. There are possibilities of export 215 and import 215 of the previous project format ***.vmp**, supported by versions from 4 to 6.
7.2 Unlimited quantity of cameras in one project. In the previous versions each project could contain no more than 100 cameras.
7.3 Unlimited quantity of constructions on each layout. In the previous versions each layout could contain no more than 5000 constructions.
7.4 Quantity of line types 475 is increased to 2000.

SPEED OPTIMIZATION

7.5 Resource-intensive operations are allocated in separate threads. This allows working in the graphics window without delays and also get considerable gain in efficiency on modern multicore processors.
7.6 3D image 357 generation is allocated in a separate thread. This allows working in the graphics window with opened 3D window without delays for redrawing 3D images. The priority of the 3D window thread can be switched 481. During image generation in the 3D window on the 3D window button 187 blinking red frame appears.
7.7 New items were added to the 3D window's main menu: Speed>Disable image processing 369 and Update image only by clicking 369. These items duplicate the same items in the Options box. When image processing is disabled the 3D image redraw speed considerably increases.

7.8 Possibility of two-stage image generation 481 in the 3D window. At the first stage the image without processing is quickly generated and displayed. Then resource-intensive per-pixel processing is carried out and the processed image is shown.
7.9 In the PTZH frame 365 mode image processing is disabled to increase speed of image redrawing. Titles are disabled too.
7.10 The algorithm of modeling sensitivity of megapixel cameras is accelerated.
7.11 Image redrawing in the Graphic window was accelerated too. Bottlenecks were optimized.

CALCULATING SHADOWS IN THE VIEW AREA

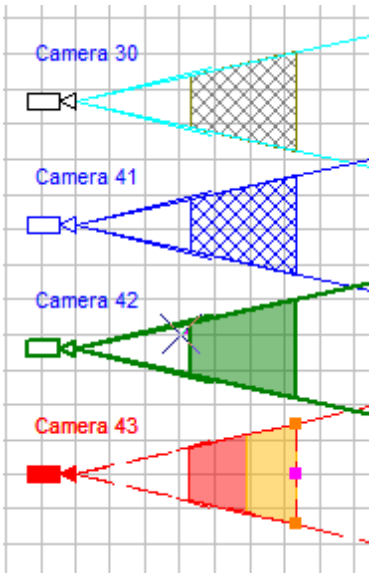


7.12 Constructing horizontal projection of camera control area taking into account shadows 178, arisen from obstacles on the scene environment. In three dimensions, shadows from any constructions (including 3D models) can be automatically calculated and displayed.
7.13 New definitions are introduced: Camera control area and Control area projection. **Camera control area** forms by subtracting shadows of environment objects (uncontrolled areas) from camera view area 147 .
7.14 Constructing the Camera control areas of PTZ 583 (dome) cameras taking into account shadows, created by obstacles on the scene environment. The tool is also useful for choosing the best location for fixed cameras to make reachable required areas.
7.15 In the Line type properties there is new item: Shadow 475. If the item is checked then all constructions made by this line type are considered as obstacles at calculating shadows.
7.16 On the Current construction parameter panel when a 3D model is editing, there is additional checkbox- Shadow 283. If the checkbox is checked, then the 3D model is considered as an obstacle at calculating shadows.

Shadows - a new powerful yet easy-to-use tool of VideoCAD 7. *Shadows are calculated for all positions of cameras, shading objects can be located at any point of space. You should only enable calculation of shadows.*

COLORS, FILLING AND HATCHING OF VIEW AREA PROJECTIONS

7.17 View area projection of different cameras can have different color 175 according to parameters of line type of these cameras (in case of disabled spatial resolution 177 visualization).
7.18 View area projection can be semitransparent. The Fill projection 175 button and corresponding item of the main menu have a drop-down list in which it is possible to choose blend filling or hatching view area projection.

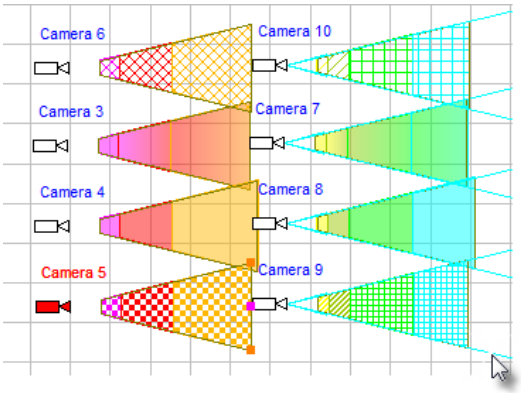


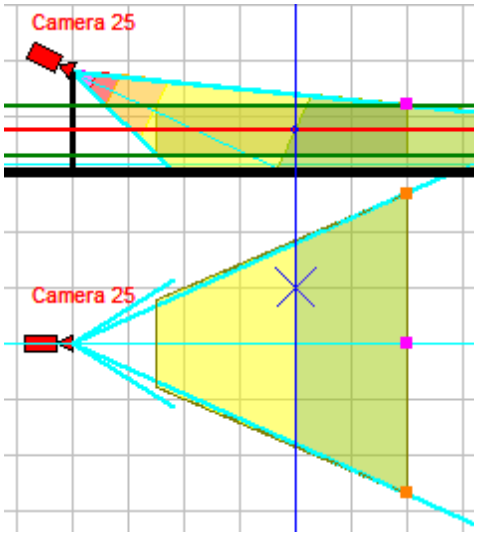
VISUALIZATION OF SPATIAL RESOLUTION AND FIELD OF VIEW SIZE

7.19 Camera view area can be divided into regions 177 filled by different color and (or) type of hatching. Regions can differ depending on the following criteria:

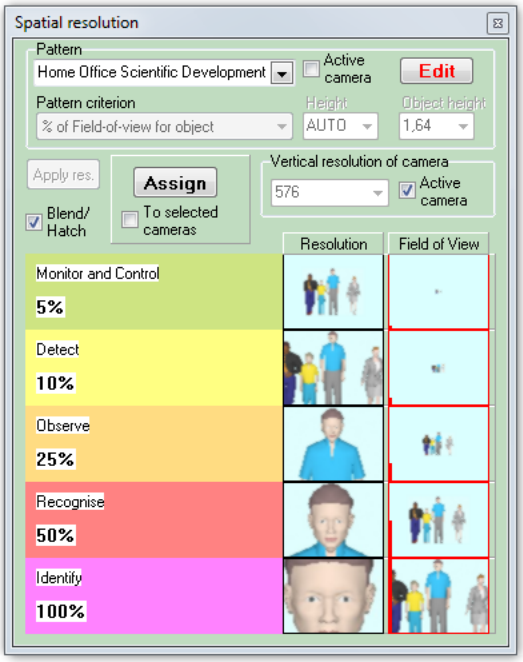
- spatial resolution (pixels/meters, pixels/foot);
- vertical field of view size (meter, foot);
- vertical number of pixels covered by an object of the specified height (meter, foot);
- the part of the frame (%) covered by an object of the specified height (meter, foot).

7.20 The spatial resolution is measured at the specified height and can be displayed in the Horizontal projection in all modes. In the Vertical projection the spatial resolution is displayed in the loaded (active) camera editing mode only.



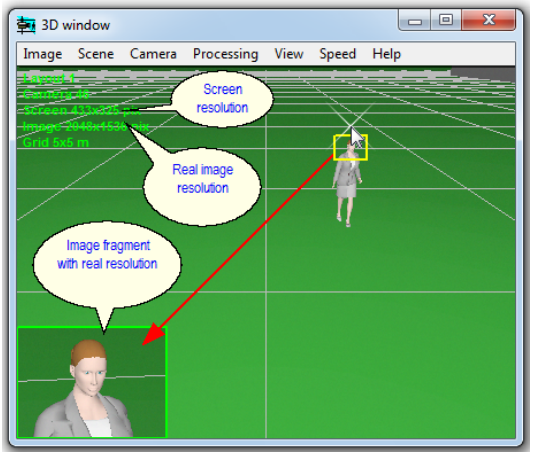


7.21 The new Spatial resolution box 316 was added in which it is possible to create and edit patterns of spatial resolution and field of view size visualization. In the box there are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch, Home Office Guidelines for identification, P 78.36.008-99. Also in the box there are examples of images of group of people are automatically displayed for each region of spatial resolution. Different patterns can be assigned to different cameras.
7.22 View area projections can have gradient colors 177. In this case key colors of the gradient correspond to the colors in the assigned pattern from the Spatial resolution box.



MODELING RESOLUTION OF MEGAPIXEL CAMERAS

7.23 On the Image parameter panel a new tab PiP 391 (Picture in Picture) was added. The PiP mode allows to model in the 3D window images with resolution exceeding the 3D window resolution and even the resolution of the Windows screen.
7.24 Digital ZOOM 393 in the PiP mode allows to additionally magnifying specified area on the 3D window for detailed analysis.
7.25 If the image resolution differs from the 3D window size and artificial decrease of resolution is performed or the PiP is displayed, in the Titles 357 of the 3D window in separated lines the image resolution and the screen resolution are displayed.

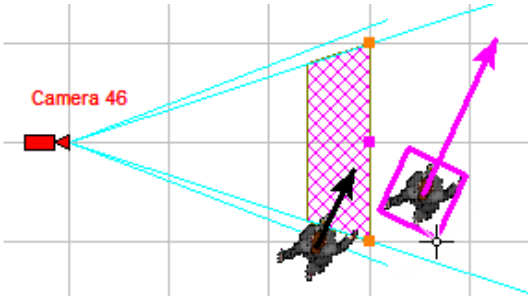


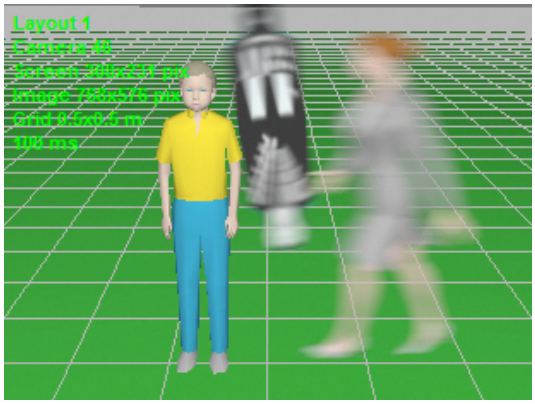
7.26 New values of resolution in the drop-down lists. Lists of resolution are stored in files H_res.txt and V_res.txt in the VideoCAD installation directory. To add new resolution it is possible to edit these files. As well as in the previous versions you can type any resolutions by the keyboard.

MODELING MOVEMENT

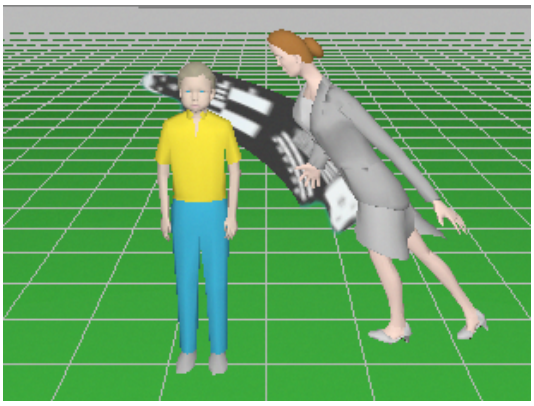
7.27 You can specify speed and direction of movement for 3D models 203 in a velocity vector form and in a numerical form.
7.28 On the Current construction parameter panel when choosing 3D models there is an additional Speed 283 box.
7.29 Frame rate 375 was added to the camera parameters.
7.30 It is possible to model movement of 3D models and rotation of the Rotakin 205 object.
7.31 Visual estimation 575 in the Graphics window how many times moving object will get into the frame, depending on speed and direction of movement of the object, location and frame rate of the

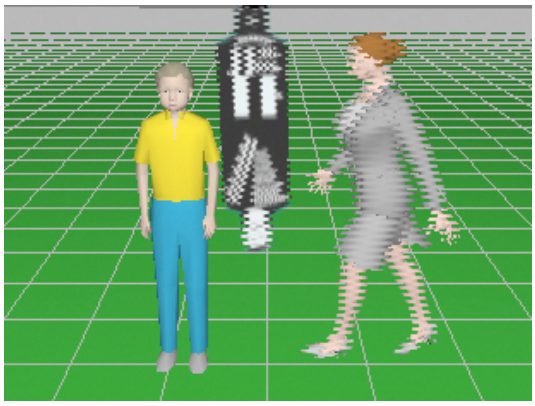
camera and the view area form.



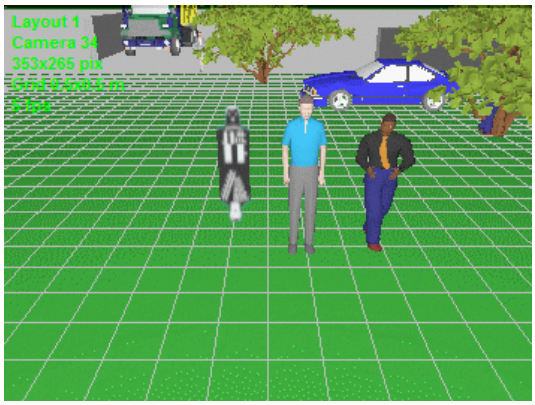


7.32 Exposure time[377] and Row time[378] of Rolling shutter were added to camera parameters.
7.33 It is possible to model blur of moving 3D models (motion blur) and rotating Rotakin depending on the speed, direction of movement and exposure time of camera.
7.34 When modeling exposure time in the 3D window Titles current exposure time value is displayed.
7.35 Modeling distortions[585] of moving 3D models and rotating Rotakin from Rolling shutter and Global shutter.
7.36 Modeling interlace distortions[585] of moving 3D models and rotating Rotakin.





CREATION OF ANIMATED IMAGES



7.37 Possibility of creation of animated images with moving 3D models.
7.38 On the Image parameter panel, View tab the Number of frames 386 box was added.
7.39 When the Number of frames is more than one, in the 3D window's titles 357 the Frame rate value is displayed and in the 3D window animated image with specified Frame rate is generated.
7.40 Animated images can be saved 360 as animated GIF files and displayed on the Monitor window.

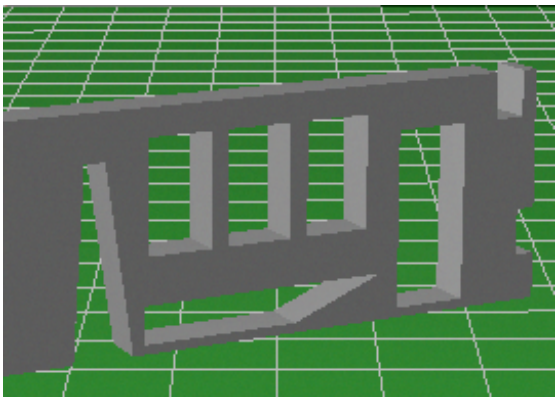
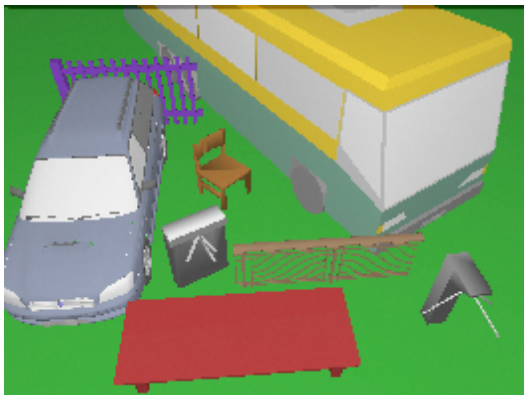
See an example of animated monitor (file size about 4 Mb).

NEW IN THE MONITOR WINDOW

7.41 Scaling the Monitor window in Windows 7 was improved.
7.42 New sizes 410 of monitors were added.
7.43 Possibility of setting resolution 411 of digital monitors.
7.44 During loading monitors it is possible to interrupt the long operation, having pressed ESC.
7.45 It is possible to set correcting factor 492 for exact modeling physical sizes of monitors.
7.46 Displaying on the monitors animated 409 images with moving 3D models.
7.47 Saving 412 image of the monitors in formats *.gif, *.tif, *.png.
7.48 Exporting images on the monitors to the *.html 412 file with static or animated images. Camera's images are saved in the camera's original resolutions in the form of separate files PNG or animated GIF.
See an example of animated monitor (file size about 4 Mb).

NEW OBJECTS AND TOOLS

7.49 New object - Rotakin 205 - an animated rotating test target for visual estimation of spatial resolution and motion distortions on the 3D images. In the Options box it is possible to change rotation speed of the Rotakin.
7.50 New object - Wall 198. It allows drawing walls with different thickness.
7.51 New object - Aperture in Wall 199. It allows making in 3D walls any apertures, for example for windows and doors.
7.52 New object - Polyline 195. It allows drawing line segments continuously.
7.53 New tool - Scale 192. It allows scaling selected constructions relative to a base point.
7.54 New tool - Mirror 193. It allows getting mirror copies of selected constructions relative to a horizontal or vertical line.

7.55 Existing Copy and Cut tools are renamed to Copy with base point 265 and to Cut with base point 265.
7.56 New Copy 191 and Cut 191 tools were added. In the new tools the base point is set automatically at the center of copied objects.
7.57 Several new 3D models 202 were added to the library.

CABLE REPORT

7.58 Possibility of using in the project a lot of brands of cables. Line types 475 can be considered as cables.
7.59 Possibility of drawing main cables, which is not associated with cameras.
7.60 Possibility of getting the Cable report 590. The report contains lengths of all cables separated by brands and cameras, including the main cables.
7.61 Continuous drawing cables 269. The end of each segment is the start of the following one. To stop drawing cable press ESC.

DEPTH OF FIELD IN THE HORIZONTAL PROJECTION

7.62 The Height 458 parameter was added to the depth of field parameter list. At the set Height the analysis of depth of field is performed do display the depth of field bounds in the Horizontal projection. The height can be different for different cameras.
7.63 When the Depth of field box 454 is opened, all cameras in the horizontal projection have displayed borders of the sharpness area, hyperfocal distance, focus distance measured at the set height. In the vertical projection the borders of the sharpness area, hyperfocal distance, focus distance are displayed in the loaded (active) camera editing mode.
7.64 It is possible to specify focus distance by clicking on the view area horizontal projection of the loaded (active) camera. The Specify focus plane 458 button is always accessible.
7.65 When the Specify focus plane button is pressed, during cursor movement over the view area horizontal projection of loaded (active) camera, on the Status bar 275 the resolution under the cursor limited by the depth of field is displayed.
7.66 In the Depth of field box the new Default 460 button was added. As a result of clicking this button, default values will be assigned to input parameters in the Depth of field box: the boundary resolution = 0.7*horizontal pixel count, focus distance = hyperfocal distance, height = AUTO (middle height of the camera's view area).

NEW IN TABLE OF CAMERAS AND TABLE OF CAMERA MODELS

7.67 A new menu for switching visibility 423 of separate columns was added.
7.68 Several new possibilities of filtering 423 data in the tables.

7.69 Several new parameters of camera model were added: Exposure time at measuring sensitivity 435, Maximal frame rate 434, Row time 433 (parameter of the Rolling Shutter).
7.70 To the Table of cameras these three new parameters of model were added and in addition: Current frame rate 375, Name of the assigned Spatial resolution pattern 316, Signal cable brand 514 and Power cable brand 515.

INTERFACE IMPROVEMENTS

7.71 Possibility to adjust 489 visibility of buttons on the Tool bar.
7.72 When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and to change scale using plus and minus keys irrespective of the input focus.
7.73 In the PTZH frame 387 mode of the 3D window you can pan and tilt the camera by moving the image in the 3D window with left mouse button pressed like moving drawing in the Graphics window.
7.74 In the Options box the Default 474 button was added. Using this button you can assign default values to all parameters on the opened tab.
7.75 Sign of the Scaling factor when turning the mouse wheel 490 in the Option box determines the reaction for direction of rotation the mouse wheel in the Graphics window.
7.76 Manual scaling 3D window in Windows 7 was improved.
7.77 On the Processing 381 tab of the Image parameter panel and in the Sensitivity and resolution 329 box between combo boxes with horizontal and vertical numbers of pixels, new buttons with a cross were added. These buttons are intended for fast calculation of vertical number of pixels from the specified horizontal number of pixels and on the contrary. Calculation is carried out using the Aspect Ratio 295.
7.78 On the View tab of the Image parameter panel near to a box with the horizontal number of pixels 385, the calculated value of vertical number of pixels and the Aspect ratio are displayed.
7.79 At the left top corner of the Tool bar the Save project 171 button was added for convenient regular saving the current project to a file.
7.80 Links to the last 10 used project files are accessible in the Main menu>Project 215.
7.81 Accuracy of 3D model selection in the Graphics window was improved.
7.82 In the Main menu>Help 272 new items with links to our web site and VideoCAD user forum in the Internet were added.

UNDO

7.83 Buffer of last operations (UNDO) stores now all parameters of cameras.
7.84 Depth of the undo buffer can be adjusted on the Miscellaneous 492 tab of the Options box. This depth can be up to last 50 operations.
7.85 The REDO 212 button was added for moving in the UNDO buffer in the opposite direction.

NEW FORMATS OF IMPORT AND EXPORT

7.86 Support of import as background 222 and export 219 drawing in the following formats: EMF +, GIF, TIFF, PNG. Blend color and gradient color are supported.
7.87 Support of export drawing to JPG format (Import of the JPG format is present in the previous versions).
7.88 Possibility of saving 360 image from the 3D window in formats: GIF, animated GIF, TIF and PNG.
7.89 Possibility of saving 412 image from the Monitor window in formats: GIF, TIF, PNG, HTML with PNG, HTML with animated GIF.

CHANGES

7.90 When editing by points a rectangle 196, an inclined rectangle 196 or 3D image 205, the rectangle remains rectangular by default. By pressing Ctrl it is possible to edit separate points and to change distance between lines. In the previous versions it was on the contrary.
7.91 Double line 197 rotates as a whole, with keeping distance between lines that is more convenient at construction of walls.
7.92 When editing by points a double line, it rotates as a whole by default. Keeping Ctrl it is possible to edit separate points and to change distance between lines. In the previous versions it was on the contrary.
7.93 The Post 389 in the 3D window is hidden by default. It is possible to show post on the View tab of the Image parameter panel.
7.94 Setting of export to raster formats on the Export 485 tab of the Options box by default correspond to an exact copy of the screen.
7.95 At the moment of closing the Image parameter panel the According to camera parameters 381 box on the Processing tab becomes marked automatically and all parameters on this tab get values from the loaded (active) camera. This is to avoid mess with displaying resolution of loaded (active) and inactive cameras.
7.96 Name of the loaded (active) camera is not red colored when exporting and printing.
7.97 When modeling interlaced fields 382, the vertical resolution of video sensor 332 (if it is set) decreases twice. In the previous versions the vertical resolution of the whole image in the 3D window was decreased.
7.98 From the Camera 375 tab of the Image parameter panel duplicating controls are removed to clear a place for new tools. The controls remain on the Sensitivity and resolution 329 box.

RENAMINGS

7.99 The **Loaded camera** term is changed to the **Active camera**.
7.100 Menu item Project> Export is renamed to Project> Export to Text 216.
7.101 Button **Actual view area projections** and the corresponding Main menu item are renamed to Fill projections 175.
7.102 The **Interface** tab in the Options box is renamed to Miscellaneous 490.
7.103 Coaxial cable is renamed to the Signal cable (the Russian version).

UTILITIES

7.104 Utilities for measuring camera and image parameters were separated out from VideoCAD in the separate product - **CCTVCAD Lab Toolkit** 494.
7.105 Utilities in the **CCTVCAD Lab Toolkit** become more stable in Windows 7.
7.106 The Video analyzer has a possibility of automatic measuring signal/noise ratio of static image or live video on the computer screen, in a window of any third party program.
7.107 In the Image analyzer, showing separate image lines as a oscilloscope can be separated by color.
7.108 In the Spectrum analyzer, a possibility of calculating spectral efficiency of infra-red LEDs of different wavelength for different image sensors was added.
7.109 In the Spectrum analyzer, spectral sensitivity curves of modern CMOS and CCD megapixel image sensors (SONY, Cypress, Micron) were added.
7.110 The technique of measuring sensitivity 551 of cameras was refined on the base of practice of measuring the sensitivity of **IP cameras**. A new method of measuring the sensitivity using the Video analyzer was added.
7.111 Procedures for measuring camera exposure time 593 and the row time of rolling shutter 596 of IP cameras were developed.

MISCELLANEOUS

7.112 Possibility to make camera and luminaries icons 483 scalable together with the other constructions on the drawing. In this case the size of icons is specified in meters (foots). This possibility allows setting the exact sizes and positions of icons and names of cameras for exporting and printing.
7.113 Possibility of assigning scalable fonts 477 to the camera names and specifying displacement of camera names in meters (foots) for scalable icons and in pixels for no scalable icons separately.
7.114 Displaying background 388 in the 3D window was improved.
7.115 A new possibility of adjusting resolution 481 of a vector background (in AutoCAD format) in the 3D window.
7.116 In the Options box on the 3D tab a slider was added which allows adjusting realism of modeling 482 depth of field, exposure time and rolling shutter.
7.117 In the Sensitivity and resolution box a new camera parameter Exposure time at measuring sensitivity 335 was added.
7.118 In the exporting text file 216 for each camera the following information was added: Horizontal angle of camera, Coordinate X, Coordinate Y, Model, Producer and Cost.
7.119 In the Camera list 509 box new parameters were added: lens focal length and vertical number of pixel. Now you can copy the camera list to the Windows clipboard to paste in **MS Excel**, **MS Word** and other software.
7.120 Help system was considerable improved; a lot of pictures were added.
7.121 Examples of work with VideoCAD 527 in the Help were updated according to the new features. Several new examples were added.
7.122 Program was adapted for modern wide-screen monitors with high resolution.
7.123 Program was tested under Windows 7. Detected incompatibilities are eliminated.

RULES OF UPGRADE

7.124 The Rules of upgrade from previous VideoCAD versions to VideoCAD7:

- For the customers who have purchased VideoCAD6 (or upgraded to VideoCAD6) after **01 January 2011** upgrade cost makes a difference between cost of VideoCAD7 and VideoCAD6.
- For the customers who have purchased VideoCAD6 (or upgraded to VideoCAD6) before **01 January 2011** updating cost makes half of the VideoCAD7 cost.
- For the customers who has VideoCAD3..VideoCAD5 and didn't upgrade to VideoCAD6, updating cost makes 3/4 of VideoCAD7 cost.
- Upgrade Lite version to Professional is paid in addition.
- For the customers, whose original valuable suggestions have found application in VideoCAD 7.0, the additional discount for upgrade is given.

- **VideoCAD 7 Professional** can work **only with USB Senselock 670 dongle**. HID registration with the Professional version is not applied. Senselock dongles from VideoCAD 6.XX are supported. In case of absence of USB Senselock dongle it is necessary to purchase it. Guardant dongles are not supported by VideoCAD 7.0.
- **VideoCAD 7 Lite** 31 can work with USB Senselock dongle 669 and with the HID registration.
- **VideoCAD 7 Starter** 49 and **VideoCAD Starter II** 45 are registered only by personal registration code, without dongle, without hardware locking.

6.1 What is new in VideoCAD 6.1

6.1.1 VideoCAD_Lite 31 is released. VideoCAD_Lite is an inexpensive version of VideoCAD with limited features. VideoCAD_Lite offers only the most useful and easy-to-master tools for CCTV

design.

6.1.2 A new possibility to assign any model to all selected cameras 185 simultaneously

6.1.3 A possibility to change the following parameters of all selected cameras 289 simultaneously: lens focal length, Image sensor size, installation height, parameters of view area, quality level.

6.1.4 Exposure time range 336 is expanded up to 1 sec. for convenience in modeling modern IP cameras with increased exposure time.

6.1.5 Line color in the 3D window 476 is displayed on the Line type panel 280.

6.1.6 Changing Number 431 and Model Name 431 is disabled on the Used models tab in the Table of camera models 419. Earlier such changes resulted in loss of the model from the model list.

6.1.7 If size of video sensor is standard, at closing the Special sensor size 308 box, the standard designation of the sensor size is kept.

6.1.8 The Help system is updated.

6.1.9 VideoCAD installer is updated.

6.1.10 Found bugs are fixed: running under a user account, error at starting VideoCAD by double clicking on a project file, an erroneous message ' Your graphics card does not support this tool ', directory path of jpg images saving is not kept, error at editing text on the drawing.

6.1.11 Updating from VideoCAD 6.0 is offered free-of-charge. Updating from earlier versions is performed according to rules 138 of updating up to VideoCAD 6.0.

6. What is new in VideoCAD 6.0

IIIUMINATION AND LUMINARIES

6.1 Modeling background scene illuminantion 371, considering type and direction of light source, separately for day and nighttime.

6.2 Luminaries 206 modeling considering lamp type and light efficiency, including discharge lamps with complex spectrum of radiation.

6.3 Different wavelength Infrared LED illuminators 469 modeling.

6.4 Illuminator calculation box 461 for creating luminaire models and calculating their parameters.

CAMERA, LENS AND DVR PARAMETERS

6.5 Camera parameters 331 modeling (spectral response; number of pixels; resolution; minimum scene illumination at known signal-to-noise ratio, IRE and aperture; maximum signal-to-noise ratio; electronic shutter; AGC; Back Light Compensation; gamma correction).

6.6 Lens parameters modeling (focal length; aperture; Auto Iris DC and Video Drive). Calculating and modeling Depth of field 457 based on calculated aperture.

6.7 Modeling cameras 332, switching into black and white mode in case of low illuminance: day/night with removable IR filter and easy day/night with permanent IR filter.

6.8 Enhanced modeling of DVR parameters 381 (vertical and horizontal digitization, brightness, contrast, compression, vertical and horizontal sharpness).

6.9 Modeling specific distortions which are arisen as a result of mismatching output image size 381 and number of pixels 332 on camera's video sensor.

6.10 Modeling images based on scene, lens, camera and DVR models. Calculating 386 and modeling 372 signal-to-noise ratio and contrast.

6.11 Image models at different illumination levels are tested 551 against **real video cameras**. Very high level of coincidence has been achieved.

UTILITIES

6.12 Image analyzer 494 tool allows measuring signal-to-noise ratio, brightness and brightness amplitude of an image, size and contrast of an object relative to background, building histogram, calculating image size at different compression levels, analyzing certain lines of an image similarly to oscilloscope, as well as modifying certain image parameters. By analyzing saved images using this tool it's possible to calculate sensitivity and resolution of a real camera for precise modeling in VideoCAD.

6.13 Live video analyzer 494 tool allows measuring brightness, average brightness and noise in certain point, as well as screen frame rate in window containing live video created by any program.

6.14 Lamp spectrum analyzer 494 tool allows to determine the spectral efficiency of any light source for various camera types based on spectral power distribution curve. Determined value of spectral efficiency is used in VideoCAD for precise modeling various types of light sources.

CAMERAS

6.15 Table of camera models 419 support (over 100 parameters for each model), ability of assigning models for project cameras. It's possible to adjust a view of model table by hiding unnecessary columns. Table of models supports sorting and filtering. Automatic calculation of sums of power consumption and prices. Ability of printing tables and their parts, importing and exporting into Excel, Word, *.txt, *.csv, *.htm.

6.16 Modern IP cameras support (16:9 Aspect Ratio 308, different image sensor sizes and aspect ratio, high image resolution).

6.17 Criteria in Quality levels concerned with limiting image resolution (maximum vertical field of view size, minimal parts of screen occupied by a license plate and a face) are related to the number of pixels for modeling and comparing digital cameras with different resolution. These criteria are now known as: Minimal vertical resolution (pixel/meter) 498, Minimal vertical size of face image (pixels) 500 and Minimal vertical size of license plate image (pixels) 503.

6.18 Varifocal and ZOOM lens support. Adjusting 294 lens focal length by moving view area bound on a layout within set limits using a mouse.

6.19 Icons for internal, outdoor and PTZ cameras may be different 171.

6.20 For each camera icon by various line types 171 can be set. Thus, the camera icons can vary in color and line thickness.

6.21 Lens focal length 294 range has been widened to 1000mm.

IMPORT AND EXPORT

6.22 A background 222 in *.dwg AutoCAD™ 2007 format support, AutoCAD™ PROXY records support, loading speed of complex *.dxf files is improved. Bug fixed. All ANSI code pages support, and other improvements concerned with *.dxf and *.dwg files import.

6.23 Export 485 to*.dxf file is improved. It's possible to set camera icons and illuminator size in AutoCAD™ units. Ability of exporting large background files.

3D MODELS AND 3D WINDOW

6.24 Several new 3D models 202 were added, including dark-skinned person for testing the ability of detecting dark-skinned people at low illumination.

6.25 3D models now can be scaled 283 in any direction.

6.26 3D models can be placed in vertical projection 202. Models placed in vertical projection will not be visible in 3D window.

6.27 Convenient 3D model 169 selection from the tool bar.

6.28 Raster images 205 in the 3D window. Usual photos and pictures in *.bmp or *.jpg format can be placed in 3D space. Raster images can be transparent, and can replace difficult-to-make 3D models. Raster images can be scaled, placed at any angle, used for modeling variety of objects, from banknotes and plates to a complex background.

6.29 **Background** can be visible 385 in the 3D window.

6.30 Redraw 3D image only by clicking 482 mode is convenient in case of complex scenes and\or slow computers, when image repainting in 3D window takes much time.

6.31 Fixed fuzzy drawing PTZH frame 387 and titles in the 3D window when using certain video cards.

6.32 Image parameter panel 370 with View, Scene, Camera, Processing tabs. Panel can be activated by right-click or double-click on the 3D window.

6.33 Setting visibility of different objects in the 3D window on View 385 panel.

6.34 View, scene and equipment parameters are set individually 371 for each camera. Quality levels no longer include 3D image parameters.

WINDOWS

6.35 Quality level box 505 contains corresponding quality level criteria..

6.36 Sensitivity and resolution 329 box with camera and lens parameters.

6.37 Camera parameter box has been renamed to Camera geometry 289. Inherited from older versions unnecessary interface elements have been removed. Additionally, this box allows to change aspect ratio 295, image sensor sizes 308 and view angles.

6.38 Modeling 16:9 410 format monitors. Switching day/night 409 illumination modes on the Monitor window.

6.39 Tab quantity in the Options box 474 has been increased.

6.40 Model column has been added to the table in the Camera list 509 box. Column width can be adjusted by the mouse. Icon box and Table of camera models button have been added to the Cameras list box.

6.41 Appropriate camera is loaded by double-clicking on the Camera list 509 box. To rename camera use appropriate pop-up menu item.

6.42 Camera type box has been added to the New camera 171 box. When creating new camera, line type can be chosen for it's icon on the Line type panel 280.

REPORTS AS A TABLE

6.43 Interactive adjustable table 443 reports including any camera parameter sets. Various types of tables can be formed by hiding unnecessary columns. Tables support sorting and filtering. Automatic calculation of sums of power consumption, cable lengths and prices. Ability of printing tables and their parts, importing and exporting into Excel, Word, *.txt, *.csv, *.htm. Convenient editing parameters by double-clicking on any cell.

TOOLS

6.44 A New Tool for automatic name generation 511 and camera serial numeration on layouts. Various numeration templates and rules.

6.45 A New Tool for counting length sum 517 of line segments of specified line type. Thus any line type can be used as a cable.

6.46 A New tools for switching draw order of constructions and cameras:Cameras over constructions 242, Bring to front 267, Send to back 267. These tools simplify work with complex 3D models of buildings, grass, etc., where another 3D models can be placed above (or inside) them.

6.47 Show all 246 tool considers not only cameras, but the background and constructions as well.

6.48 Change line type 268 tool can change icon line type of selected cameras.

6.49 In order to model windows and transparent objects, inclined rectangle 196 in the 3D window can be transparent by 70%.

6.50 Edit 282 button will appear on the Current construction parameters panel when drawing construction is complete. Click this button to edit last drawn construction.

INTERFACE

6.51 Assigning and editing keyboard Shortcuts 479 for items in Graphics window main menu.

6.52 Rotating cameras 162 in both planes by moving view area bound on the layout using the mouse.

6.53 Adjusting lens focal length 166 by moving view area bound on the layout using the mouse.

6.54 Loading and saving directories are stored. When recalling same operation stored directory is opened.

6.55 Horizontal and vertical **scroll bars** and scaling by + - keys to simplify work on portable computers.

6.56 Tabs 274 in the Graphics window for fast switching, creating and deleting layouts. Layouts button has been removed from the Tool bar.

6.57 A combo box 172 on the Tool bar for fast loading of any camera. Using pop-up menu of the combo box it is possible to search the camera on the layout.

6.58 A combo box 185 on the Tool bar for fast assigning a model to the loaded camera.

6.59 Enhanced selecting and loading cameras on the layout using the mouse. Cursor snaps to a camera icon with higher priority, and it's highlighted with red rectangle.

6.60 Priority of mouse selection 189 of close objects is presetted: 1. Cameras; 2. Constructions; 3. Text; 4. 3D models.

6.61 A New algorithm of selecting constructions 189, located over each other. In order to select another construction it is necessary to click the same point again.

6.62 Snap sensitivity 490 can be adjusted for convenient work with different screen resolutions and mouse accuracy. The snap to a camera has a priority.

6.63 Following info is displayed at the bottom of the Graphic window on the Status bar 275 when moving cursor close to a camera icon: name, model name and basic parameters of the camera.

6.64 Field of view size 207 on the Status bar in loaded camera edit mode now is displayed when moving the cursor over view area in vertical projection, not only when clicking.

6.65 Move 192 mode is set after creating new camera 171. It's convenient to place new camera on the layout instantly.

6.66 **ESC** key stops current operation. If an operation is not performed, Select/edit 189 mode is switched on.

6.67 Current line type 475 is stored before placing 3D models, cameras and illuminators, and is restored after placing.

6.68 In case of editing height 282 values on the Current construction parameter panel during drawing, new height value will be kept when drawing is complete. Other parameters of construction located on the Current construction parameters panel are kept as well.

6.69 Loaded camera icon's color is changed to red.

6.70 View>All camera cables 242 and View>Loaded camera cables 242 menu item states are not

stored individually for each camera; they are stored in common project settings.

INHERITED ELEMENTS

6.71 Fast scaling mode by rotating pressed mouse-wheel is disabled due to inconvenience of work with certain mouse types.

6.72 Title button has been removed from the Tool bar. It is possible to show/hide titles 241 using the main menu item.

6.73 Saving Resolution and Edit Image menu items have been removed from the Main menu. Resolution can be changed in the Options box on Export 485 tab.

6.74 Measurement format by default box has been removed from the Options box 474. When creating new project, measurement format concurs with measurement format in the current project.

6.75 Layout combo box has been removed from the New camera 171 box. The layout of creating camera always concurs with the current layout.

6.76 Camera>Save as item has been removed from the Main menu.

OTHER

6.77 VideoCAD Help system is now in **Html Help** format for compatibility with **Windows Vista**.

6.78 Help system has been redesigned taking into account user's suggestions and new program features. Examples 527 have been renovated.

6.79 Many functions are improved, detected errors are corrected.

6.80 VideoCAD 6.0 can read projects, created in VideoCAD 4.xx and VideoCAD 5.XX.

6.81 VideoCAD 6.0 has been tested on **Windows Vista**. All incompatibilities found have been eliminated.

6.82 The regulations of upgrading 665 previous VideoCAD versions to VideoCAD 6:

- The cost of upgrading amounts the difference between the costs of previous VideoCAD versions (VideoCAD 3.02, VideoCAD 4.0 or VideoCAD 5.0) and VideoCAD 6.0.
- Considerable discounts are offered to the users, whose valuable suggestions have found application in VideoCAD 6.0.
- At upgrading it is necessary to exchange USB dongle.

5. What is new in VideoCAD 5.0

5.1 Monitor window 407 has been added. Monitor window logically finishes the information transfer process in video surveillance system "from a real object to an operator" and thus, allows to model the video surveillance system as a hole.

5.2 The new tool in 3D window - PTZH frame 365 allows operating a camera in 3D window similarly to PTZ one and additionally to change camera's installation height. Together with the **Monitor window** this tool offers a new method 546 of 3D CCTV design.

5.3 There is a new opportunity to carry out Depth-of-field 363 3D modeling.

5.4 There is a new opportunity to carry out 3D modeling visibility 361 limited by rain, snow, fog according to the **Meteorological Visibility**.

5.5 Current construction parameters panel 282 allows creating and editing constructions by input of parameters.

5.6 The **Load camera box** is essentially modified and renamed to the Camera list box 172. The following options are added: 3D image show, search, sorting.

5.7 Snap panel 258 allows fast switching of snaps during drawing.

5.8 An option to set heights in 3D window 193 separately for each construction, irrespective to a line type.

5.9 The new tool - Inclined rectangle 196 allows modeling 3D inclined objects.

5.10 The new tool - Filling 202 allows creating fillings and hatchings.

5.11 Print preview box 226 is updated. There is a new option to save exact position of the drawing and adjustment for reprinting. The print area displacement caused by **Line type panel** and **Font type panel** is eliminated.

5.12 The new 3D models 259: a **boy** and a **truck**.

5.13 The new tools: Combine to block 268 and Destroy block 268.

5.14 VideoCAD **5.0** can use files of the following CAD formats as a background 222:

***.dxf** AutoDesk DXF Release 12, 13, 14 , 2000, 2002, 2004, 2005, 2006.
***.dwg** AutoDesk DWG Release 12, 13, 14 , 2000, 2002, 2004, 2005, 2006.

5.15 DWG and DXF reference images, SHX fonts, DXF Autocad Table, Hatch gradients, Unicode fonts (important especially for languages based on hieroglyphs - Chinese, Korean, Japanese etc.) are supported in CAD background 222.

5.16 Visibility of Camera view area 183 in **3D window** can be switched independently of View area visibility 172 in **Graphics window**.

5.17 Displaying cameras' names 241 and titles can be switched separately..

5.18 Option to switch on/off the display of view area 172 and view area projections for all selected cameras simultaneously.

5.19 Selected camera changes the color together with it's view area.

5.20 Construction of person detection area 495 is carried out more precisely, considering additional inflection of bound.

5.21 Option to move constructions and cameras in Select/Edit 189 mode, without switching to **Move mode.**

5.22 While working only with cameras we have a new option to lock constructions 259.

5.23 The tool **Find loaded camera** is updated and renamed to Show loaded camera 210.

5.24 Number of redrawings in **3D window** is reduced for increasing program's speed. For forced redrawing, click the image in **3D window**.

5.25 Exact position of the drawing is stored at finishing the work with the program and restored at restart.

5.26 Reloading speed of cameras is increased.

5.27 The range of drawing scaling is expanded.

5.28 The range of focal lengths of lens is expanded.

5.29 Many functions are improved, detected errors are corrected.

5.30 VideoCAD 5.0 can read projects, created in VideoCAD 4.xx.

5.31 The regulations of updating previous VideoCAD versions to VideoCAD 5.0:

- The cost of updating amounts **the difference between the costs of previous VideoCAD versions (VideoCAD 3.02 or VideoCAD 4.0) and VideoCAD 5.0**.

For users, whose valuable suggestions have found application in VideoCAD 5.0, updating is **free of charge**.

4. What is new in VideoCAD 4.0

4.1 There is a possibility of full value 3D designing 357 of a video surveillance object with loading prepared 3D models 259 (a man, car and other) and getting images from cameras in the project.

4.2 It has become possible to model the 3D image quality from each camera through the image quality parameters 505, based on the real videosignal distortions.

4.3 Line type parameters 475 include minimum, maximum height and color in the 3D window. The number of line types has increased to 100.

4.4 There are new system fonts 477 and line types 475:

- title font in the 3D window;
- sharpness area line;
- focus plane line;
- hyperfocal distance line;
- 3D model line.

4.5 Test object 507 became 3D parallelepiped. Test object can be seen in the 3D window.

4.6 There is the depth-of-field 454 and hyperfocal distance calculation.

4.7 There is a support for all ***.dwg** file formats as a background 222: ***.dwg AutoDesk Release 12, 13, 14 , 2000, 2002, 2004**.

4.8 It has become possible to export 219 obtained drawing to the file of *.dxf format on several layers. It is convenient to process the obtained file in AutoCAD.

4.9 It has become possible to change the scale factor 480 of nonscalable elements when exporting.

4.10 There is a new function of saving drawing - Save as background 222.

4.11 It has become possible to print 226 and export together with the prepared **frames with Title-Blocks**.

4.12 The **scaling range and grid step is expanded**. Now maximum grid step is **500 m**, and maximum area displaying on the screen is **15x20 km** (more than 200 square kilometers).

4.13 It has become possible to change the scale factor 480 when clicking the button **Zoom in**, **Zoom out** and by **turning the mouse wheel**.

4.14 There are new means of navigation **Show all** 246, **Find text** 247 and **Zoom window** 162.

4.15 Image refreshing is realized without blinking 480 due to the using the graphics buffer.

4.16 The speed of image repainting with a big number of video cameras is increased.

4.17 The text 201 scaling accuracy has become higher. Now Title Blocks and other tables can be filled without a risk of strings getting out of the frames.

4.18 It has become possible to select one or more constructions located 189 one over another.

4.19 The **Main window** is renamed to **The camera parameters box** 289. When launching VideoCAD first Graphics window loads. For showing the camera parameters box the button **Show Camera parameters box** 186 is used.

4.20 Real view area 175 filling now is not solid, but as hatching. Due to this it doesn't shade other objects.

4.21 Graphics background files 222 themselves, not the references to their loading, are included in the project file.

4.22 All information on program settings (line types, fonts, etc.) is included in the project.

4.23 The current project is saved now in the VideoCAD database and at the next program launching the last project, on which you worked, will be available and exactly in the place, on which you broke the work.

4.24 There is a **context help** not only for the menu items, but also for the tools on the tool bars. To get the context help for the button click it by the right mouse button and then by the appeared Item **"What's this?"**.

The context help is still available for the menu items and other interface elements. To get the context help for the menu item or the interface element select it and press **F1**.

4.25 Now the recommended operating system is **Windows XP**. When working in other operating systems big graphics file displaying errors are possible.

4.26 From the tool bar 169 and the main menu 213 of the graphics window unnecessary buttons and items are deleted.

4.27 Default parameters of quality levels 505 are changed.

4.28 **Examples** are remade taking into account new possibilities of the program. The example of the person identification criteria determination according to the real image 542 is included.

4.29 Many functions are improved, detected errors are corrected.

4.30 Multilingual version of VideoCAD 4.0 has the possibility of registration with the dongle 665.

4.31 **VideoCAD MAP** is released. VideoCAD MAP is a graphical interface for security systems on the basis of VideoCAD technology. VideoCAD MAP includes all possibilities of VideoCAD and many other additional functions, is partly compatible with VideoCAD by the projects and integrated in the Russian Integrated security system **"Intellect"**.

4.32 The regulations of updating previous VideoCAD versions to VideoCAD 4.0:

- For buyers of **VideoCAD 1.0**, i.e. for **our first buyers**, the updating is **free-of-charge**.
- For the others the cost of updating amounts **the difference between the costs of VideoCAD 3.02 and VideoCAD 4.0**.
- For those, who have bought **more than one VideoCAD licenses at once**, the updating is **chargeable only for one license**. Other licenses can be freely updated.

3. What is new in VideoCAD 3.0

3.1 The opportunity of loading 222 the **prepared layouts** as a background in ***.bmp, *.jpg, *.emf, *.wmf, *.dwg, *.dxf** formats was introduced. To display ***.dwg and *.dxf** files the **CAD Import** module by **CAD Soft Tools** http://www.cadsofttools.com was used.

3.2 The obtained drawing can be saved 219 in ***.bmp, *.wmf, *.emf** formats or copied 222 to clipboard in ***.bmp, *.emf** formats.

3.3 The opportunity of **quality** printing 226, including the one on several pages to glue them was introduced.

3.4 The opportunity of using texts 255 was introduced.

3.5 The opportunity of using various fonts 477 and line types 475 was introduced.

3.6 New object is a Mask 255. The masks allow to cover any part of a drawing. It is possible to draw new constructions over masks.

3.7 New objects is a Circle 253, an Arc 200, a Double line 197.

3.8 New operations are Align 267, Move loaded camera name 219.

3.9 The opportunity to undo 211 the last four operations was introduced.

3.10 The opportunity of using a constant coordinate system 245, that is not dependent on the loaded camera, was introduced.

3.11 The speed of redrawing the drawing containing many constructions and cameras was increased.

3.12 The size of a project file was reduced.

3.13 The maximal quantity of objects on each plan was increased up to 5000 and the maximal quantity of cable segments of each camera was increased up to 500.

3.14 The opportunity of precise scaling using Ctrl 287 was introduced.

3.15 The opportunity of quick navigation using the mouse wheel was introduced.

3.16 The opportunity of operating with inches and feet was introduced.

3.17 The opportunity of changing 189 the size of a rectangle without distorting its shape was introduced.

3.18 The displaying view area edges 172, view area projection bounds 173 and view area actual projections 175 can be switched on/off separately.

3.19 The opportunity of copying and pasting 191 constructions, cables and texts between projects was introduced.

3.20 Many existing functions have been improved, discovered errors have been corrected.

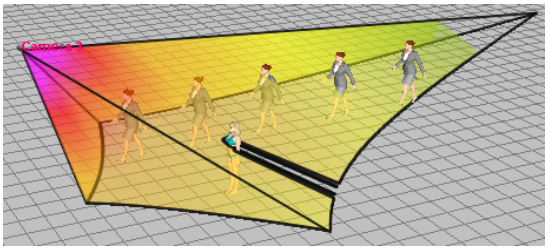
Part VII

Definitions

7 Definitions

Camera view area

A dimensional figure in shape of a near-pyramid with vertex abutting the **camera lens** and bisector, coinciding with the **main optical axis** of the **camera lens**.
Any object within the view area will be displayed on the screen, if it is not shaded by other objects on the scene.



*View area has the form of a regular pyramid only if lens distortion 654 is negligible. The **lens distortion** complicates the form of the **view area**.*

View area projections

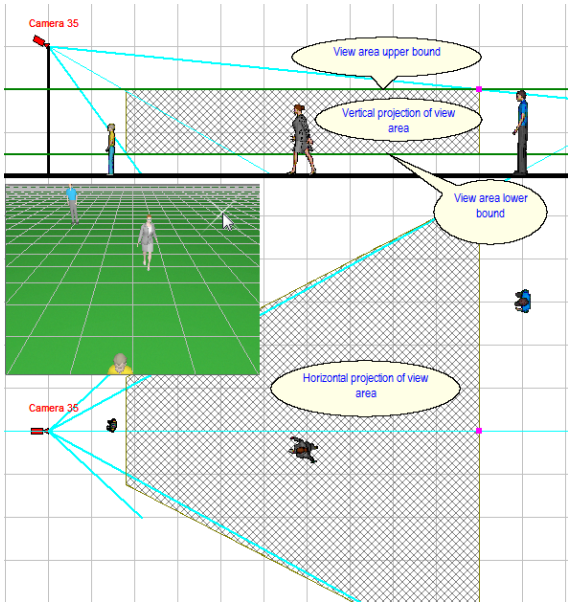
Horizontal projection of the view area can be displayed as a volume projection (**Projection**) or in the form of two sections of the view area on two levels (**2 levels**). Type of displaying for the active camera 166 is selected in the pop up menu of the View area projection bounds 173 button.

In the case of the volume projection (Projection):

It is displayed as projection to horizontal plane of a view area part, which is residing between the view area upper 298 and lower bounds 300 specified in parameters 291 in the Camera Geometry box 289.

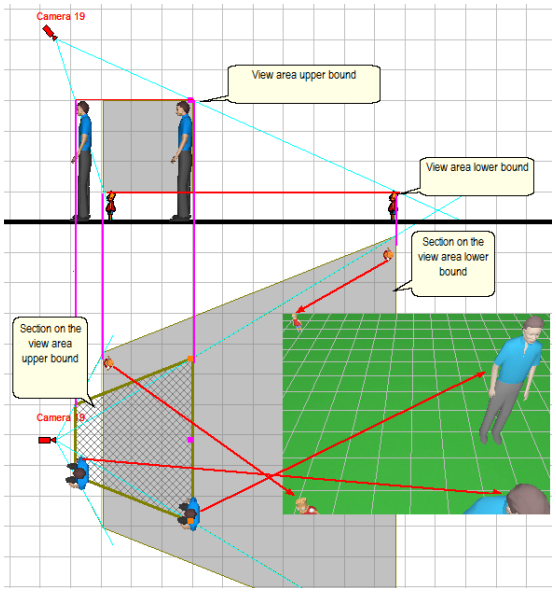
View area horizontal projection is calculated according to the rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.



In the case of 2 sections (2 levels):

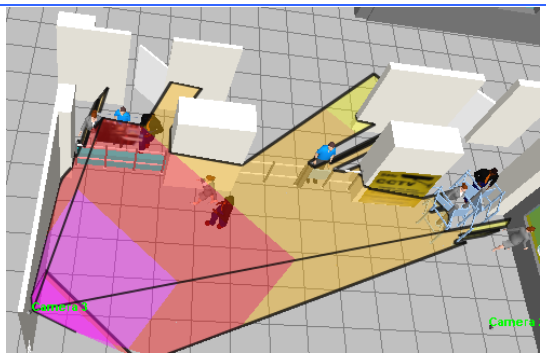
Instead of the volume horizontal projection, two sections on the view area upper bound height 298 and on the view area lower bound height 300 are displayed simultaneously.



Camera control area

A complex dimensional figure inside view area. Camera control area forms by subtracting shadows of environment objects (uncontrolled areas) from the camera view area.
Any object within the control area will be displayed on the screen.

In the Graphics window 161 VideoCAD calculates Horizontal projection 148 of the control area. In the 3D World 342 window, the Camera control area is represented in 3D by View area faces 346 and Active camera coverage 348.

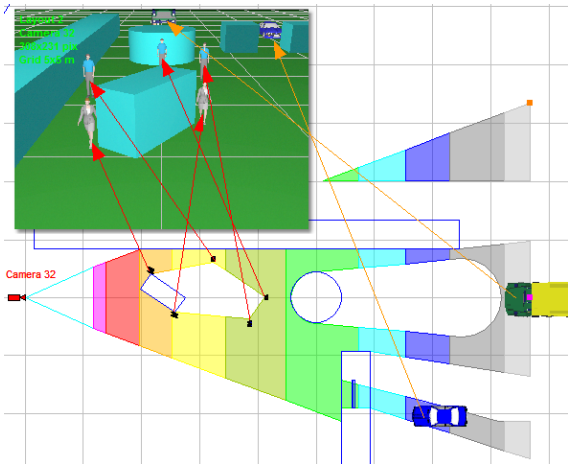


Control area horizontal projection

Horizontal projection of the control area can be displayed as a volume projection (**Within projection**) or in the form of two sections of the **view area** on two levels (**2 levels**). Type of displaying for the active camera 166 is selected in the pop up menu of the Shadow 178 button.

In the case of the volume projection (Within projection):

Projection to horizontal plane of a control area 148 part, which is residing between the view area upper 298 and lower bounds 300 specified in parameters 291 in the Camera Geometry box 289.



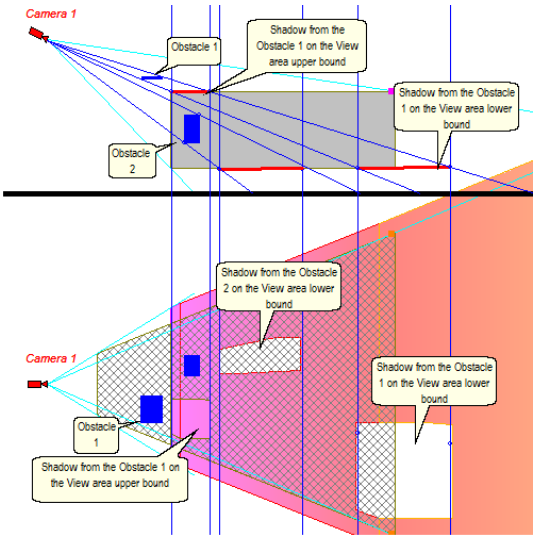
Control area horizontal projection is calculated according to the rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.

In the case of 2 sections (2 levels):

Projection of the control area is displayed by two sections 179 of the view area by the horizontal planes located at the lower 300 and upper 298 bounds of view area. Shadows from obstructions are deducted from these sections.

See also: *3D World> 3D View area* 346, *3D World> Active camera coverage* 348.



Projections of person detection area

Projections to horizontal and vertical planes of a view area part meeting person detection criteria 498 .

Projections of person identification area

Projections to horizontal and vertical planes of a view area part meeting person identification criteria 500.

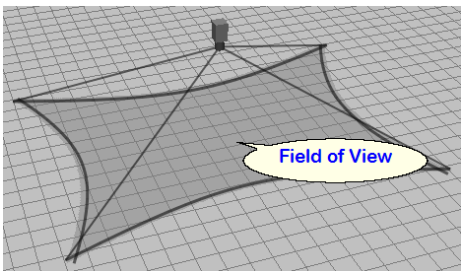
Projections of license plate reading area

Projections to horizontal and vertical planes of a view area part meeting license plate reading criteria 503.

Camera Field of View

A flat figure limited by view area bounds and residing in a plane, perpendicular to the **main optical axis** of camera lens.

*The **field of view** has rectangular form only if lens distortion 654 is negligible. The **lens distortion** complicates the form of the **field of view**.*



Camera resolution in LPH - lines per picture height

Lines per Picture Height (LPH) - is an **unit of measuring image resolution**. It equals the number of distinct lines in the image (the sum of the black + white lines) were placed at the size equal to the height of the frame.

Analog cameras have limited vertical resolution because of a fixed number of horizontal lines , therefore, the resolution is a number of vertical lines along the horizontal, not over the entire width of the frame but along a part of the width equals to the height of the frame.
In this case, the Lines per Picture Height equal to the television lines (TV - lines) .
If we assume number of lines across the whole width , the number of lines must be divided by the ratio of the horizontal to the vertical frame size (*Aspect Ratio* 295).

In VideoCAD camera resolution 333 is determined by the number of lines per picture height (LPH), wherein the contrast of the lines drops to a predetermined portion of contrast of the widest lines (10 %, 20 %, 30 %, 50 %).
In the 3D Video window you can watch the resolution LPH using the Test chart 368 that is set up so that visually displays the resolution in LPH regardless of aspect ratio.

Image sensor size and size of active area of the image sensor

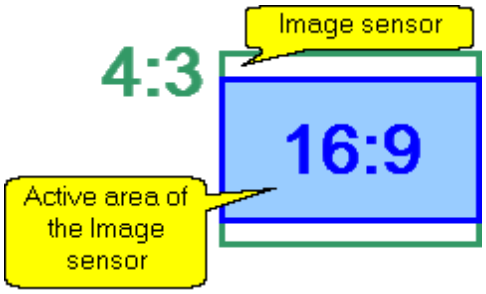
The Image sensor size in VideoCAD implies the size of the entire light sensitive area of the image sensor, which can form an image with the maximum number of pixels horizontally and vertically.

Active area of the image sensor in VideoCAD implies an area of image sensor on which in a given mode of the camera the image is formed. The sizes of the active area may be less than or equal to the **image sensor size**. Active area can differ in different modes of operation of the same camera.

Exactly the **active area size** and lens focal length 294 determines the **angles of view**, and through them influences on the results of camera modeling. Accuracy of specifying the active area size greatly affects the accuracy of modeling the camera.

Aspect ratio of the active area of image sensor is identical with the **aspect ratio of the output image of the camera,** but can differ from the **aspect ratio of the image sensor.**

On the figure on the right you can see the **image sensor size** and the **active area of the image sensor** in case of the image sensor has aspect ratio of 4:3, but the output image from the camera has aspect ratio of 16:9.



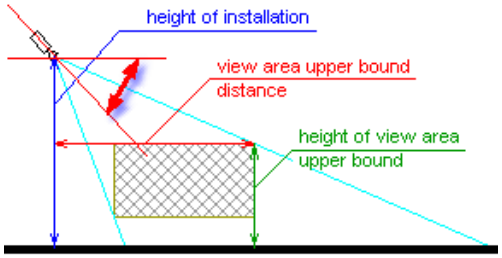
See also: Specifying active area size of the image sensor 636

Camera tilt angle

Camera tilt angle is a calculated parameter and can not be edited directly. The camera tilt angle is an angle between the **main optical axis** of camera lens and a horizontal.

Camera inclination is defined not by the tilt angle but by the three parameters:

- Height of installation 296;
- View area upper bound distance 301
- View area upper bound height 298



Zero ground

Zero height level, relative which the base height of layer 277, base height of cameras 298 and ground height 351 in the **3D World** window are determined.

Relative the **base height of layer**, heights of all constructions 193 on this layer, illuminators 284 and 3D models 283 are determined.
Relative the **base height of camera**, heights associated with the camera: installation height 296, view area lower bound 300 and upper bound 298 heights, the height of the criteria of detection 498, dentification 500 and license plate reading 503, measurement height of spatial resolution 320, height of the test object 507 are determined.

Background

It is a **prepared horizontal site plan** in any of the following formats:

***.bmp** - a bitmap (e.g., the layout scanned from a paper copy);
***.dxf** - AutoCAD format (created in AutoCAD or other program supporting export to *.dxf);
***.dwg** - AutoCAD format (created in AutoCAD or other program supporting export to *.dwg);
***.pdf** - cross-platform electronic document format from Adobe Systems;
***.jpg, *.png, *.gif, *.tif** - the compressed image (e.g., a digital picture of the plan, scanned image);
***.wmf, *.emf, *.emf+** - Windows Metafile (export to *.wmf is supported by the majority of the Windows graphics applications).

Over the background, cameras, constructions and 3D models can be drawn.

AutoCAD DXF and DWG formats allows additional possibilities:

- lines and polylines from the buckground can be imported to VideoCAD constructions using Import DXF / DWG background 224 tool;
- VideoCAD cameras and constructions can be added 486 to the AutoCAD background to special layers;
- you can control 223 visibility of layers of such background, hide texts.

Compatiability with AutoCAD versions

VideoCAD 8.0 can use files of the following CAD formats as a background:

***.dxf** AutoDesk DXF Release 12, 13, 14 , 2000, 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015.
***.dwg** AutoDesk DWG Release 12, 13, 14 , 2000, 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015.

Software registration by personal registration code (applied for all versions except VideoCAD Professional)

After installing the program you must enter personal pair of the name and the registration code, which is valid on any computer. USB dongle is not required.

If the license provides limited number of workplaces, attempt to run the program on more computers may produce error.

Software registration on USB Dongle basis (applied for VideoCAD Professional)

The program is operable on any computers to which port the dongle is connected. So you can carry the program from computer to computer, modernize computer, etc.

In the past USB dongle was used for VideoCAD6, VideoCAD 7 Lite, VideoCAD 7 Professional. Now it is used for VideoCAD 8 Professional only.

When you purchase a new license of **VideoCAD 8 Professional Kit**, one license of VideoCAD 8 Lite 31 can be supplemented free of charge. This minimizes the inconvenience of having to use the USB dongle with VideoCAD Professional.

The dongle should be connected to the USB port of you computer.

You can get more information on USB dongles in the USB dongle 669 topic.

Software protection on HID identifiers basis (not used for new licenses)

In the past HID protection was used for VideoCAD1..VideoCAD6, VideoCAD 7 Lite. Now it is not used for new licenses.

The registration is realized with the tie to your computer parameters. After computer change, hard disk formatting or other serious upgrade you will need a **reserve registration**.

Although the number of reserve registrations is limited to two, the registration counter cleaning is regularly realized. So you won't lose the purchased program in any case. If you spend all reserve registrations before the registration counter cleaning, you will have to wait for the next registration counter cleaning to continue using the program.

You may exchange the variant on the HID protection to the variant with the dongle protection, paying in addition for the cost of the dongle and delivery.

Part VIII

Getting started

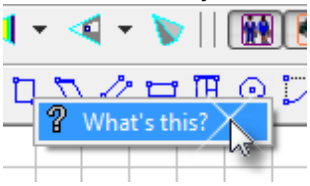
8 Getting started

These illustrated teaching articles with step by step instructions will help you to get started with VideoCAD quickly:

The principles of CCTV design in VideoCAD. Part I. Camera view area (*.pdf)
The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution.""(*.pdf)
The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(*.pdf)
The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(*.pdf)
The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects."(*.pdf)
The principles of CCTV design in VideoCAD. Part 6. Lens distortion in CCTV design."(*.pdf)

See also: Examples of work with VideoCAD 527, *CCTVCAD Software on Youtube*

VideoCAD employs a **context-sensitive help system**. This means that the program tries to direct you to the portion of the help system that is most likely to answer your question, based on what you are viewing or doing.
To get detailed information about any component, box or menu item, move the input focus (mouse cursor) to the component and press **F1.**
To get detailed information about any button on the Tool bar, right click on it then choose **What's this?** pop-up item.



Part IX

Interface

9 Interface

The VideoCAD 8 Professional interface consists of the Graphics window 161 and the additional windows and boxes:

You can open any window or box from the Graphics window.

VideoCAD employs a **context-sensitive help system**. This means that the program tries to direct you to the portion of the help system that is most likely to answer your question, based on what you are viewing or doing.
To get detailed information about any component or menu item, move the input focus (mouse cursor) to the component and press **F1.**
To get detailed information about any button on the Tool bar, right click on it then choose **What's this?** pop-up item.

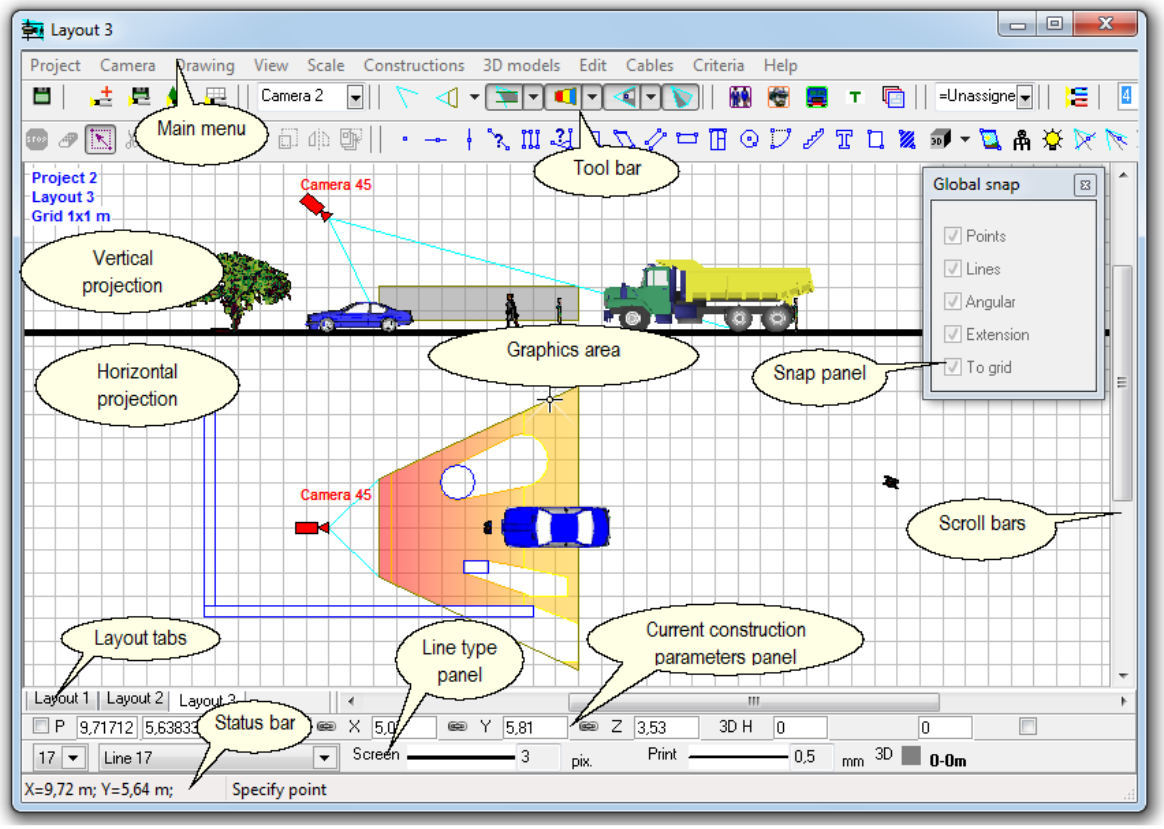
Mouse:

Any **Wheel Mouse** is particularly convenient when changing parameters and moving along layouts in the **graphics window**.

In all the windows except for the Graphics window the use of mouse is almost the same as when using it with other Windows programs. The use of mouse in the **graphics window** is reviewed in the

correspondent HELP section 162.

9.1 Graphics window



It is the main window of the program.
The window is designed for the visual cameras' view area and control area representation and analysis, visual choice of lens parameters and camera locations, calculation of cable parameters and a **2D drawing** preparation to be pasted into graphical path of the project.
During 3D modeling 357, all work of placing and editing 3D models is carried out in the Graphics window too.

The graphics window contains:

- Graphics area 162
- Main menu 213
- Tool bar 169
- Status bar 275
- Line type panel 280
- Font type panel 281
- Current construction parameters panel 282
- Layout tabs 274
- Layers 276
- Horizontal and vertical scroll bars
- Snap panel 258
- Keyboard shortcuts 287

9.1.1 Graphics area

See Graphics area location 161.

The **graphics area** contains two projections of the current layout 513.

A thick black line designating the **ground** in vertical (upper) projection parts these two projections.

You can **hide** any projection using the tools Hide horizontal projection 188 and Hide vertical projection 187 or using the corresponding items of the Main menu 213.

Main work is carried out as a rule in the horizontal projection. Vertical projection is used only in some cases. In the Vertical projection cameras and constructions are shown relative to the ground without taking into account base heights of layers 277 and base heights of cameras 298.

Navigation

Wheel Mouse is particularly convenient when working in the **graphics window**. Using the **Wheel mouse** you can change drawing scale with the simultaneous zooming in the drawing sections pointed by the cursor.

If **Ctrl is not pressed** at **changing the scale**, then the scale changes roughly which is convenient at navigation.
If **Ctrl is pressed**, the scale changes with the less step which is convenient for the precise drawing positioning before printing 226 or saving 219.

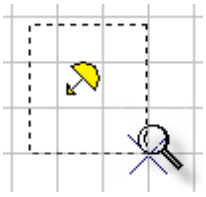
The Step and direction of scaling can be changed in wide range via Scale factor 490 in the Options box.

You can **move the drawing** by pressing and holding down the **mouse wheel** (or the middle button). If **Ctrl** is not pressed, the entire drawing is dragged, if **Ctrl** is pressed, the horizontal projection is dragged only.

You can move drawing using horizontal and vertical scroll bars.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

To increase any screen area press in the corner of the area and hold the right mouse button then move the mouse with the right button pressed. At the same time you will see zoom window. After releasing the button, the area inside the zoom window will be shown on the full screen.



There is an opportunity of quick navigation with the help of text markers 247.

Since all the constructions in VideoCAD are made by **two clicks**, but not by pressing and release the mouse button (as in most CAD programs), so it is very convenient to combine constructions with quick navigation.

To show all cameras and constructions, use item of the **Main menu** or **Pop-up menu**: Scale> Show all 246.

Coordinate systems

The **graphics area** allows to use **2 coordinate systems** 245:

- **Fixed coordinate system**
- **Float coordinate system attached to the Active camera** 166

In case of **Fixed coordinate system**, the **origin of coordinates** does not vary when changing the active camera. The origin of coordinates is displayed by **two icons** in horizontal and vertical projections. You can change a point of origin after choosing the menu item **View > Set origin** 245.

In case of the **coordinate system attached to the active camera**, the origin always coincides with the active camera location. It is convenient when studying its view area.
A grid 188 is fixed to the **origin of coordinates**, and the counting of the **cursor current coordinates** in the status bar 275 starts from the origin.

Types of objects

The **graphics area** may contain the following **objects**:

- **Cameras**
- Constructions 193
- 3D objects 259
- Illuminators 206
- Backgrounds 222
- Cables 269
- Texts 201
- Titles 241

Possible states of objects

All the **objects** except for the **backgrounds** and **titles** can take one of the following states:

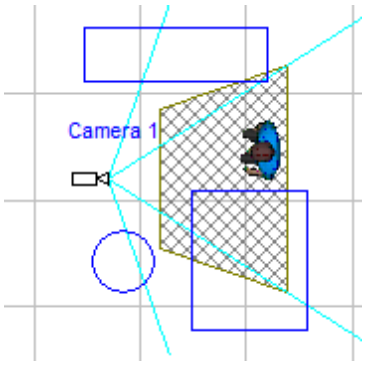
- Normal 163;
- Selected 164;
- Editing 164 (active state of camera);
- Hidden 167;
- Graphical editing state 167 of active camera.

You can change object's state with the help of the Select/Edit 189 tool.
To hide objects use the Hide 267 Main menu item.

To switch the active camera to the **graphical editing state** use the Edit active camera 210 button .

Normal state

An object is displayed in its usual color. Editing and moving is not possible.



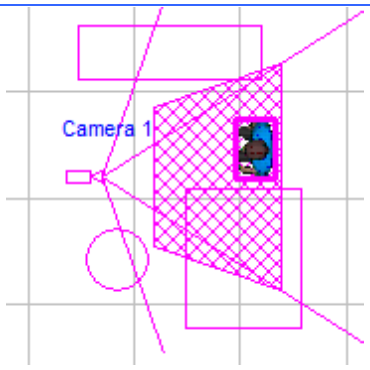
Selected state

An object is displayed in **pink color**. It is possible to **delete**, **drag**, **move, rotate**, **change draw order, scale, mirror** and **copy** the **object**.

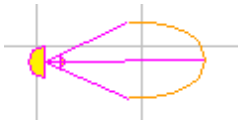
Several objects can be selected at a time.

You can select objects by clicking or by capturing by the **selection window** in the Select/Edit 189 mode.

See Select/Edit 189 for details.

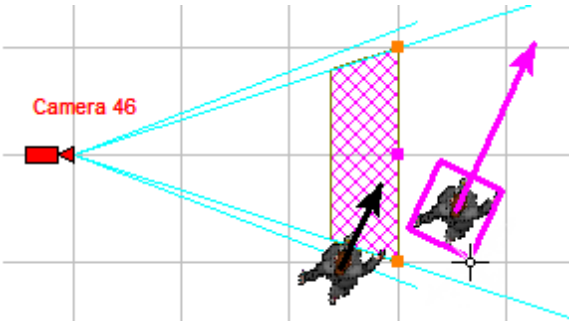


Selected Illuminator displays its **Light intensity distribution curve**.



If a 3D model 203 has non zero speed, then the **velocity vector** is displayed.

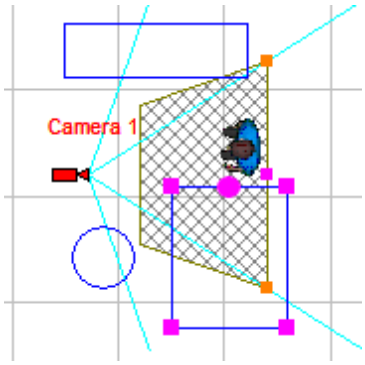
If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model passes per second (crimson arrow)**.
If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the Active camera 166 (black arrow).**



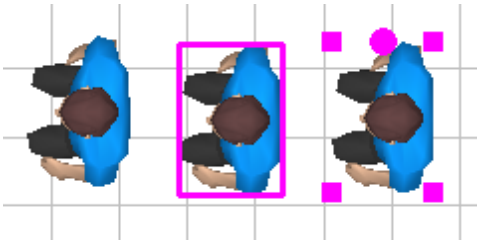
The length of the velocity vector of a 3D model in the normal state is inversely proportional to the frame rate 375 of the active camera. Thus we can see how many times the moving 3D model gets into the frame of the active camera.

Editing state (active state of cameras)

Object's **base points** are marked with **pink grips**, **camera name and icon** are marked with **red color**, **texts** are displayed in **pop-up frame**.



In the editing state, 3D models 202 are displayed with square grips and pink circle.



The editing state can be taken only by one of the objects and one camera at a time.
One of the cameras is always Active.

Switching an object to the editing state is performed by **double clicking** the object in the Select/Edit 189 mode.

To switch circle 253 into the **editing state** you need to double-click on **its center** or on the **point on its radius** that appears during the process of construction.
To switch arc 254 into the editing state you need to double-click on **its center** or on **either of its two ends**.
To switch illuminator 206 to editing state double-click on its center.

How to edit objects

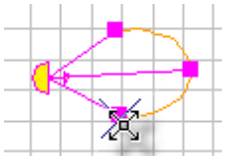
You can change the shape and geometrical sizes of the objects and **edit the texts**. The line types 280 of the objects and the fonts 281 of the **texts** can be changed, too.
To edit an object click beside a **base point** with a grip and move the cursor. After clicking for the second time, the changed object will be saved.
When on one side of a construction a circle appears, the construction can be rotated around its axis by gripping the circle by the mouse.

When editing a rectangle 196 or a mask 202, then several points will move at a time, the **rectangle** or the **mask** remaining square.
If **Ctrl** is pressed when editing a **rectangle** or a **mask**, then **one point** will move only.

When editing the Double line 197 or Wall 198, the **whole Double line or Wall** will be moved.
If **Ctrl is** pressed when editing the **double line or wall**, **only one line** will be moved.

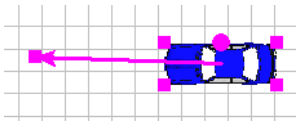
When clicking the text 201 twice the **pop-up frame** appears allowing to edit **text** in it. When clicking the right mouse button the **pop-up menu** of text editing appears in the frame.

To edit parameters of illuminators 206 move pink grips keep **Ctrl** pressed.



You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.. Sizes of 3D models can be edited with the help of the Current construction parameter 282 panel or by changing line type 280.

You can edit the velocity vector 203 of **3D model** in editing state by moving its terminus.

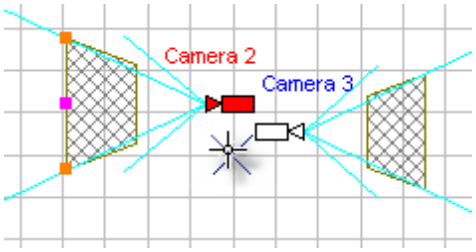


It is possible to change object's parameters in editing state on the current construction parameters panel 282 which automatically appears in the bottom of graphics window.
You can edit the object by changing parameters on the panel.

Active camera

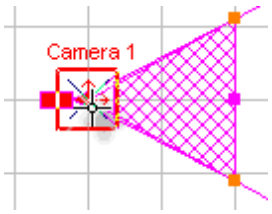
Pay attention that the icon of one of cameras is **highlighted in red**, and icons of other cameras are colorless. One of cameras is always **active**.

The **active camera** parameters are displayed in the Camera Geometry box 289, Sensitivity and Resolution 329, Depth of field box 457, Spatial resolution 316.
The **active camera** itself is displayed on the foreground in the **Graphics window**.



In the 3D Video 357 there is an image from the active camera.

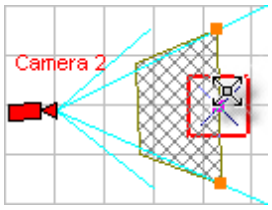
To switch camera to **active state** double-click on the center of its lens.
You can fast activate any camera in the project using the Active camera 172 combo box on the **Tool bar**. To activate a camera, just choose its name in the list.
To find the active camera on the layout, right click on the combo box then choose **Find camera** item.



The active camera **parameters** can be changed both using the **boxes** and graphically with the tools of the Active camera group 209. With the help of the View 172 button group you can change the appearance of **view area projections** of the **active camera.**

For tilting and panning the active camera on the layout in Select /edit 189 mode:

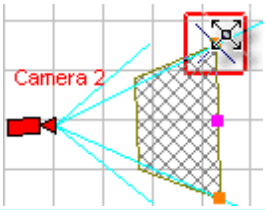
- Move the cursor to the pink grip in the middle of the view area bound. Thereupon, the point will be outlined by red square;
- Click on it by mouse;
- Move the cursor;
- To stop tilting or panning click once again on a point where the middle of the view area bound is to be located.



To change lens focal length 294 of the active camera on the layout in Select /edit 189

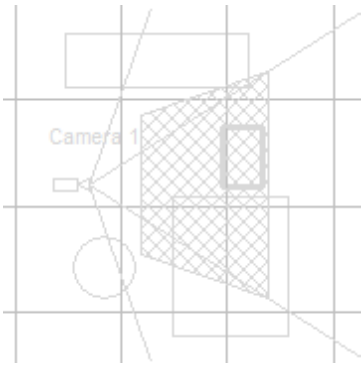
mode:

- Move the cursor to any orange grip on the ends of view area bound. Thereupon, the point will be outlined by red square;
- Click on it by mouse;
- Move the cursor;
- To stop changing focal length click once again on a point where the end of view area bound is to be located.



Hidden state

An object is displayed on the background in **light grey** color. **3D objects** are displayed as grey frames. The rest characteristics are similar to those of **normal state**.



The **hidden state** is used to conceal the temporarily interfering objects.

Constructions in the **hidden state** is not exported to AutoCAD formats 219.

The snap Extension 258 is disabled for **hidden objects**.

Several objects can be hidden at a time.

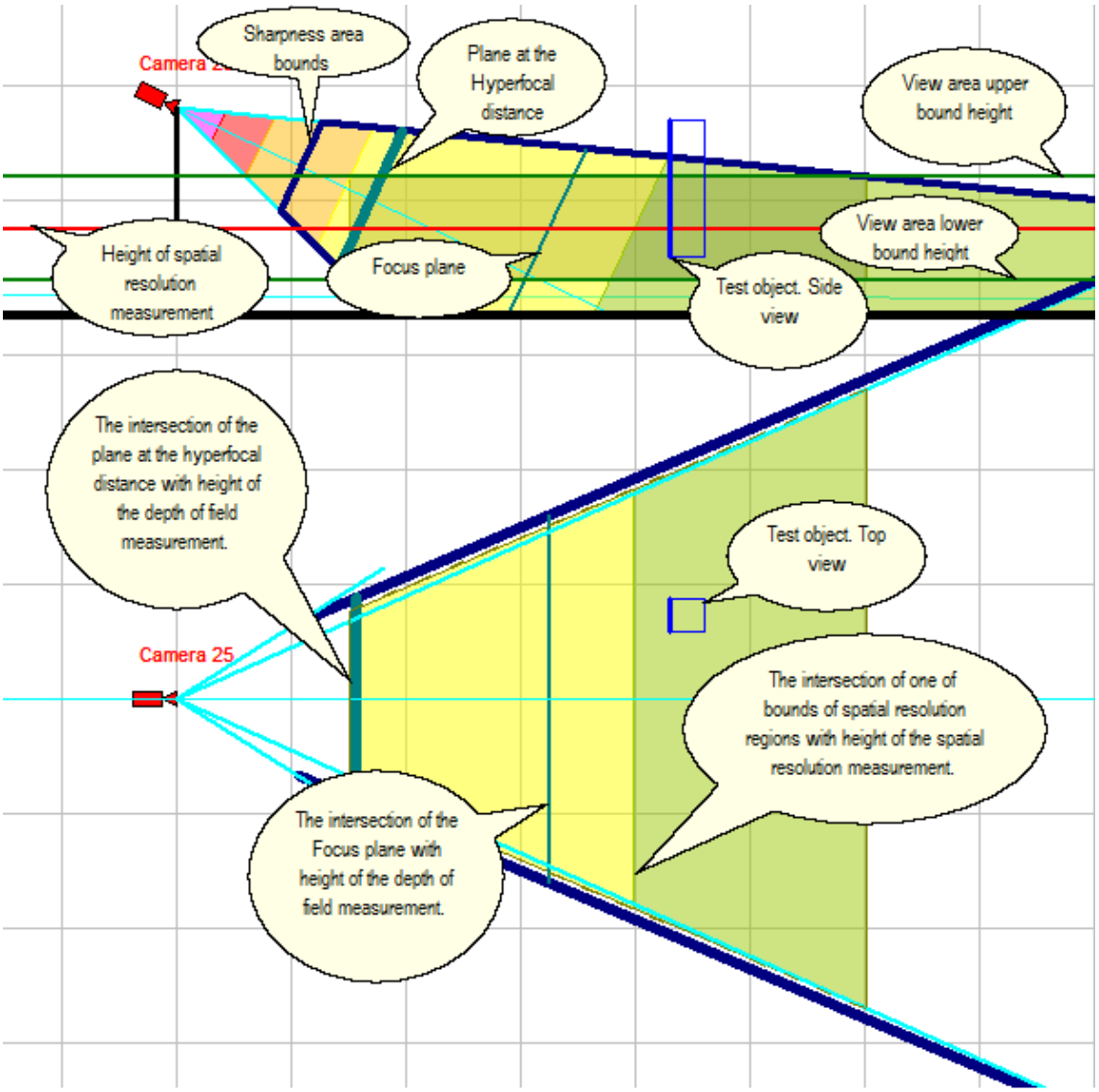
To hide an object use Select/Edit 189 and Hide 267 tools.

See also: Layers - Hidden 277;

Graphical editing state of active camera

The Active camera 166 can take the **Graphical editing state** . In this case the **objects** in the **horizontal projection** rotate so that the direction of the camera lens **main optical axis** becomes parallel to a screen plane, and the bounds of **active camera** view area are marked with lines of double thickness.

The lower 300 and upper 298 bounds of view area displayed by horizontal **green lines**.
If the active camera has spatial resolution 177 displayed, the horizontal **red line** indicates height 320 of spatial resolution measurement.



The **graphical editing state** enables a detailed analysis of **view area** using the test object 507, in the **vertical projection** it becomes possible graphical calculation of depth of field, 454 spatial resolution analysis and field-of-view sizing 207 at any point of **view area**. In the graphical editing state the **Test object** is visible in the 3D Video 357.

In the graphical editing state 167 of the active camera, selection and rotation of the active camera is blocked to prevent displacement of the background, constructions and cameras relative to each other on other layouts.

To switch active camera to the **graphical editing** use the Edit active camera 210 button .

9.1.2 Tool bar

See Tool bar location 161

Visibility of buttons on the Tool bar can be adjusted on the Toolbar 489 *tab of the* ***Options box****.*

- **'Project' button group** 171

Save project 171

- **"Camera" button group** 171

New 171
Save to project 172
Camera list 172
Table of cameras 172
Combo box Active camera 172

- **"View" button group** 172

View area edges 172
View area projection bounds 173
Fill projections 175
Spatial resolution 177
Shadow 178
3D view area 183
Person detection area 183
Person identification area 184
License plate reading area 184
Test object 184
Layers 185
Combo box Model of active camera 185
Table of camera models 185
Combo box Lens focal length 185
Camera Geometry 186
Sensitivity and Resolution 186
Spatial resolution 186
Depth of field 186
3D Video 187
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9.1.2.1 Tools

See Tool bar location 161

Visibility of buttons on the Tool bar can be adjusted on the Toolbar 489 *tab of the* ***Options box****.*

'Project' button group

Save project

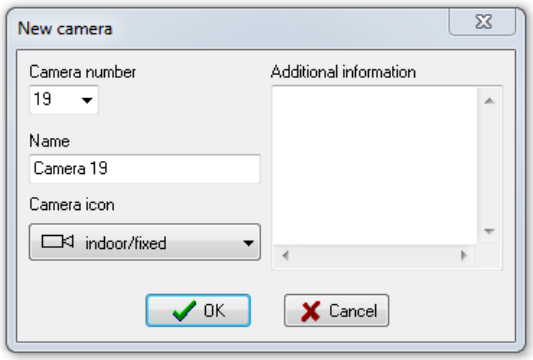
Save working project to a file.

"Camera" button group

New

Create **new camera** with default parameters.

In the dialog box appeared you can change **camera number**, **name**, type of the camera which determines the kind of icon by which it will be displayed. If necessary, you can enter **additional information** on the created camera (for example: purpose, a place and features of installation).



Later it is possible to change name, number, type of the camera and the additional information in the Camera list 509 *box.*
Cameras can be numerated sequentially with the help of the Numerate cameras 218 *tool.*
Cameras are displayed by different icons only if the Display camera type 483 *box in the Options box* 474 *is marked.*

On the Line type panel 280 it is possible to choose line type 475 by which the icon of the camera and View area projection bounds 173 will be drawn. When displaying spatial resolution 177 is disabled, projection will be filled 175 (hatched) by the color of assigned line type. Later it is possible to change line type using Change line type 268 tool.
Hatch style 175 is determined by style of a line type 475, assigned to the camera (solid, dash, dot, dash dot etc.).

After entering all necessary data click **OK**, to cancel the operation click **Cancel**.

If there is already a camera with chosen number in the current project, VideoCAD will ask to specify, whether you would like to rewrite it.
After camera creation specify by clicking a place for the new camera on the layout.
Just after camera creation the moving mode will be switched on. When placing will be completed, click Select/Edit 189 button or press **ESC**.

It is convenient to create new cameras with already set parameters by copying 191 and pasting 191 existing ones.

At the moment of placing new camera 171 or pasting 191 copied camera, its base height 298 is set to the base height of the active layer 277.

Save to project

All the **specified** and **calculated parameters** of the Active camera 166 and layout are saved to the current project.

Saving is performed automatically at many operations.

Camera list

Clicking this button opens **Camera list box**, in which camera list of current project is displayed. Active camera 166 is highlighted by **red frame**. Any camera can be activated, removed, renamed, found on layouts, it is possible to show 3D image from any camera. It is also possible to sort cameras in the list. For carrying out any manipulations with the camera first select its name in the list by single clicking.

See more: Camera list 509

Table of cameras

Show interactive Table of parameters of all cameras in the project. The table can be exported to *.txt, *.csv, *.htm, *.rtf, *.xls formats.

See more: Table of cameras 443

Active camera combo box

Using the combo box, you can fast activate any camera in the project. To activate a camera, just choose its name in the list.
To find the active camera on the layout, right click on the combo box then choose **Find camera** item.

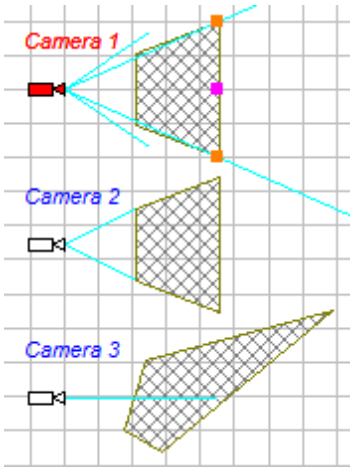
"View" button group

View area edges

Show the Active camera view area edges, calculated according to parameters 291 in the **Camera Geometry box**.

Line type can be changed in the options box 475.

When View area projection bounds 173 is disabled, but Shadows 178 is enabled, the View area edges 173 is shown simplified in the form of two rays if the angle of camera rotation around its axis 297 is multiple of 90 degrees (Camera 2) or in the form of one ray if the angle of camera rotation around its axis 297 is not multiple of 90 degrees (Camera 3).

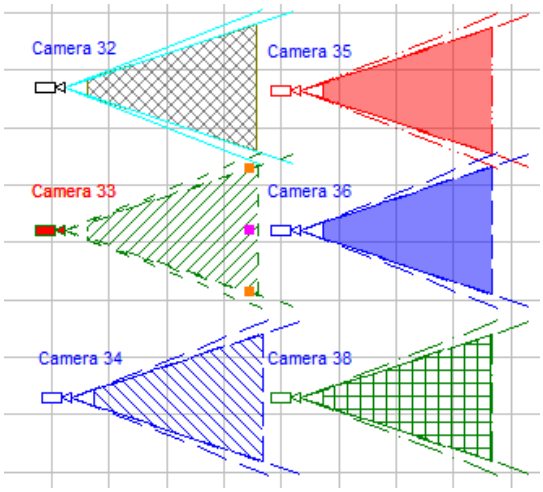


If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera the line type of View area edges is taken from the Options box>Lines>System line types>Bounds 475. This line type is assigned to new cameras by default (Camera 32 on the figure).

Default line type for cameras is Line 21.

If another line type was assigned to the camera, the View area edges of this camera is drawn by this line type assigned to the camera, as well as the View area projection bounds 175 and camera icon. (Camera 33...38).

Thus you can draw different cameras and their view areas by different colors, thickness and line style.



*A button state at the moment of camera saving determines whether the **view area edges** of the given camera will be displayed when this camera is inactive.*

If selected cameras exist on the current layout, except the active camera, this button changes view and operates the visibility of **View area edges** of all selected cameras simultaneously.

View area projection bounds

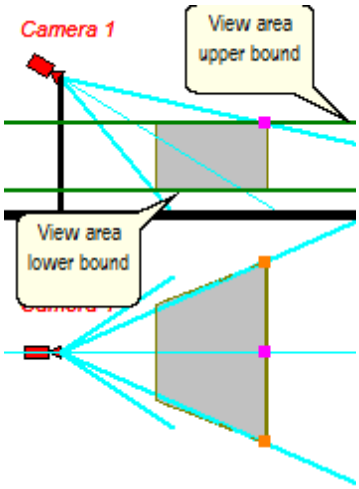
Show the bounds of the Active camera view area projections or sections of the view area on two levels calculated according to parameters 291 in the Camera Geometry box.

Submenu of the button:

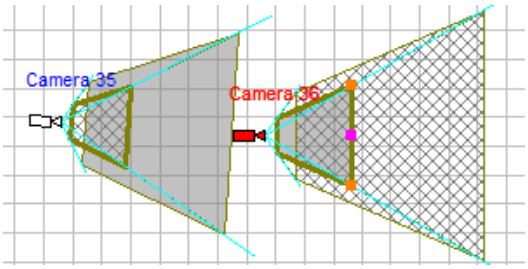
1. Projection - show View area projection bounds of the active camera.

Projection is calculated according to a simple rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.



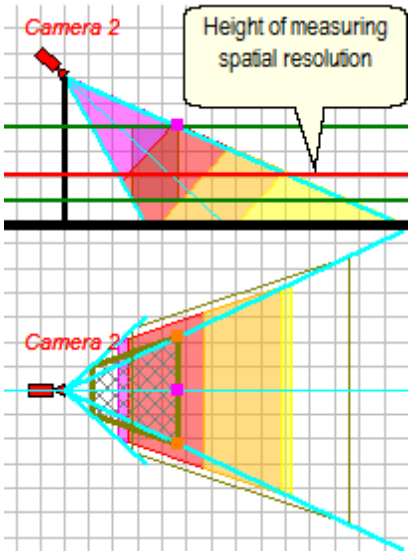
2. 2 levels - simultaneously show 2 sections of the view area by 2 horizontal planes, located on the height of the lower 300 and upper 298 bounds of the view area.



The upper section is shown by thick lines.

- If in the submenu of the Fill projections 175 button **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu of the Fill projections button **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).

When visualizing spatial resolution 177 with two levels, the lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



If the height 320 of measuring spatial resolution is set to **AUTO**, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in VideoCAD7 and earlier versions) .

*Difference between the **View area projection bounds** and Shadows 178 buttons is that the **View area projection bounds** are built without obstacles on the scene but the **Shadows** are built considering obstacles. Both buttons can be used simultaneously in various combinations.*

3. Off. - don't show.

When **View area projection bounds** is disabled, but Shadows 178 is enabled, the View area edges 173 is shown simplified in the form of two rays if the angle of camera rotation around its axis 297 is multiple of 90 degrees or in the form of one ray if the angle of camera rotation around its axis 297 is not multiple of 90 degrees.

*If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera the line type of **View area projection bounds** is taken from the Options box>Lines>System line types>Bounds 475. This line type is assigned to new cameras by default.*

*If another line type was assigned to the camera, the **View area projection bounds** of this camera is drawn by this line type assigned to the camera, as well as the View area edges 173 and camera icon.*

A button state at the moment of camera saving determines whether the bounds of the given camera view area projections will be displayed when this camera is inactive.

If selected cameras exist on the current layout, except the active camera, this button changes view and operates the visibility of **View area projection bounds** of all selected cameras simultaneously.

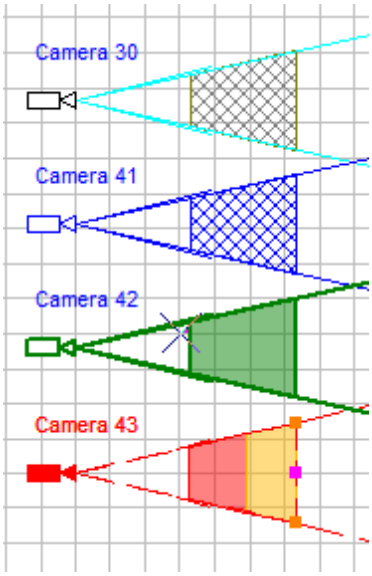
Fill projections

Hatch or fill by blend color view area projections of active camera 166 (if these projections exist) calculated according to parameters in the Camera Geometry 291 box.

If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then hatching (filling) projections of this camera is performed by grey color by default (Camera 30 on the figure).

If another line type was assigned to the camera, then hatching (filling) projections of this camera is performed by a color of this line type assigned to the camera. (Camera 41,42).

If the Spatial resolution 177 is enabled, then colors of hatching (filling) projections is determined by Spatial resolution parameters (Camera 43).

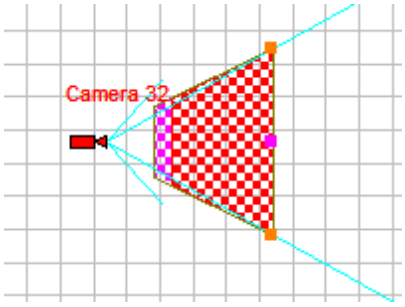


Drop-down menu:

1. Hatching - hatch projections.

2. Filling - fill projections by blend semitransparent color.

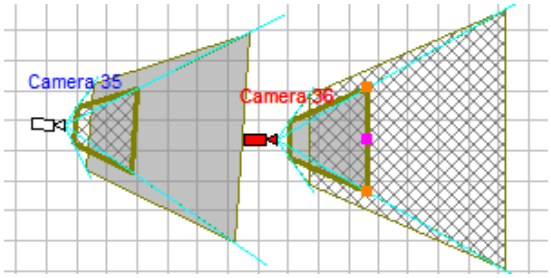
If the **Hatching** item is chosen, but in the drop-down menu of the Spatial resolution 177 button the **Gradient** item is chosen, then the projections will be hatched by a bold style of hatch without gradient.



Transparence of filling in the Graphics window can be adjusted in the Options box 483. Transparence of filling in the 3D World window can be adjusted in the 3D World 348.

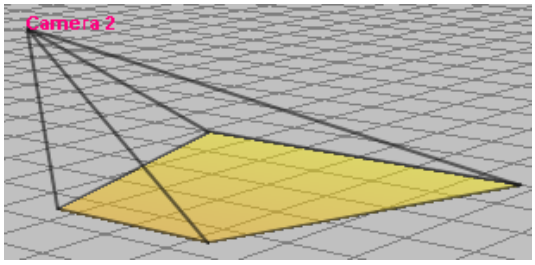
If in the submenu of the View area projection bounds 173 button, **2 levels** is chosen then:

- If in the submenu **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).



3. Off - don't hatch and fill view area projections.

If **Off** is chosen in the **Fill projections** and Shadows 178, then filling view area faces 346 in the 3D World 342 is not shown.

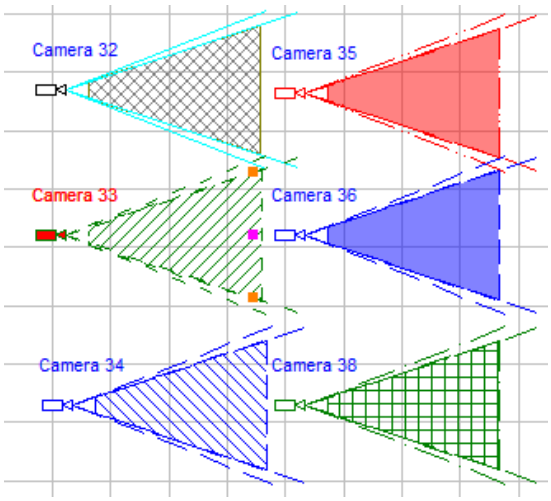


If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera Filling is performed by Gray color and Hatching by **DiagCross** style**.** *(Camera 32)*

Default line type for cameras is Line 21.

If another line type was assigned to the camera, then for this camera filling is performed by a color determined by ***color*** *of the line type and hatch style is determined by* ***style*** *of the line type (Camera 33…38).*

Thus you can fill and hatch projections of different cameras by different colors and hatch styles.



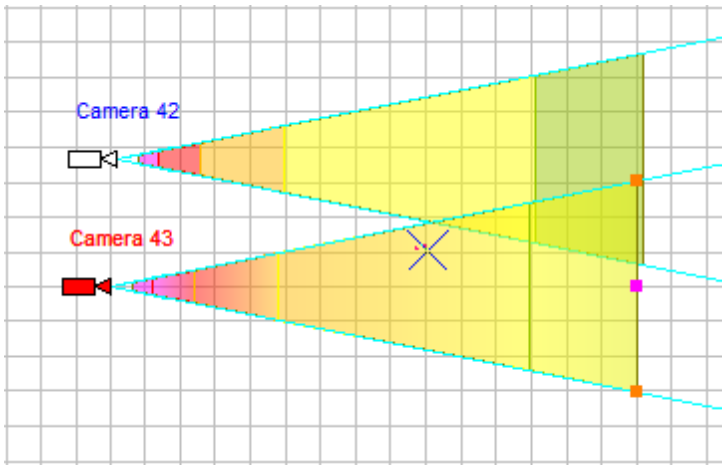
A button state at the moment of camera saving determines whether the filling or hatching of the view area projections of the camera will be displayed when this camera is inactive.

If selected cameras exist on the layout, except the active camera, this button changes view

and operates the visibility of filling (hatching) projections of all selected cameras simultaneously.

Spatial resolution

Fill in different colors **regions** on the **view area projections of the active camera**, depending on the **spatial resolution** within these regions.
Colors of the regions and the boundary values of the spatial resolution are determined by the **spatial resolution pattern** assigned to the camera.
In the Spatial resolution box 316 you can edit the patterns and assign them to cameras.



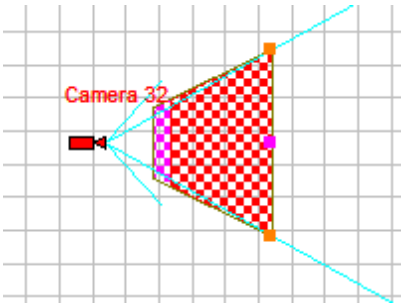
Drop-down menu:

1. Discrete colors - fill the regions in discrete colors in accordance with a spatial resolution at the far bounds of the regions.

2. **Gradient** - fill the view area projection in gradient color according to the spatial resolution at each point on the projection.

*In case of gradient color is chosen, the colors at the **far region bounds** equal to the colors of the **spatial resolution pattern**, but between the bounds color changes smoothly, as well as real spatial resolution.*
Gradient reflects the spatial resolution more accurately and looks impressive, but discrete colors are more intuitive and easy to use..

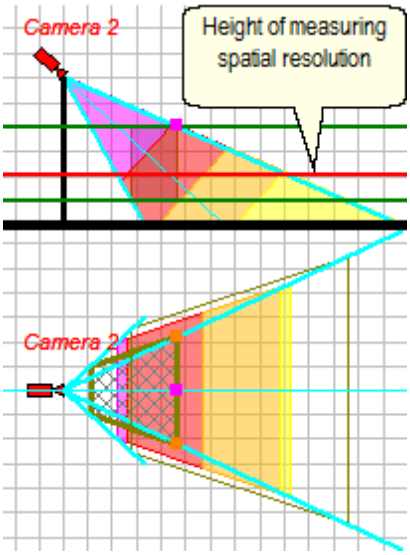
*If the **Gradient** item is chosen, but in the drop-down menu of the Fill projections 175 button the **Hatching** item is chosen, then the projections will be hatched by a bold style of hatch without gradient.*



Calculation of gradient demands a lot of resources and increases redraw time.

3. Off. - don't display spatial resolution

If in the submenu of Shadows 178 button or View area projection bounds 173 button (when Shadows is Off) the **2 levels** is chosen, then lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



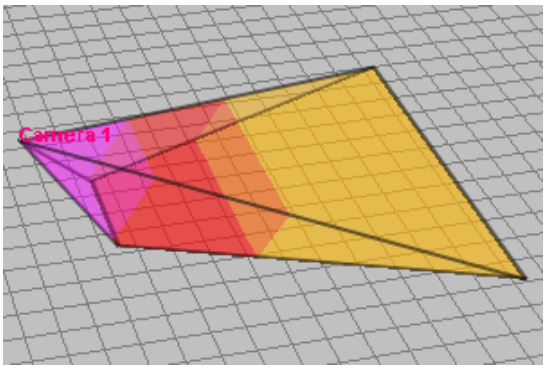
If the height 320 of measuring spatial resolution is set to AUTO, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in previous versions) .

In the active camera editing mode 167, the regions of spatial resolution can be displayed in the vertical projection, with the height 320 of spatial resolution measurement (horizontal red line).

*In the Dome 179 mode the **Spatial resolution** is calculated without taking into account pan and tilt angles of camera. It is assumed that the camera can pan and tilt freely, and spatial resolution is calculated at the center of the field of view.*

The Spatial resolution button controls displaying spatial resolution on 3D view area 346 and the Coverage 348 in the 3D World 342 window .



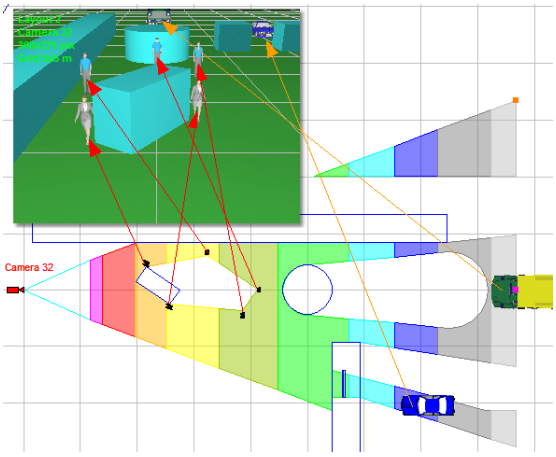
A button state at the moment of camera saving determines whether the spatial resolution of the camera will be displayed when this camera is inactive.

If selected cameras exist on the layout, except the Active camera 166, this button changes view ( ) and operates the visibility of spatial resolution of all selected cameras simultaneously.

See also: Spatial resolution box 316, Visualization of the camera control area projections and spatial resolution within them 580

Shadow

Display horizontal projection of the view area **of the active camera** taking into account shading from constructions 193 and 3D models 202.



Shadows - a powerful yet easy-to-use tool of VideoCAD. Shadows are calculated for all positions of cameras, shading objects can be located at any point of space. You should only enable calculation of shadows with the help of this button.

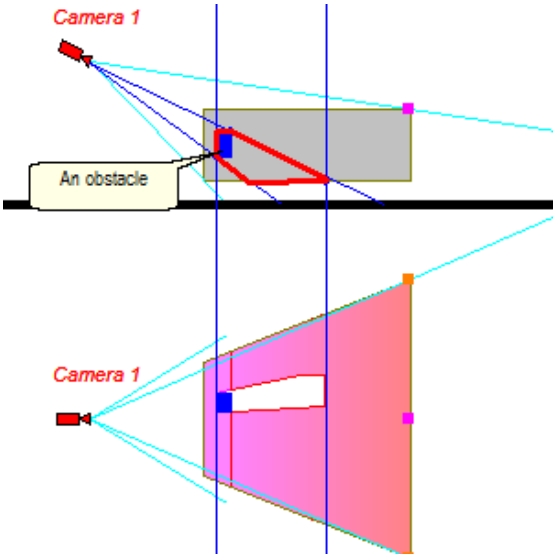
Shading takes into account the camera installation height and all 3 coordinate of constructions and 3D models (including heights).

Drop-down menu:

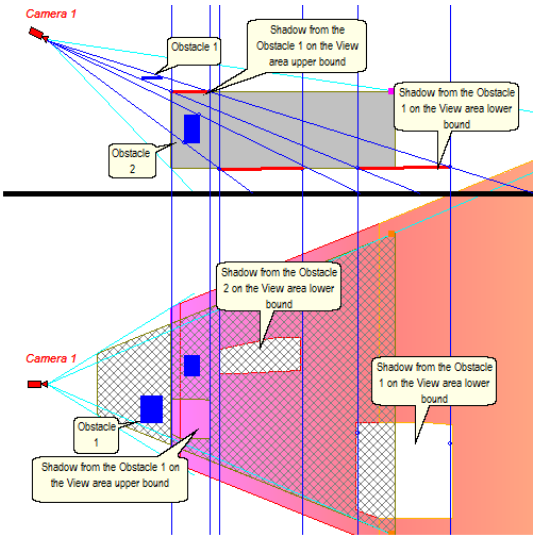
1. Within projection - display view area projection taking into account shadows. Shading is calculated according to a rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.

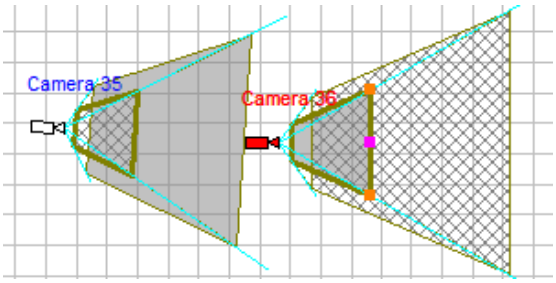
By the same rule the horizontal projections 173 of view area are calculated. Changing the height of the lower and upper bounds of view area could change conditions of calculation of shading.



2. 2 levels -simultaneously show 2 sections of the view area by 2 horizontal planes, located on the height of lower 300 and upper 298 bounds of the view area. From the sections subtract shadows from obstacles



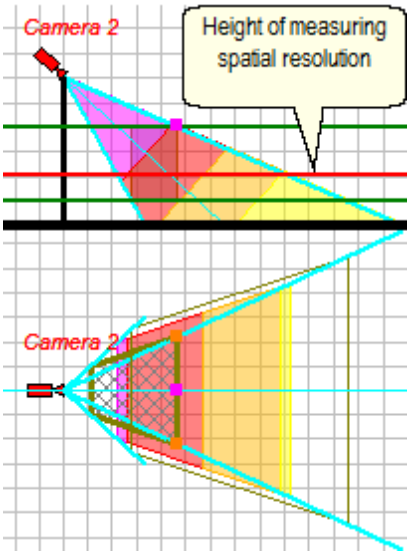
- If in the submenu of the Fill projections 175 button **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu of the Fill projections 175 button **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).



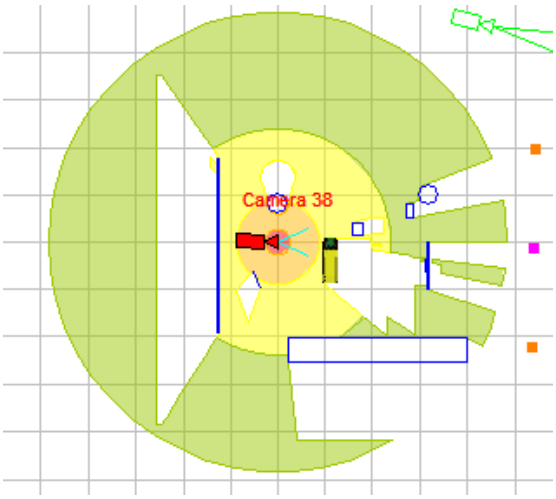
If in the submenu of the *Spatial resolution* 177 *button* ***Discrete colors*** *or* ***Gradient*** *is chosen*, then lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.

If the height 320 of measuring spatial resolution is set to AUTO, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in VideoCAD7 and previous versions).



3. Dome - display projection of the territory controlled by the camera in 360 degrees, without view area borders, but only taking into account the shadowing.



When the **Dome** item is chosen, actually the **control area** of a **dome (PTZ)** camera is displayed.

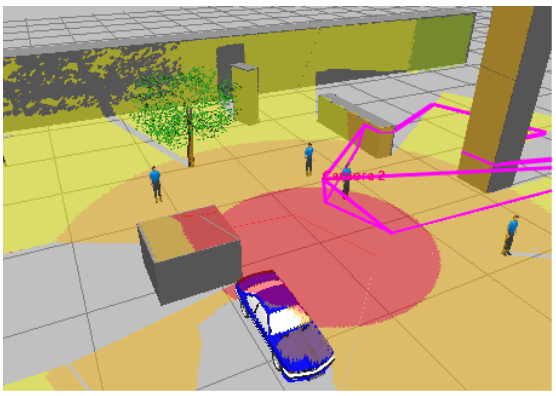
The **Dome** mode is also useful for choosing the best installation place for fixed cameras to make required areas reachable for the cameras.

In the **Dome** mode all shaded areas from the specified camera position become visible.

In the **Dome** mode the Spatial resolution 177 is calculated without taking into account pan and tilt angles of camera. It is assumed that the camera can pan and tilt freely, and spatial resolution is calculated at the center of the field of view

In the Graphics window calculation of shadows in the Dome mode is performed like in the Within projection 179 mode, ie according to the rule:
A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.

In the 3D World 342 in the **Dome** mode the territory controlled by the active 166 camera is displayed as coverage 348 on the environment. *The coverage in the 3D World is displayed for the **active camera** only.*



4. Off - disable shadow calculation and displaying.

*Difference between the **Shadows** and View area projection bounds 173 buttons is that the **View area projection bounds** are built without obstacles on the scene but the **Shadows** are built considering obstacles. Both buttons can be used simultaneously in various combinations.*

*The **Shadow button** works in conjunction with the Spatial resolution 177 and the Fill projections 175 buttons. Depending on the state of these buttons, shadows can be displayed in different ways: as filling, as shading, as a border lines, with mapping spatial resolution*

or not.

The calculation of shading - resource-intensive operation. *During the shadow calculation on the* ***Shadow button red frame flashes*** *.*
Automatic shadow calculation is performed only for the active 166 camera. To recalculate shading for a particular camera - activate this camera. To recalculate shading for all selected cameras, click Main Menu>View>Recalculate shadows 239.
To temporarily disable the automatic calculation of shading (keeping already calculated shadows visible) clear the item Main menu>View>Calculate shadows for active camera 239.

The calculation of shading from 3D models 202 is disabled by default to save resources. To enable the calculation of shading from the 3D models, check the Options box> Miscellaneous> Shadow>Calculate shadows for 3D models 491.
Additionally, for each 3D model, which must be taken into account when calculating the shading:

- *double click on the model to switch it to editing state 164;*
- *on the appeared* ***Current construction parameter panel*** *check Shadow 283 checkbox.*

To force to calculate shadows from a type of 3D model you can mark Shadows 402 checkbox on the 3D Models 397 window while editing the type of the 3D model.

Whether or not a specific construction takes into account in the calculation of shading determines by the Shadow 475 checkbox of the line **type used** for the construction.

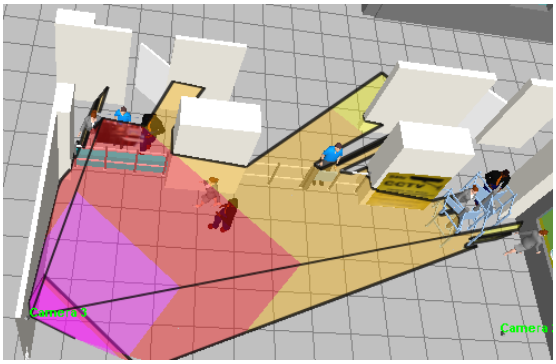
You can ignore constructions of specified layers 276 while calculating shadows, using the Shadows 277 row in the table of layers.

A button state at the moment of camera saving determines whether the shadows of the camera will be displayed when this camera is inactive.

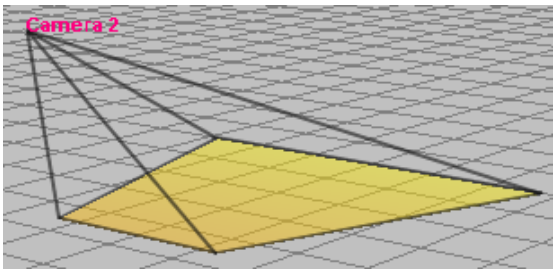
If selected cameras exist on the layout, except the Active camera 166, this button changes view (and operates the visibility of shadows of all selected cameras simultaneously.

When calculating 3D view areas 346 and coverage of the active camera 348 in the 3D World 342 window, shadows are calculated independently from shadows in the **Graphics window**. Calculation of shadows in the **3D World** is rougher, but much faster.

Accounting 3D models as obstacles in the 3D World window does not depend on the state of the Calculate shadows from 3D models 491 checkbox in the **Options** box.



If **Off** is chosen in the Fill projections 175 and **Shadows**, then filling view area faces 346 in the 3D World 342 is not shown.

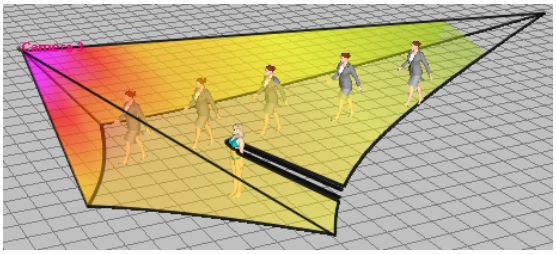


See also: *Shadows* 178, *Main menu>View>Calculate shadows for active camera* 239, *Main Menu>View>Recalculate shadows* 239, *Line type>Shadow* 475, *Options box>Miscellaneous>Shadow* 490, *Layers>Shadow* 277, *Options box>Calculate shadows from 3D models* 491, *Current construction parameter panel>3D model>Shadows* 283, *3D Models window>Shadows* 402, *Choosing the best place for PTZ (dome) camera* 583, *Visualization of the camera control area projections and spatial resolution within them* 580

3D view area

Show 3D transparent view area faces 346 and active camera coverage 348 area in the **3D World** window.

See details: 3D World>View>View area 346



Button state at the moment of camera saving determines whether the 3D view area of the given camera will be displayed when this camera is inactive.

If selected cameras exist on the current layout, except the Active camera 166, this button changes view and operates the visibility of **3D view areas** of all selected cameras simultaneously.

Person detection area

Show/hide the Active camera 166 projections of person detection area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 498 of the active camera.

If the projections are present, a **lilac frame** round the button appears.

The projections are displayed in **lilac color**. **Line type** can be changed in the options box 475.

A button state at the moment of camera saving determines whether the projections of person detection area of this camera will be displayed when this camera is inactive.

Clicking this button opens person detection area size 495 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner. Person detection area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, *shadows* 178 *and lens distortion* 310.

See also: *Person detection area size box* 495, *Criteria editing box of person detection area* 498.

Spatial resolution box 316

Person identification area

Show/hide the Active camera 166 projections of person identification area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 500 of the active camera.

If the projections are present, a **orange frame** round the button appears. The projections are displayed in **orange color**.

Line type can be changed in the options box 475.

A button state at the moment of camera saving determines whether the projections of person identification area of this camera will be displayed when this camera is inactive.

Clicking this button opens person identification area sizes 496 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner**.** Person identification area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, *shadows* 178 *and lens distortion* 310.

See also: Person identification area size box 496, *Criteria editing box of person identification area* 500, *Spatial resolution box* 316

License plate reading area

Show/hide the Active camera 166 projections of license plate reading area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 503 of the active camera.

If the projections are present, a **bright green frame** round the button appears. The projections are displayed in **bright green color**.

Line type can be changed in the options box 475.

A button state at the moment of camera saving determines whether the projections of license plate reading area of this camera will be displayed when this camera is inactive.

Clicking this button opens license plate reading area sizes 497 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner**.** License plate reading area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, *shadows* 178 *and lens distortion* 310.

See also: License plate reading area size box 497, *Criteria editing box of license plate reading area* 503, *Spatial resolution box* 316

Test object

Show the **test object of the Active camera** 166 with the sizes and location according to parameters in the test object box 507.
Clicking this button also opens this **box**.

Clicking this button once again close the **test object box** and hide test object on the layout. If it is necessary to close only **the box**, and **test object on the layout** should be left, close the box by clicking **Close** in upper right corner**. Test object** will remain and the button will remain pressed.

*A **test object** can be displayed only in the graphical editing state 167 of active camera.*

See more: Test object box 507

Layers

Show the Layers 276 panel. Cameras and constructions can be distributed by layers. On each Layout 513 unlimited number of layers can be. Control of layers is performed by the **Layers** panel.

See more: Layers panel 276

Model of active camera

Using this combo box, you can choose a model for the Active camera 166.
The list consists of two parts:

Under **=Used models =** header there are camera models listed which are already used in the project . All parameters of these models can be seen on **Used models** tab in the Table of camera models 419.

Under **=All models = header** there are **all** camera models listed which are available in the database of models. Parameters of these models can be seen and edited on **All models** tab in the Table of camera models.

To assign a model, just choose its name in the list.

As a result of model assignment to the active camera, model parameter values will be assigned to parameters of the active camera. After that changing some parameters will be locked.

There is **=Unassigned = string** in the bottom of the list. Choose this string if it is necessary to remove model assignment from the active camera. As a result of removing model assignment all parameters of the active camera will be unlocked and can be changed.

*You can change model **of all selected cameras simultaneously**. For this purpose:*
- *Select 189 necessary cameras on the layout*
- *Right click on this combo box, then click on the **Assign to selected cameras** pop up item.*

See more: Table of camera models 419

Table of camera models

Show **Table of camera models**. In this table it is possible to adjust parameters of camera models and assign any model to the Active camera 166. The table can be exported to *.txt, *.csv, *.htm, *.rtf, *.xls formats.

See more: Table of camera models 419

Lens focal length combo box

The box duplicates a corresponding box 294 in the **Camera Geometry** box to enhance the convenience when using the **graphics window**.

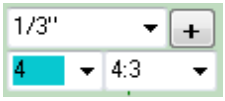
When moving the cursor to the box with a lens focal length the information on the **lens view angles** appears.

If a model 419 is assigned to the camera, and the model has fixed 438 focal length lens, then you can not change the focal length.

If a model is assigned to the camera, and the model has a lens with limited 438 variable focal length, then you can change focal length within the limits only. When approach to the limit values, the box will become crimson.

You can change focal length in wide range of 0.5-1000mm of cameras, which have not assigned model or the assigned model have not specified limits of the lens focal length.

If the active camera is panoramic 312 then the lens focal length box is colored by aqua-green.



Changing the lens focal length, and therefore the calculated values of view angles of a camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking into account the changed values of calculated view angles.

You can change lens focal length **of all selected cameras simultaneously**. For this purpose:

- Select 189 necessary cameras on the layout
- Right click on this combo box, then click on the **Assign to selected cameras** pop up item.

See more: Lens focal length 294

Camera geometry

Clicking this button will open Camera Geometry box 289. This box includes geometric parameters of the camera, lens and installation parameters of the camera.

See more: Camera geometry box 289

Sensitivity and Resolution

Show the Sensitivity and Resolution 329 box in which there are parameters of sensitivity and resolution of the Active camera 166.

Sensitivity parameters take part in modeling only if 3D Video 357 is opened and illumination modeling 372 is switched on.

See more: Sensitivity and Resolution 329

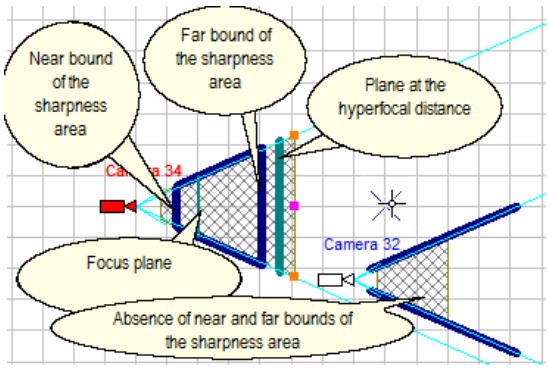
Spatial resolution

Show or hide the Spatial resolution box 316. In this box it is possible to create and edit patterns of spatial resolution and field of view size visualization. In the box there are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch, Home Office Guidelines for identification, P 78.36.008-99**,** Australian Standard AS4806: Closed Circuit Television, European Standard EN 50132-7, ISO/IEC 19794 Biometric data interchange formats. Also in the box there are examples of images are automatically displayed for each region of spatial resolution.

See more. Spatial resolution box 316, *Spatial resolution button* 177.

Depth of field

Show or hide the **Depth of field calculation box**.



When the depth of field box is visible, next to all cameras in the horizontal projection the following lines are displayed:

- sharpness area bounds 457;
- focus plane 458;
- plane at the hyperfocal distance 458.

These lines are calculated according to the depth of field parameters 457 of each camera at the height of depth of field measurement 458.

If the **focus plane** or the **plane at the hyperfocal distance** not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then the **focus plane** or the **plane at the hyperfocal distance** are not displayed.

If the near or the far bound of the sharpness area 457 not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then this bound is not displayed.

The absence of near and far bounds of the sharpness area indicates that the sharpness area completely covers projection of view area, thus the depth of field does not reduce the resolution of the camera.

This tool doesn't take into account camera rotation around its main optical axis 297, shadows 178 and lens distortion 310.

See more: Depth of field calculation box 454, Control of Depth of Field in the horizontal projection 592.

3D Video

Show or hide the **3D Video** window. The **3D Video** displays the image from the Active camera 166.
*During the image generation in the 3D Video window on the **3D Video button red frame flashes** .*

See more: 3D Video 357.

3D World

Show or hide the **3D World** window. In the **3D World** the project layout with cameras and view areas is shown in 3D.

See more: 3D World. 342

Monitor window

Show or hide **Monitor window**. In the Monitor window images from any quantity of cameras are displayed simultaneously. Monitor window allows modeling monitors of video surveillance system.

See more: Monitor window 407.

Hide vertical projection

If this button is pressed, the **horizontal projection** is only present in the **graphics area**.

To display a **vertical projection** click this button again.

Hide horizontal projection

If this button is pressed, the **vertical projection** is only present in the **graphics area**. To display a **horizontal projection** click this button again.

"Grid" control element group

*The graphics area 162 includes **2 grids** with the coinciding horizontal coordinates: a **grid in the vertical projection** and a **grid in the horizontal projection**. The grid origin coincides with the chosen origin of coordinates 245.*

Grid selected step box

To change a grid step click the box and choose the required step from the pop-up list.
*If the **automatic step selection** mode is active when changing the step value in the box this mode is deactivated.*

See also: "Grid" control element group 188

ON/OFF the automatic grid step selection mode

Switch on/off the mode of **automatic grid step selection** according to a drawing scale.

See also: "Grid" control element group 188

ON/OFF displaying grid

Switch on/off displaying grid.
*Choosing **NO** in the **grid step selection box** can also deactivate grid displaying.*

See also: "Grid" control element group 188

"Edit" button group

*Buttons of this group are used for the editing constructions 193, 3D objects 259, cables 208, texts 201 and **cameras**. In this case the status bar 275 in the bottom of the Graphics window displays hints.*
*When editing an object the **projections** should be taken into account. Different projections are different views, though connected ones. Moving objects correctly between projections has no sense and is impossible to perform.*
*To start the editing select 189 the desired **objects**.*
Choosing the items from the pop-up menu that appears when clicking the graphics area 162 by the right mouse button performs the commands of this group as well.

Stop operation

Stop the current operation. Use also **Esc**.

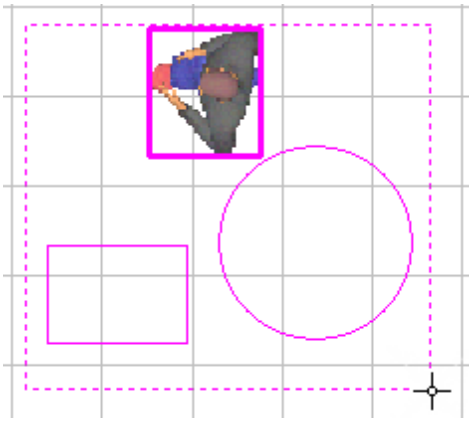
Erase

Erase the selected objects 164. To select objects use the button Select/Edit 189.
If there are no **selected objects** this button is disabled.
Use also **Del**.

You can not erase the Active camera 166.

Select/Edit

With this button chosen the first corner of **selection window** appears when clicking any empty place of graphics area 162 once. Clicking it again completes the designation of **selection window**.
All the **objects**, which hit in the **selection window** and reside on the **projection** coinciding with one being clicked for the first time, will be selected 164. However, the earlier **selected objects** not hitting in the **selection window** will revert to normal state 163.



*If **Ctrl is pressed** at clicking, the **objects** within the **selection window** are inverted, on the contrary, state of those not hitting in the **selection window** remains the same.*

It is possible **to select objects by one** by clicking their image once, thus enabling the earlier selected **objects** to revert to normal state.
*If **Ctrl** is pressed at clicking, the **objects** are inverted, and the state of the rest remains the same.*

You can make a *3D model* 202 *insensitive to mouse click by Lock checkbox* 402 *in the 3D Models window.*

During construction 3D scenes 357 it is often necessary to place some constructions one over another at a different height, made by means of different line types 475.
To select one or more construction, located one over another, made by means of different line types:
- make the line type panel 280 visible, for example by double clicking any construction;
- choose on the panel the line type of construction you want to select;

select the construction by clicking.

Just repeat clicking at the same place without moving the cursor. Thus objects under the cursor will be selected sequentially.

Layers 185 are very useful for multi-level constructions.

An object can be *inaccessible for selection if it belongs to a not enabled layer* 276

To move objects on the foreground or background use menu items: Bring to front 267, Send to back 267.

Selected objects can be moved. To move the selected objects, bring the cursor to the selected one, press the left mouse button and move the selected objects. After finishing the moving, release left mouse button.

To cancel selection click this button again.

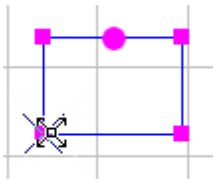
*To **select all objects** on the current layout use **Ctrl+A** shortcut.*

*For switching to Select / Edit mode from any mode use also **Esc** button.*

See also: Selected state 164

Editing state of objects

To translate an object into editing state 164 double-click its image. After that **pink grips** appear on the object base points. When moving the cursor over this point its image changes.



To edit an object click beside a base point with a grip and move the cursor. After clicking for the second time, the changed object is set up.
If on one side of a construction a **circle** is displayed, the construction can be rotated around its axis by gripping the circle by mouse.

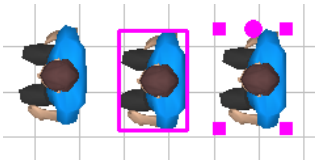
To switch the circle 253 into the editing state you need to double-click on its center or on the point on its radius that appears during the process of construction.
To switch the arc 254 into the editing state you need to double-click on its center or on either of its two ends.

When editing a rectangle 196 or a mask 202, then several points will move at a time, the rectangle or the mask remaining square.
If **Ctrl** is pressed when editing a rectangle or a mask, then one point will move only.

When editing a Double line 197 or Wall 198, the whole Double line or Wall will be moved.
If **Ctrl** is pressed when editing the double line or wall, only one line will be moved.

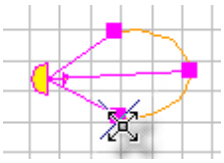
When clicking the text 201 twice the pop-up frame appears allowing to edit text in it. When clicking the right mouse button the pop-up menu of text editing appears in the frame.

In the editing state, 3D models 202 are displayed with square grips and pink circle.
You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.



To switch illuminator 206 to editing state click on its center.

Thereupon, the Light intensity distribution curve (LIDC) becomes visible. To edit the curve by moving grips on the layout press Ctrl.



It is possible to change object's parameters in editing state on the current construction parameters panel 282 which automatically appears in the bottom of graphics window.

See also: Editing state 164

Activate cameras

When double-clicking the camera lens the following actions are performed:

- the Active camera 166 is saved.
- the camera being double-clicked will become active.

It is convenient to pan and tilt the active camera by moving the grip in the middle of the view area upper bound.
In a similar way by moving grips on the ends of the view area upper bound it is possible to change lens focal length 294 of the camera.

If a model 419 is assigned to the camera, the focal length changing is possible only in the limits specified in model parameters 438.

Changing the lens focal length, and therefore the calculated values of view angles of a camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking into account the changed values of calculated view angles.

See also: Active camera 166

See also: "Edit" button group 188

Cut

Cut the selected objects 164 into the VideoCAD internal clipboard.

It is possible to cut **objects** of different projections at a time, and to cut any quantity of constructions 193, 3D objects 259, **cameras,** illuminators 206, texts 201 and **cables**.

When cutting the Active camera 166 it is copied.

See also: Cut with base point 265

Copy

Copy the selected objects 164 into the VideoCAD internal clipboard.

It is possible to copy **objects** of different projections at a time, and to copy any quantity of constructions 193, 3D objects 259, illuminators 206, texts 201 and **cables**.

See also: Copy with base point 265

Paste

Paste the **objects** from the VideoCAD internal clipboard.
After clicking this button specify the **base point** of paste in the projection being clicked when **cutting** or **copying**.

It is possible to paste into different layouts 513, paste **cables** of one camera while another camera is active (in this case the pasted cables belong to a camera which is active during paste), and to paste any quantity of constructions 193, 3D objects 259, **cameras,** illuminators 206, texts 201 and **cables** at a time.

It is available to **copy** and **paste constructions**, **cables** and **texts between the projects**. To this effect make a copy in one project, then open another project or create a new one and paste what you have copied.

Be careful when copying and pasting **cables**. You can copy only **cables of Active camera** 166, and when pasting, these cables will belong to the **camera which is active during pasting**.

*If a camera is being pasted a **new camera** with parameters of the pasted camera is created automatically. **This is an alternative way to create new cameras.***

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but pasted camera doesn't become active. Therefore the view area of the pasted camera is displayed without shadows. To calculate shadows - activate 166 the camera after pasting.

Pasting is always performed to the active layer 276. *At the moment of placing new camera 171 or pasting 191 copied camera, its base height 298 is set to the base height of the active layer 277.*

Move

Move the selected objects 164.
After clicking this button the first click in a graphics area 162 designates the starting moving point, the second click - the final one.

*When moving take into account the **projection** to which the objects are attached. A simultaneous moving objects in different projections vertically is locked as being incorrect.*

Selected 164 objects or cameras can be moved in Select / edit 189 mode. In order to move place the cursor above the selected object, press left mouse button, move, after moving is finished release the left mouse button.

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but moved camera can be not active. If the camera is not active, the view area of the moved camera is displayed with old shadows. To recalculate shadows - activate 166 the camera after moving.

Rotate

Rotate the selected objects 164.
After clicking this button the first click in a graphics area 162 designates the rotation **center**, the second click specifies the initial rotating point, and the third click specifies the final rotating point.

*When rotating take into account the **projection** to which the objects are attached. The selected objects, attached to the projection with a rotation center designated, can rotate only.*

*The scalable 477 fonts can rotate only. If a font is not scalable then its **initial point** rotates only, **the text remaining horizontal**.*

The Active camera 166 can be rotated in Select / edit 189 mode by moving the grip in the middle of the view area upper bound.

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but rotated camera can be not active. If the camera is not active, the view area of the rotated camera is displayed with old shadows. To recalculate shadows - activate 166 the camera after rotating.

Scale

Change scale of selected 164 constructions relative to the center of scaling.

After clicking on this button, the first click on the graphics area 162 specifies the **center of scaling**
.

Then moving the cursor up increases sizes of selected constructions, moving the cursor down decreases sizes of selected constructions.

In the Status bar 275 the current scale factor is displayed.

When required sizes will be achieved, click for the second time to complete scaling operation. To cancel the scaling press **ESC**.

This tool does not scale 3D models 202. 3D models can be scaled in editing state 164 with the help of the Current construction parameter panel 283.

Mirror

Mirror the selected 164 constructions relative to the horizontal or vertical line passing through the specified point.

After clicking on this button, the first click on the graphics area 162 specifies the point through which a mirror line must be passed.

Then moving the cursor changes position of the mirror line.

When required position of the mirroring objects will be achieved, click for the second time to complete mirroring operation. To cancel mirroring press **ESC**.

Move to active layer

Move to active layer all selected 164 objects.

See more: Layers 276

"Constructions" button group

*Buttons of this group are used to perform **measurements** and **constructions**. The status bar 275 in the bottom of the Graphics window and the Current construction parameter panel 282 display the **results** of measurements. The **constructions** can be used* for 3D modeling the video surveillance object, for *specifying the **required view areas**, **objects**, **obstacles**, etc.*
*Each **construction** is attached to the projection containing its **initial point**. The constructions can be **moved**, **deleted**, **rotated**, **edited**, **copied**, **mirrored , scaled, changed draw order**, **hidden** using the buttons of Edit 188 group.*

Constructions made in the horizontal projection are also displayed in the 3D Video 357 and 3D World 342 . At this, the line corresponds to a vertical rectangle, the point - to a vertical segment, the rectangle - to a parallelepiped, circle - to a cylinder, etc.
Constructions are stretched throughout the height and become 3D objects.

Minimal and maximal height of each object is determined by parameters of line type 475, by which the construction is made. The heights can be set separately for each object, during constructing and editing by means of current construction parameters panel 282. Heights of constructions are calculated relative to base height 277 of a layer to which the construction belongs.
Color of constructions is determined only by line type 475, which is used at constructing.

Constructions can be distributed by Layers 276. By changing parameters of a layer you can change some parameters of all constructions belong to the layer. At the moment of drawing, construction is placed on the active 276 layer.

To enhance speed and convenience of drawing, VideoCAD uses global and local snaps 258.

*The **construction coordinates** are displayed relatively to the chosen origin of coordinates 245. The coordinates of constructions **belonging to one camera only** (focal plane 171, optical axis 171, field-of-view size 171, test object 171, change view area upper bound 210) are always displayed **relatively to the Active camera** 166.*

When choosing a button of this group a line type panel 280 or a font type panel 281 appear, allowing to change the line 475 or font 477 types.
When double-clicking the panels the options box 474 appears.

Above these panels the current construction parameters panel 282 appears, by means of which it is possible to create construction, by setting its parameters.

Point

When this button is pressed, clicking on the graphics area places a point.
The status bar 275 displays the coordinates of this **point** relatively to the origin of coordinates 245.

In the 3D Video 357 and 3D World 342 the vertical segment will be displayed in the points place.

Default minimal and maximal heights of the segment are determined by the line type 475, which constructs the point. The heights can be set separately for each point by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the point in numeric values.

See also: "Constructions" button group 193

Horizontal line

When this button is pressed, clicking on the graphics area 162 specifies a point through which a **horizontal line** is passes.

The status bar 275 displays the line **height** or its **shift** from the origin of coordinates 245 according to the projection being clicked.

In the 3D Video 357 and 3D World 342 at the place of the horizontal line 2 horizontal lines will be displayed.

Default minimal and maximal heights of the lines are determined by the line type 475, which constructs the horizontal line. The heights can be set separately for each horizontal line by means of current construction parameters panel 282, on which it is also possible to set coordinates of the horizontal line in numeric values.

See also: "Constructions" button group 193

Vertical line

When this button is pressed, clicking on the graphics area 162 specifies a point through which a **vertical line** is passes.

The status bar 275 displays the **distance** from the origin of coordinates 245.

In the 3D Video 357 and 3D World 342 at the place of the vertical line 2 horizontal lines will be displayed.

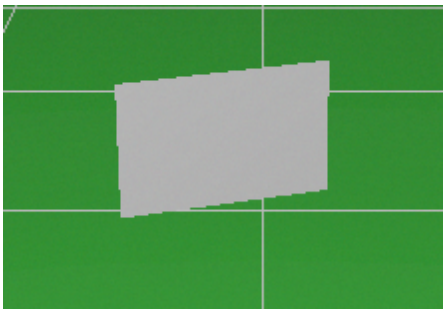
Default minimal and maximal heights of the lines are determined by the line type 475, which constructs the vertical line. The heights can be set separately for each vertical line by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the vertical line in numeric values.

See also: "Constructions" button group 193

Line segment

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **line segment.** Second clicking specifies the end point of the **line segment.**

The status bar 275 displays the segments length and its projection to distance and height.
Both clicks are to be made in the same projection. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing a drawing the segment is attached to the projection with its **initial point** in it.



In the 3D Video 357 and 3D World 342 a vertical rectangle will be displayed at the segment place.

Default minimal and maximal heights of the rectangle are determined by the line type 475, which constructs the line segment. The heights can be set separately for each line segment by means of current construction parameters panel 282, on which it is also possible to set coordinates of the line segment in numeric values.
Color of the rectangle is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the segment**: coordinates of the first and second points, length, angle.

*A segment can be also used to **measure distances** on layouts without clicking for the second time in this case.*

*Line segments can be used for modeling cables with subsequent cable length calculation. Use separate **line types** to draw each cable type. For length calculation use the Length calculation of line segments 517 tool.*

See also: "Constructions" button group 193

Polyline

This tool allows to draw line segments continuously. The end of each segment is the start of the next one. To stop drawing lines, press **ESC.**
In other respects this tool equals to the Line segment 195 (see. above).

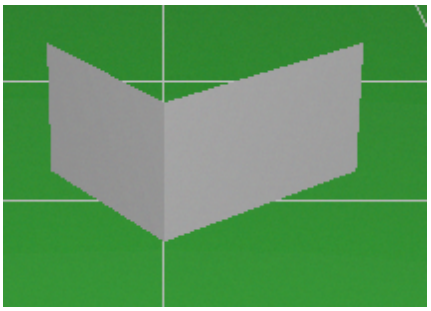
See also: "Constructions" button group" 193

Angle

When this button is pressed, the first clicking on the graphics area 162 specifies the **vertex** of an **angle.** Second and third clicking specify its **arms.**

The status bar 275 displays the angle value in **degrees**.

If the angle **vertex** and **arms** are constructed in **different projections**, when changing drawing the angle is attached to the projection with its vertex.



In the 3D Video 357 and 3D World 342 2 vertical rectangles will be displayed at the angle place.

Default minimal and maximal heights of the rectangles are determined by the line type 475, which constructs the Angle. The heights can be set separately for each Angle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the line segment in numeric values.
Color of the rectangles is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the angle**: coordinates of the first, second, third points, length, angle value in degree.

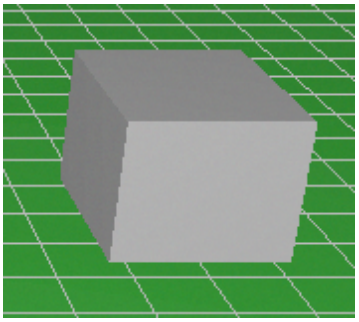
*The **angle** tool is also used to measure angles on layouts.*

See also: "Constructions" button group 193

Rectangle

When this button is pressed, the first clicking on the graphics area 162 specifies the first corner of a rectangle**.** Second clicking completes the rectangle construction**.**

The status bar 275 displays the information on the rectangle sizes and location.



In the 3D Video 357 and 3D World 342 a parallelepiped will be displayed at the rectangle place.

Default minimal and maximal heights of the parallelepiped are determined by the line type 475, which constructs the rectangle. The heights can be set separately for each rectangle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the rectangle in numeric values.
Color of the parallelepiped is determined only by line type 475, which is used at constructing.

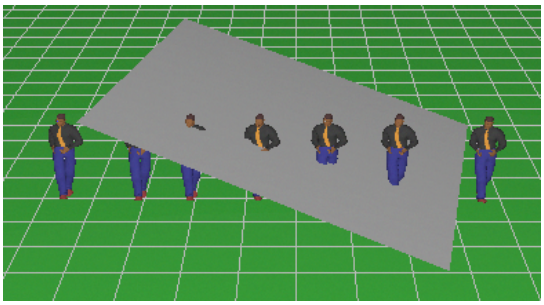
On the **current construction parameters panel** it is possible to set and fix **parameters of the rectangle**: coordinates of the first points, height, width.

*Rectangles are also used for creating rectangular **horizontal planes** in the **3D Video**, for example a ceiling or floor.*

See also: "Constructions" button group 193

Inclined rectangle

When this button is pressed, clicking on the graphics area 162 specifies first corner of an inclined rectangle.



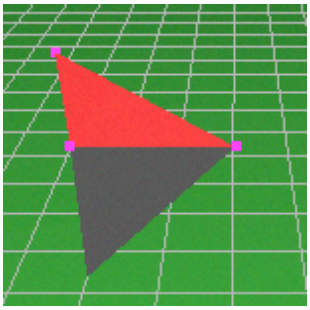
Inclined rectangle is similar to a rectangle 196 and differs from it that in 3D Video 357 and 3D World 342 it is displayed in the form of **inclined rectangle**. The **minimal height of rectangle** corresponds to the **lower side** of this rectangle, and the **maximal height** - to the **upper one**.

In the **Graphics window** the upper side of inclined rectangle is displayed by **thick line**.

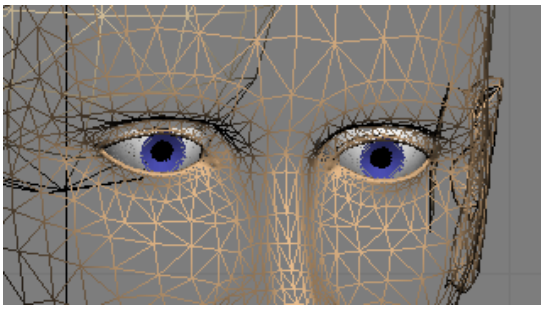
For modeling complex objects it is possible to edit 189 inclined rectangle by points, moving its vertexes.
*When moving separate vertexes press **Ctrl**.*

Inclined rectangle can be made transparent by 70 %. For this purpose it is necessary to mark the **Transparence** checkbox on the Current construction parameter panel 282.

Inclined rectangle is very universal tool. Using the inclined rectangles it is possible to model any 3D objects.



It can be useful to combine inclined rectangles in pairs thus to get triangles with independent vertexes in the 3D space. Meanwhile two vertices of each inclined rectangle must coincide. The rest two vertices of first inclined rectangle must coincide with the other two vertices of second inclined rectangle.



Using obtained triangles you can theoretically build any 3D surfaces, although it can be not simple in practice.
For example, all 3D models in VideoCAD consist of triangular mesh only.

See also: "Constructions" button group 193

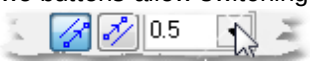
Double line

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **double line.** Second clicking specifies the end point of the **double line.**

The **length** and the **width** of the double line appear in the status bar 275.

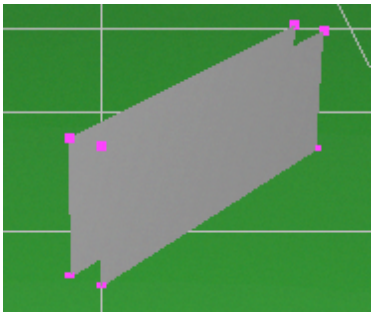
In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the distance between lines of the double line.

Two buttons allow switching the **orientation of the second line** relatively to the first one



.

You can also switch the orientation quickly by pressing the **Space bar**.



In the 3D Video 357 and 3D World 342 2 vertical rectangles will be displayed at the double line place.

Default minimal and maximal heights of the rectangles are determined by the line type 475, which constructs the double line. The heights can be set separately for each double line by means of current construction parameters panel 282, on which it is also possible to set coordinates of the double line in numeric values.
Color of the rectangles is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the double line**: coordinates of the first, second points, length, angle.

See also: "Constructions" button group 193

Wall

The Wall tool is intended for drawing walls with specified thickness and height. In these walls you can make apertures 199 of any shape, for example for doors and windows..

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **Wall.** Second clicking specifies the end point of the **Wall.**

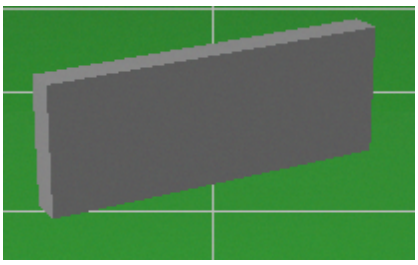
The **length** and the **width** of the wall appear in the status bar 275.

In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the thickness of the wall.

Two buttons allow switching the **orientation** of the second wall side relatively to the first one

.

You can also switch the orientation quickly by pressing the **Space bar**.



In the 3D Video 357 and 3D World 342 a parallelepiped will be displayed at the wall place.
Default minimal and maximal heights of the wall are determined by the line type 475, which constructs the wall. The heights can be set separately for each wall by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the wall in numeric values.
Color of the parallelepiped is determined only by line type 475, which is used at constructing.

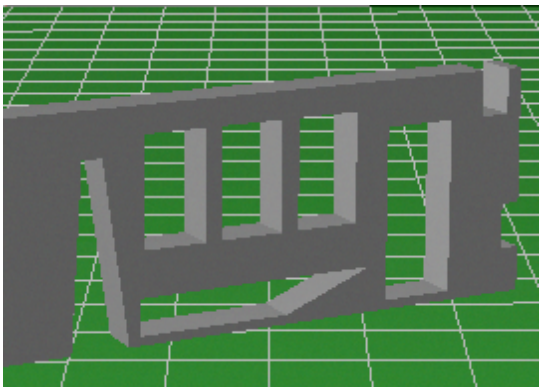
On the **current construction parameters panel** it is possible to set and fix **parameters of the wall**: coordinates of the first, second points, length, angle.

In walls it is possible to make apertures for doors and windows using the Aperture in Wall 199 *tool.*

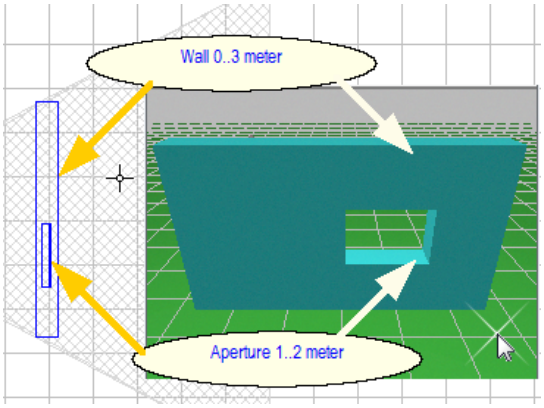
See also: "Constructions" button group 193

Aperture in Wall

The Aperture in Wall tool designed to easily create apertures (openings) of various shapes in the walls, built by the Wall 198 tool.



In order to an aperture will appear in the 3D space, it must intersect the horizontal projection of the wall.



The Aperture in Wall tool is similar to the Inclined rectangle 196 tool. But the **Inclined rectangle** creates a **flat rectangle** in 3D space, but the **Aperture in Wall** placed inside the **Wall**, cuts an aperture in the wall. This aperture equals to the projection of the same **flat rectangle** on the plane of the wall.
The **minimal height of aperture** corresponds to the **lower side** of this rectangle, and the **maximal height** - to the **upper one**.

In the **Graphics window** the upper side of aperture is displayed by **thick line**.

In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the thickness of the aperture.

The Thickness of the wall affects only the shape of aperture projection in the Graphics window. In the 3D Video the apertures always cut through a wall at its full thickness.

Two buttons allow switching the **orientation** of the second aperture side relatively to the first one

.

You can also switch the orientation quickly by pressing the **Space bar**.

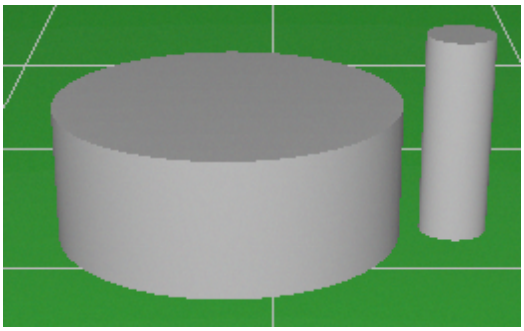
For modeling complex apertures it is possible to edit 189 the Apertures by points, moving its vertexes.
*When moving separate vertexes press **Ctrl**.*
You can create complex apertures using several intersecting apertures.

See also: Wall 198, *"Constructions" button group"* 193

Circle

When this button is pressed, the first clicking on the graphics area 162 specifies the **center of a circle.** Second clicking completes the **circle** construction**.**
The status bar 275 displays the information on the sizes and location of the circle.

To switch the **circle** into the **editing state** you need to double-click on **its center** or on the **point on its radius** that appears during the process of construction.



In the 3D Video 357 and 3D World 342 a cylinder will be displayed in the circle place.

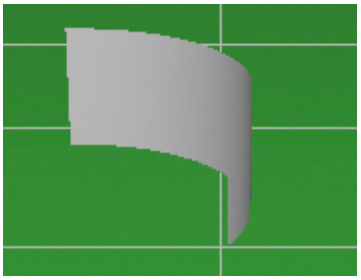
Default minimal and maximal heights of the cylinder are determined by the line type 475, which constructs the circle. The heights can be set separately for each circle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the circle in numeric values.
Color of the cylinder is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the circle**: coordinates of the center and second point, radius, angle.

See also: "Constructions" button group 193

Arc

When this button is pressed, the first clicking on the graphics area 162 specifies the **center** of an **arc.** Second and third clicking specify its **ends.**.
To switch the arc into the **editing state** you need to double-click on **its center** or on either of its two ends.



In the 3D Video 357 and 3D World 342 the arc stretches, creating a cylindrical surface.

Default minimal and maximal heights of the cylindrical surface are determined by the line type 475, which constructs the arc. The heights can be set separately for each arc by means of current construction parameters panel 282, on which it is also possible to set coordinates of the arc in numeric values.

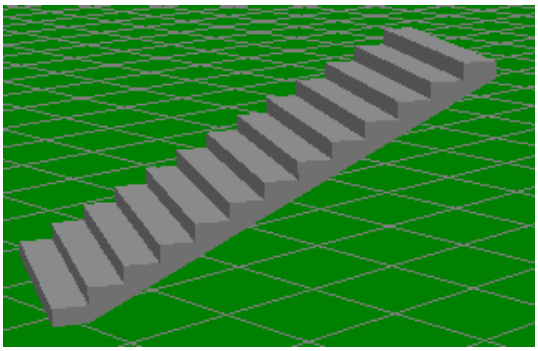
Color of the arc is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the arc**: coordinates of the center, first and second points, radius, angle.

See also: "Constructions" button group 193

Stairs

Stairs is similar to the Inclined rectangle 196 and differs from it that in the 3D Video and 357 3D World 342 windows it is shown in the form of stairs



On the **current construction parameters panel** the minimum height corresponds to the pedestal of the stairs, maximum height corresponds to the top of the stairs.

In the **Graphics window** the upper side of stairs is displayed by **thick line**.

The number of steps is calculated automatically from the height of one step equals to 15 cm.

See also: "Constructions" button group 193

Focal plane

When this button is pressed, clicking on the graphics area 162 in the vertical projection specifies a point through which a plane vertical projection passes. This plane is perpendicular to the **main optical axis** of the active camera lens (parallel to the **lens focal plane**).

The status bar 275 displays the coordinates of the clicked point **relatively to the active camera**.

When changing camera location the position of the obtained plane changes correspondingly.

In the 3D Video 357 and *3D World* 342 *the Focal plane is not displayed.*

Generally speaking, the obtained plane is not a focal one, being only parallel to it.

See also: "Constructions" button group 193

Optical axis

When this button is pressed, clicking on the graphics area 162 specifies a point through which an **optical axis** of the active camera lens passes.

The status bar 275 displays the coordinates of the clicked point **relatively to the active camera**.

When changing a camera location the position of the obtained axis changes correspondingly.

In the 3D Video 357 and *3D World* 342 *the Optical axis is not displayed.*

See also: "Constructions" button group 193

Text

When this button is pressed, clicking on the graphics area 162 specifies the place for a text string. At this point a **pop-up frame** with cursor will appear.
The necessary text is to be entered within a frame. To separate the lines use **Enter**.

The font type panel 281 appears below in the graphics area allowing to change the font type 477. A **pop-up menu** is available within a frame, appearing at clicking the right mouse button.

The entered text is a text marker and can be quickly found using the Find text 247 tool. This is a very convenient and quick means for navigation on big layouts.

See also: "Constructions" button group 193, *Find text* 247

Mask

When this button is pressed, the first clicking on the graphics area 162 specifies the first vertex of **rectangular mask.** Second clicking completes the mask construction**.**

The status bar 275 displays the information on the mask sizes and location.

Using **masks** allows to cover any image parts. Constructions 193 and texts 201 can be drawn over masks.

To cover **separate construction fragments** you can also use **line of white color**.

In the 3D Video 357 and 3D World 342 masks are not shown.

See also: "Constructions" button group 193

Filling

Filling is similar to a mask 202, but can be of any color, and also in the form of **different hatch type**. Color of filling is defined by the **color of line type**, by which the filling is made, and **type of hatching** or its absence - by **style of this line type**.

Fillings, as well as other objects, could be edited 189 *by moving separate vertexes, and thus could be stretched on various objects.*

In the 3D Video 357 and 3D World 342 fillings are not shown.

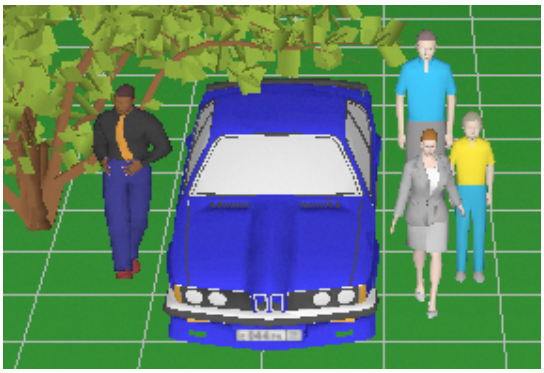
See also: "Constructions" button group 193

3D model

The button opens submenu, in which there are **3D models** which are present in the program library.

When any item in the submenu is chosen, clicking in the graphics area 162 specifies the place for a **3D model**.

***3D models** placement is possible in the horizontal and vertical projections, however only 3D models placed in **the horizontal projection** will be visible in the* 3D Video 357 and 3D World 342.



In the horizontal projection the **3D models** are displayed in the **top view**, in the vertical projection **-** in the **side view**, and in the 3D Video 357 and 3D World 342 models are as **3D objects**.

Horizontal and vertical projections 399 for displaying in the **Graphics window** can be created in the 3D Models 397 window.

3D models can be **moved**, **rotated, copied**, changed draw order 267 as other VideoCAD objects.

The default **height of the 3D models** above the ground is determined by the **maximal height of the line type** 475 which was chosen when the **3D model** was being placed. The height can be set separately for each **3D model** using the current construction parameters panel 282.

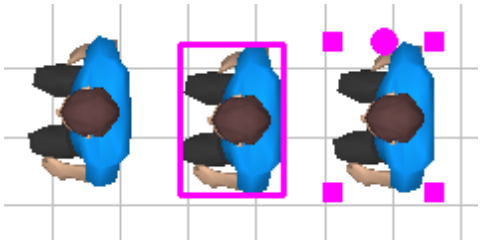
T**o change 3D model height** above the ground, select 262 the 3D model, then change line type 268 or switch the 3D model to editing state by double clicking on it and change value in the **3D H** box on the **Current construction parameters panel.**

By default the **3D models** are on the ground and constructed by the **line type** with the number, specified on the Lines 475 tab of the Options box 474. This line type has the **maximum height equal to 0**.
*Heights can also take on **negative values**, in this case **3D model plunges under ground**.*
*For example, **to place a 3D model on a surface:** construct the surface by the rectangle 196 tool using **line type** with the required maximum height, place the 3D model on it, and then change 3D model **line type** to the line type of the surface.*

In multilevel 3D projects heights are calculated relative to the base height of a layer 277 the which the 3D model belongs. By changing the base height a layer you can move up or down all 3D models and constructions on the layer

In the Editing state 164 using the **Current construction parameters panel** you can resize 3D models separately on axes.
To do this, enter new values into X, Y, Z boxes during 3D model editing. If the box is marked, change of any size leads to proportional change of other sizes, thus model proportions are not broken. 3D model **height above the ground** is displayed and can be changed in **3D H** box.

In the editing state 164, 3D models are displayed with square grips and pink circle. You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.

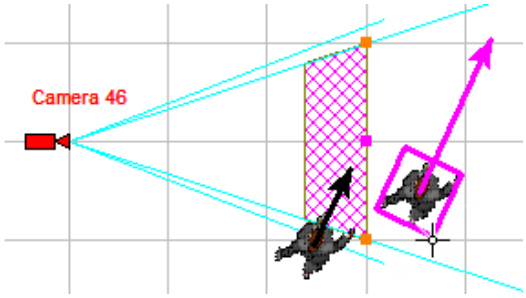


Moving 3D models

3D models can have velocity vectors. Model with specified nonzero speed will move with this speed along a specified direction when modeling exposure time 377, Rolling Shutter 378, interlace distortions 376 and creation of animated images 386.
To set speed to 3D model you should enter a nonzero value in the Speed 283 box in the Current construction parameter panel during the placement or editing 3D models.

If a 3D model 202 has non zero speed, then the **velocity vector** is displayed.

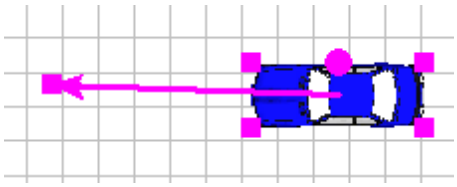
If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model pass per second (crimson arrow)**.
If 3D model is in the **normal state**, the length of the **velocity vector** equals to the



distance which the 3D model passes for the period between successive frames of the Active camera 166 (black arrow).

** the length of the **velocity vector** of a **3D model in the normal state** is inversely proportional to the frame rate 375 of the active camera. Thus we can see how many times the moving 3D model gets into the frame of the active camera.*

You can edit the **velocity vector** of 3D model in editing state by moving its terminus.



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You can hide the **velocity vectors** of all 3D models using the Velocity vectors 241 menu item.

License plate of cars

Let's consider 3D models - cars with license plates. License plate type, the same for all car models, is determined by the file **number.bmp** file in the directory **\Models**, and the **plate size** - by the corresponding settings in the **Options box** on the 3D modeling 480 tab. This opportunity allows using the same models in different countries with different license plates.

To make cars appear in the 3D Video with the license plate of your country:

- create a ***.bmp** file with the image of you license plate;

!! The size of file sides, in pixels, must be equal to powers of two: 16,32,64,128,256,512,1024,2048 ….

- replace the file **number.bmp** by your file;
- specify the sizes of your license plate in the **Options box**.

3D models of terrain

You can use 3D model of terrain of video surveillance, for example: buildings, territory etc. Cameras, constructions, other 3D models can be placed inside the 3D model-territory. VideoCAD offers special tools 397 for working with 3D models-territories

See more: *3D Models window* 397, *3D World window* 342, *Work with 3D model-territory* 602.

Adding new 3D models, manage 3D models

You can add new 3D models to the library using Add 3D Model 262 menu item.

You can add, delete, duplicate 3D models, distribute 3D models by directories in menu, get projections of 3D models for the Graphics window using the 3D Models 397 window.

Files of 3D models in ***.vcm** format can be exported from **SketchUP** and **3ds max** using plugins. Custom 3D models for VideoCAD can be created in **SketchUP** and **3ds max**.

See more: Importing 3D models from SketchUp and Autodeck 3ds Max 599

See also: *3D Video* 357, *3D World* 342, *3D Models* 397, *Options box>Lines* 475, *Options box>3D modeling* 480

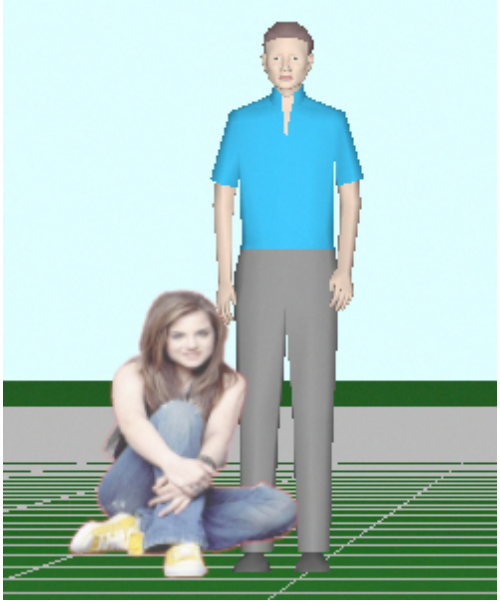
3D image

This tool is similar to Inclined rectangle 196. As well as the **inclined rectangle** it allows to place a rectangle in three-dimensional space at any angle.

But this rectangle can be "covered" by any raster image in *.bmp , *.jpg, *.gif, *.tiff, *.png formats. The image can be a photo or a figure. In *.bmp and *.jpg files, pixels of the image can be transparent if they have a color ***coincided*** with the **color of the left bottom pixel.** Thus the image border can take any form.

In *.png files transparent pixels will be displayed transparent.

In many cases raster images can replace 3D models 202 which are difficult to make. They can be used for modeling many objects from banknotes and plates up to a complex background.



After choosing this button the **Loading 3D image** dialog box appears. After choosing a file in *.bmp,*.jpg,*.jpeg,*.png,*.gif,*.tif or *.tiff format place **3D image** in the same way as Inclined rectangle.
On the Current construction parameter panel 282 the minimal height corresponds to the bottom bound of this rectangle and the maximal height - to the top bound.

In **the Graphics window** the top of 3D images is displayed by **thick** line.

Later **3D image** can be edited 189 by moving its grips. It is possible to change **3D image** sizes on the Current construction parameter panel, delete and change the image file using buttons and . on **the Current construction parameter panel.**

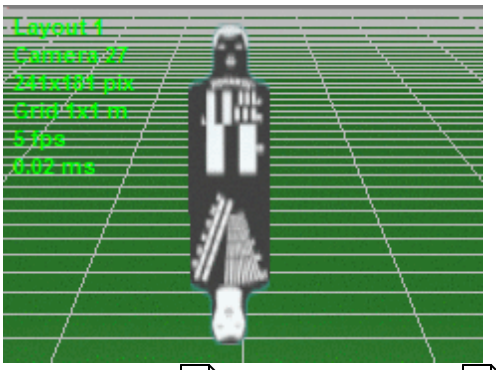
To make transparent pixels with color ***coincided*** with **color of left bottom pixel** (or transparent pixels of *.png file), check **Transparence checkbox** on **the Current construction parameter panel.**

*To get the transparence of *.bmp or *.jpg file, the image file has to be specially prepared by means of any graphic editor, for example **Paint**. **Pixels that should become transparent have to be filled by color that coincides with the color of left bottom pixel.***

See also: *"Constructions" button group* 193

Rotakin

Rotakin - an animated rotating test target for visual estimation of spatial resolution and motion distortions on the 3D images.



In the **horizontal plane** the Rotakin automatically turns towards the Active camera 166.

In the **vertical plane** the Rotakin rotates with a specified speed about an axis passing through its center (in Professional version only).

Rotakin rotates when modeling exposure time 377, Rolling Shutter 378, interlace distortions 376 and creation of animated images 386.

To place the Rotakin specify a place for the Rotakin by clicking.
On the **current construction parameters panel** it is possible to set minimal and maximal heights of the Rotakin.
In the Options box 482 it is possible to change rotation speed of all Rotakin objects.

*Rotating test target named **Rotakin** is used in field testing of video surveillance systems by the techniques developed by the **Home Office Scientific Development Branch** 'Performance **Testing of CCTV Perimeter Surveillance Systems (Using the Rotakin Standard Test Target)** ". The Rotakin model meets the requirements of the document.*

See also: "Constructions" button group 193

Illuminator

The tool is designed to model illuminators with photometric accuracy.

As a result of clicking this button the **Illuminator calculation box** appears.
You can specify internal parameters of an illuminator in the box.

See more: Illuminator calculation 461.

You can open the Illuminator calculation box 461 by the button on the Current construction parameter panel 282 during placing or editing Illuminator.

On the Line type panel 280 it is possible to choose the line type 475, by which the Illuminator's icon will be drawn. Later line type can be changed using Change line type 268 tool.

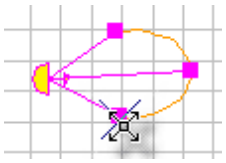
On the **Current construction parameter panel** it is necessary to specify **Illuminator height** relative to the base height 277 of a layer to which the illuminator belongs and **Inclination angle** (for projectors).

See more. Current construction parameter panel> Illuminator 284.

After assigning the parameters in the **Illuminator calculation box** and on the **Current construction parameter panel**, specify an Illuminator place by the first clicking in horizontal projection. Then specify a radiation axis direction by the second clicking (for projectors).

If graphic specifying **angle of radiation** and **Light intensity distribution curve (LIDC)** are not required, click for the third time on any point in the graphics area.
To specify **angle of radiation** and **LIDC** graphically after the second clicking clear **Angle** checkbox on the **Current construction parameter panel**. After that by the third clicking specify **angle of radiation** and **light intensity concentration** on an axis of radiation.

Light intensity distribution curve *is displayed by orange line.*
Light intensity distribution curve represents relative light intensity distribution. The curve does not depend on absolute values.



It is possible to specify parameters after the Illuminator placement. To set parameters click **Edit** button and set parameters on the **Current construction parameter panel**. To open **Illuminator calculation box** click the button.
In order to edit angle of radiation and concentration by moving pink grips, press and keep **Ctrl** pressed.

Created Illuminator will take part in 3D image modeling from some camera only if for this camera:

- Illumination modeling is switched on 372;
- Illuminators are enabled 373;
- The Illuminator is switched on 286.

While modeling Illuminators VideoCAD considers only direct light. Reflected light can be considered only approximately by specifying a part of light from this Illuminator diffused on the scene. Shadows cannot be modeled in VideoCAD.

See also: Illuminator calculation 461, Current construction parameter panel 282.

Field-of-view size at point

When this button is pressed, moving the cursor in the vertical projection of graphics area 162 a field-of-view size value passing through the cursor point is indicated on the Status bar 275

The **field-of-view size** depends on **height** and **distance**, therefore measuring in the **vertical projection** is allowed only.

The button is available in the graphical editing state 167 only.

*If no other measurements made after the **field-of-view size** is marked at a point, with changing a camera position, the values in the status bar change correspondingly, thus representing the current **field-of-view sizes** at a point.*

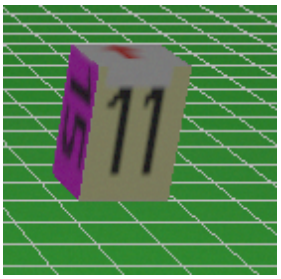
See also: "Constructions" button group 193

Test object location

When this button is pressed, clicking on the graphics area 162 specifies the **test object location**. The parameters of **test object location** in the test object dialog box 507 change correspondingly.

The button is available in the graphical editing state 167 only.

Test object can be seen in the 3D Video 357 in the **graphical editing state**.



See also: Test object box 507

Signal cable

When this button pressed, you can draw the **signal cable** of the Active camera 166 by successive clicks in the **graphics area**. The end of each segment is the start of the next one. To stop drawing cable, press **ESC.**

The status bar 275 displays the segment length and its projection to distance and height.

Both clicks are to be made in the **same projection**. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing the drawing the segment is attached to the projection with its **initial point**.

A cable consists of **segments**, allowing to draw it in different projections and layouts, representing an actual scheme of laying accurately.

When copying 191 the **cable segments** between **cameras** and layouts 513 a process of cable drawing is accelerated considerably even in complex CCTV systems.

When drawing a cable the menu item Cable laying 271 might be used. When choosing it a float panel of the same name appears enabling to choose a shift of segment ends for a level parallel cable drawing along the walls, columns etc.

The type and parameters of **line designating the Signal cable** can be changed in the options box 475.

VideoCAD summarizes the lengths of all the segments, considers the **reserves** and calculates the **total length of cable**. To change the default parameters and obtain the calculation results double-click the image of any cable segment or click **Signal cable** again.
A dialog box of the same name appears after that.

The results of the cables' calculation on each individual camera and on the project as a whole are included into the text file obtained by Text report 216, Table of cameras 443 and Cable report 271.

In multi-layer drawings, cables belong to the same layer 276 as a camera to which the cables belong.

It is possible to use Line segments 195 for cable modeling with subsequent cable length calculation. Use separate line types 475 for drawing a cable of each type. For length calculation use the Length calculation of line segments 517 tool and the Cable report 271.

See also: "Constructions" button group 193, View>Active camera cables 242, View>All camera cables 242, Cable laying 271, Length calculation of line segments 517, Cable report 271.

Power cable

When this button pressed, you can draw the **power cable** of the Active camera 166 by successive clicks in the **graphics area**. The end of each segment is the start of the next one. To stop drawing cable, press **ESC.**

The status bar 275 displays the segment length and its projection to distance and height.

Both clicks are to be made in the **same projection**. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing a drawing the segment is attached to the projection with its **initial point**.

A cable consists of **segments**, allowing to draw it in different projections and layouts, representing an actual scheme of laying accurately.

When copying 191 the **cable segments** between **cameras** and layouts 513 a process of cable

drawing is accelerated considerably even in complex CCTV systems.

When drawing a cable the menu item Cable laying 271 might be used. When choosing it a float panel of the same name appears enabling to choose a shift of segment ends for a level parallel cable drawing along the walls, columns etc.

The type and parameters of **line designating the power cable** can be changed in the options box 475.

VideoCAD summarizes the lengths of all the segments, considers the **reserves** and calculates the **total length of cable**. To change the default parameters and obtain the calculation results double-click the image of any cable segment or click **Power cable** again.

A dialog box of the same name appears after that enabling to choose a **cross-section area of power cable** to fit the requirements of **camera voltage supply**. It is assumed that the conductor material is **copper** and the conductor temperature is **+ 50° C**

The results of the cables' calculation on each individual camera, each individual section area and on the project as a whole are included into the text file obtained by Text report 216, Table of cameras 443 and Cable report 271.

In multi-layer drawings, cables belong to the same layer 276 as a camera to which the cables belong.

It is possible to use Line segments 195 for cable modeling with subsequent cable length calculation. Use separate line types 475 for drawing a cable of each type. For length calculation use the Length calculation of line segments 517 tool, Cable report 271.

See also: "Constructions" button group 193, View>Active camera cables 242, View>All camera cables 242, Cable laying 271, Length calculation of line segments 517, Cable report 271.

Global snaps

This button is used to promptly switch global snaps 258 on/off.
Snaps enhance the convenience in drawing. As a result of the snaps' functioning the cursor "sticks" to the certain **points**, **lines** or **directions**.

- **Points** - the cursor sticks to base object points.
- **Lines** - the cursor sticks to objects lines.
- **Angular** snap functions at construction of line segments, angles, cables, and at moving and rotating as well. After that the subsequent construction points are leveled from the previous points horizontally and vertically.
- **Extension** - the cursor sticks to the virtual horizontal and vertical lines passing through base objects points.

The snap Extension is disabled for hidden 267 objects and in the Select/Edit 189 mode.

- **At grid** - the cursor sticks to grid nodes.

In the pop-up menu you can choose permanent opened **snap panel**, with the help of which it is convenient fast switch the snaps during drawings.

*In the Options box 490 you can change **snap sensitivity**.*

You can disable snaps for any layer 276 using parameter of layers - Snap 277.

"Active camera" control element group

Change installation height

When this button is pressed, clicking in a **vertical projection** specifies a new **height of the Active camera** 166 **installation**.
The value of camera installation height 296 in the Camera Geometry box 291 changes according to the clicked point height.

Change view area upper bound

When this button is pressed clicking in a **vertical projection** specifies a new height of the view area upper bound 298 and new distance up to the view area upper bound 301.
Clicking in the **horizontal projection** specifies a **distance up to the view area upper bound** only. The values of correspondent parameters in the Camera Geometry box 289 change to clicked point coordinates.

You can change view area upper bound in the Select / Edit 189 mode, by moving the grip in the middle of the view area upper bound.

Change view area lower bound

When this button is pressed clicking in a **vertical projection** specifies a new **height of the view area lower bound**. The values of view area lower bound height 300 in the Camera Geometry box 289 change according to a clicked point height.

Move active camera

When this button is pressed, clicking on the graphics area 162 specifies a **new location of the Active camera** 166 relative to the view area upper bound, test object, constructions and other cameras. All the parameters' values are recalculated.

Show active camera

Clicking this button make visible the active camera with it's view area in the graphics area 162. The **scale** is chosen automatically. If the active camera is disposed in another layout 513, the correct **layout** is activated.

In this mode the scale changing and drawing dragging are not available.
It is convenient to use this tool at both projections 187 switched on, and also together with the Edit active camera 210 tool.
For switching off this mode, click the same button once again.

Edit active camera

Clicking this button switches the Active camera 166 into the graphical editing state 167.

A drawing in the graphics area 162 rotates so that the direction of the **main optical axis** of camera lens becomes parallel to the display plane, and view area edges of the active camera are displayed in lines of double thickness. The view area upper 298 and lower bounds 300 are displayed in horizontal **green** lines.

If the Spatial resolution 177 is displayed, the **horizontal red line** indicates the height of measurement of the spatial resolution.

*This state enables the detailed analysis of **view area** using the test object 507.* In the **vertical projection** calculation of the depth of field 454, the calculating the field-of-view sizes 207 at any point of view area and displaying Spatial resolution 316. Test object can be seen in the 3D Video 357 in the graphical editing state.

In the **graphical editing state** of the active camera, selection and rotation of the active camera is blocked to prevent displacement of the background, constructions and cameras relative to each other on other layouts.

See more: Graphical editing state 167.

"Scale" button group

Move drawing

When this button is pressed you can move a drawing within the graphics area 162 using the mouse.
To do that press and hold down the **left mouse button** at any spot of drawing and then move the mouse holding the button down. To stop moving the drawing release the mouse button.

If your mouse is an **Intellimouse** or other **Wheel mouse** you can move the drawing at any time by pressing and holding the **middle button** down.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

When the Show active camera 210 button is pressed, moving the drawing is not allowed and this button is unavailable.

Zoom IN/Zoom OUT

Clicking these buttons increases or reduces a **drawing scale** correspondingly.

Using the **Intellimouse** or other **Wheel mouse** you can change the **drawing scale** with the simultaneous zooming in the drawing sections pointed by the cursor.

If **Ctrl is not pressed** at changing the scale, then **the scale changes roughly** which is convenient at navigation. If **Ctrl is pressed**, **the scale changes with the less step** which is convenient for the precise drawing positioning before printing, saving or exporting.

If input focus is on the graphics area, scale can be changed by + and - buttons on the keyboard.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

When the Show active camera 210 button is pressed, moving the drawing is not allowed and this button is unavailable.

"Undo" button group

UNDO

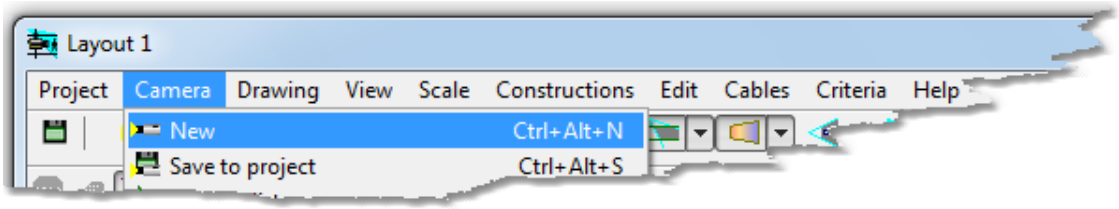
Undo the last operation.

VideoCAD stores several **last operations including Undo operation**. When clicking this button successively VideoCAD retraces to the last states and a state before the button **Undo** was clicked for the first time.
The quantity of the stored operations can be adjusted in the Options box>Miscellaneous>UNDO depth 492.

REDO

Redo the last operation undone by the UNDO 211 tool.

9.1.3 Main menu



See Main menu location 161

Menu items substantially duplicate the buttons of the tool bar 169; however, there are certain advanced tools.

Keyboard shortcuts 479, 288 can be assigned to each menu item.

- **Project**

  New 215
  Open 215
  Save 215
  Save as 215
  Import from VideoCAD3..6 215
  Export to VideoCAD3..6 215
  Text report 216
  PDF Report 216
  Exit 216

- **Camera**

  New 216
  Save to project 217
  Camera list 217
  Table of cameras 218
  Numerate cameras 218
  Table of camera models 218
  Show active camera 218
  Edit active camera 218
  Change installation height 219
  Change view area upper bound 219
  Change view area lower bound

- **View**

  View area edges 228
  View area projections bounds 229
  Fill projections 231
  Spatial resolution 232
  Shadow 235
  Calculate shadows for active camera 239
  Recalculate Shadows 239
  3D view area 239
  Person detection area 240
  Person identification area 240
  License plate reading area 241
  Titles 241
  Camera names 241
  Velocity vectors 241
  Active camera cables 242
  All cameras' cables 242
  Cameras over constructions 242
  High resolution on top 242
  Camera Geometry 243

- **Constructions**

  Point 247
  Horizontal line 247
  Vertical line 247
  Focal plane 248
  Optical axis 248
  Line segment 248
  Polyline 249
  Angle 249
  Rectangle 250
  Inclined rectangle 250
  Double line 251
  Wall 252
  Aperture in Wall 252
  Circle 253
  Arc 254
  Stairs 254
  Text 255
  Mask 255
  Filling 255
  3D image 255
  Rotakin 256
  Illuminator 257
  Field-of-view size 258
  Test object location 258
  Global snaps 258
  Lock constractions 259

- **3D Models**

  3D model 259
  3D Models window 261

- **Edit**

  Bring to front 267
  Send to back 267
  Hide 267
  Align 267
  Change Line type 268
  Move to active layer 268
  Combine to block 268
  Merge contour 268
  Destroy 268
  Switch ON illuminators 268
  Switch OFF illuminators 269
  Undo 269
  Redo 269
  Erase 269
  Erase all 269

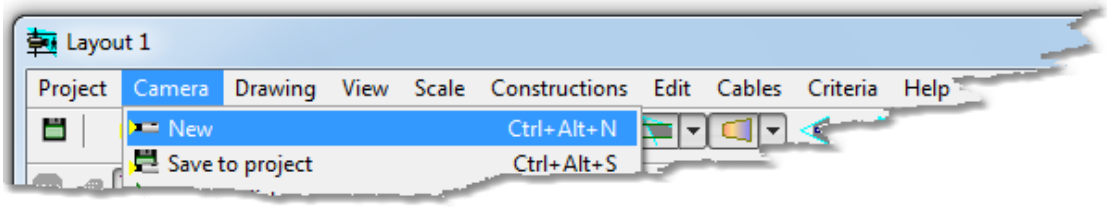
- **Cables**

  Signal cable 269
  Power cable 270
  Cable laying 271
  Length calculation of line segments 271
  Cable report 271

- **Criteria**

  Person detection area 271
  Person identification

9.1.3.1 Menu items



See Main menu location 161.

Menu items substantially duplicate the buttons of the tool bar 169*; however, there are certain advanced tools.*

Keyboard shortcuts 479, 288 can be assigned to each menu item.

Project > New

Create new project.
A project may contain unlimited number of cameras and up to **10** layouts 226.

In the New project dialog box type the **new project name**.

You can change the **format of measurements** in new project when necessary: **Metric** (meters, millimetres) or **Imperial** (feet, inches).

Project > Open

Open earlier saved project.
Choose a project file. If the current project was not saved, VideoCAD offers to save it.

Project > Save

Save project to a file.
If a project is saved for the first time, the dialog box **Save as** appears enabling to change a project **filename** and a saving directory when needed.

Project > Save as

Save project to a file under another name or in another directory.
In the appearing dialog box choose a filename and a directory to save it.

The project includes all information on the program settings (line types, fonts, etc.).

Project > Import from VideoCAD3..6

Import of the previous project format ***.vmp**, supported by VideoCAD versions from 3 to 6.. In the appearing dialog box choose a filename with ***.vmp** extension.

If after importing project seems incorrectly, - restart VideoCAD.

Project > Export to VideoCAD3..6

Export current project to the previous project format ***.vmp**, supported by VideoCAD versions from 3 to 6.. In the appearing dialog box choose a filename with ***.vmp** extension.

***.vmp** file can contain no more than 100 cameras and no more than 5000 constructions on each layout. All that exceeds these limits, will be lost. Also new tools which appeared in VideoCAD7 and VideoCAD8 will not be saved.*

Project > Text report

Export the data on most of the **specified** and **calculated** parameters of cameras and **cables** included into the current project to a text file.

Enter a filename. A default filename coincides with the **project name**.

When clicking **OK**, the text document obtained is automatically loaded into a **text editor** for viewing and editing.

You can copy and paste the text obtained into a project explanatory note.

All parameters of cameras in the project can be obtained in the form of adjustable table which can be exported into various formats. You can get a report in PDF format 216.

See also: PDF report 216, Table of cameras 443, Cable report 271

Project > PDF report

Export the data on most of the **specified** and **calculated** parameters of cameras and **cables** included into the current project to a PDF file.

Unlike the Text report 216, the **PDF Report** can include images from the cameras, fragments of layouts with camera placed, a cover with logo. Report parameters and the structure of information in the report is configurable.

After choosing this menu item, a dialog box for configuring the report parameters will appear. After the setting, click **OK** in the dialog.

See more details about PDF report configuration: PDF Report 519

Generating a report in PDF format can take a lot of time, while generating the image in the Graphics window may vary, the 3D Video 357 window can appear. Be patient, do not touch the mouse and keyboard.

All parameters of cameras in the project can be obtained in the form of adjustable table which can be exported into various formats.

See also: PDF Report 519, Text report 216, Table of cameras 443, Cable report 271

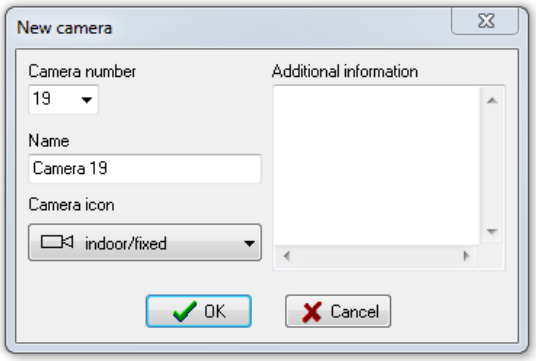
Project > Exit

Exit the program.

Camera > New

Create **new camera** with default parameters.

In the dialog box appeared you can change **camera number**, **name**, type of the camera which determines the kind of icon by which it will be displayed. If necessary, you can enter **additional information** on the created camera (for example: purpose, a place and features of installation).



Later it is possible to change name, number, type of the camera and the additional information in the Camera list 509 box.
Cameras can be numerated sequentially with the help of the Numerate cameras 218 tool.
Cameras are displayed by different icons only if the Display camera type 483 box in the Options box 474 is marked.

On the Line type panel 280 it is possible to choose line type 475 by which the icon of the camera and View area projection bounds 173 will be drawn. When displaying spatial resolution 177 is disabled, projection will be filled 175 (hatched) by the color of assigned line type. Later it is possible to change line type using Change line type 268 tool.
Hatch style 175 is determined by style of a line type 475, assigned to the camera (solid, dash, dot, dash dot etc.).

After entering all necessary data click **OK**, to cancel the operation click **Cancel**.

If there is already a camera with chosen number in the current project, VideoCAD will ask to specify, whether you would like to rewrite it.
After camera creation specify by clicking a place for the new camera on the layout.
Just after camera creation the moving mode will be switched on. When placing will be completed, click Select/Edit 189 button or press **ESC**.

It is convenient to create new cameras with already set parameters by copying 191 and pasting 191 existing ones.

At the moment of placing new camera 171 or pasting 191 copied camera, its base height 298 is set to the base height of the active layer 277.

Camera > Save to project

All the **specified** and **calculated parameters** of the active camera and layout are saved to the current project.

Saving is performed automatically at many operations.

Camera > Camera list

Clicking this button opens **Camera list box**, in which camera list of current project is displayed. **Active camera** is highlighted by **red frame**. Any camera can be activated, removed, renamed, found on layouts, it is possible to show 3D image from any camera. It is also possible to sort cameras in the list. For carrying out any manipulations with the camera first select its name in the list by single clicking.

See more: Camera list 509

Camera > Table of cameras

Show interactive Table of parameters of all cameras in the project. The table can be exported to *.txt, *.csv, *.htm, *.rtf, *.xls formats.

See more: Table of cameras 443

Camera > Numerate cameras

Open the Numerate cameras 511 tool. This tool allows renaming and serial numeration any quantity of cameras simultaneously.

See more: Numerate cameras 511

Camera > Table of camera models

Show **Table of camera models**. In the table it is possible to set parameters to models and assign any model to the active camera. The table can be exported to *.txt, *.csv, *.htm, *.rtf, *.xls formats.

See more: Table of camera models 419

Camera > Show active camera

Clicking this button make visible the active camera with it's view area in the graphics area 162. The **scale** is chosen automatically. If the Active camera 166 is disposed in another layout 513, the correct **layout** is activated.

In this mode the scale changing and drawing dragging are not available.
It is convenient to use this tool at both projections 187 switched on, and also together with the Edit active camera 210 tool.
For switching off this mode, click the same button once again.

Camera > Edit active camera

Clicking this button switches the Active camera 166 into the graphical editing state 167.

A drawing in the graphics area 162 rotates so that the direction of the **main optical axis** of camera lens becomes parallel to the display plane, and view area edges of the active camera are displayed in lines of double thickness. The view area upper 298 and lower bounds 300 are displayed in horizontal **green** lines.

If the Spatial resolution 177 is displayed, the **horizontal red line** indicates the height of measurement of the spatial resolution.

*This state enables the detailed analysis of **view area** using the test object* 507. In the **vertical projection** calculation of the depth of field 454, the calculating the field-of-view sizes 207 at any point of view area and displaying Spatial resolution 316. Test object can be seen in the 3D Video 357 in the graphical editing state.

*In the **graphical editing state** of the active camera, selection and rotation of the active camera is blocked to prevent displacement of the background, constructions and cameras relative to each other on other layouts.*

See more: Graphical editing state 167.

Camera > Change installation height

When this button is pressed clicking in a **vertical projection** specifies a new **height of the Active camera** 166 **installation**.
The values of camera installation height 296 in the Camera Geometry box 291 change according to a clicked point height.

Camera > Change view area upper bound

When this button is pressed clicking in a **vertical projection** specifies a new height of the view area upper bound 298 and new distance up to the view area upper bound 301.
Clicking in a **horizontal projection** specifies a **distance up to the view area upper bound**. The values of correspondent parameters in the Camera Geometry box 289 change to clicked point coordinates.

You can change view area upper bound in Select / Edit 189 mode, by moving the the grip in the middle of the view area upper bound.

Camera > Change view area lower bound

When this button is pressed clicking in a **vertical projection** specifies a new **height of the view area lower bound**. The values of view area lower bound height 300 in the Camera Geometry box 289 change according to a clicked point height.

Camera > Move active camera

When this item chosen clicking in the graphics area 162 specifies a **new position of the active camera** relative to the view area upper bound, test object, constructions and other cameras. All the parameters' values are recalculated.

Camera > Move active camera name

When this item chosen, clicking in the graphics area 162 specifies **new location of the active camera name** relatively to its icon **in the projection which you clicked**.

If the Options box>Camera and Illuminator>Camera Icon>Scalable 483 **is not checked**, then the size of the camera icon is not scalable so the distance up to the name also cannot be scalable. The distance is saved in pixels.
If the **Scalable is checked**, then the size of the camera icon is scalable so the distance up to the name is scalable too. The distance is saved in meters(foot).

Scalable and unscalable positions are stored separately, so switching the Scalable box will not lead to losing of the saved positions of the camera name.

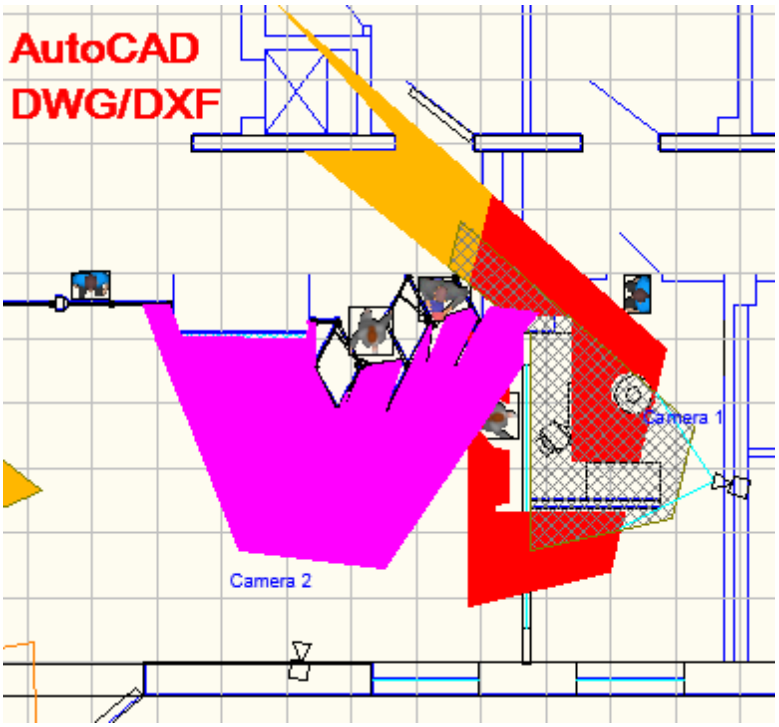
Drawing > Save as

The item opens a submenu in which a **format of saving drawing file** can be chosen. You may save the drawing in any of the following formats: ***.dxf, *.dwg, *.wmf, *.emf, *.emf+, *.gif, *.tif, *.png, *.pdf** (raster and vector)**, *.plt** (HPGL/2), ***.cgm** (Computer Graphic Metafile), ***.swf** (Adobe Flash), ***.bmp, *.jpg**.

To the ***.png, *.pdf (raster), *.bmp, *.emf+ (vector)** formats, a copy of the image in the Graphics window is exported practically without artefacts. The default export is performed with the same resolution as on the screen. You can increase the resolution of the drawing on the Export 487 tab in the **Options box**. Therein you can also configure other export parameters.

Export to AutoCAD *.dxf, *.dwg is much more than a copy of the image in the Graphics window:

- Cameras with view areas are exported as AutoCAD blocks, view area bounds are exported as polylines. To attributes of the block the most important parameters of the camera are recorded: Name, Model, Lens focal length, Height of installation, Base height, Heights of view area lower and upper bounds, View angles, Number of pixels, Spatial resolution pattern, Quality level.
- Illuminators are exported as AutoCAD blocks. To attributes of the block the most important parameters of the illuminators are recorded: Lamp type, Number and power of lamps, Height of installation.
- Distribution by layers 276, set in VideoCAD is saved.
- Hatching and filling of shadows 178 are saved.
- Styles and weights of lines 475 set in VideoCAD are saved.
- Point of origin is saved.
- Grid is exported as AutoCAD block with attributes.
- In the exported file the references to raster insertions are saved: background and 3D model projections. Raster images in *.png format are exported along with DXF or DWG file into a separate directory **<exported file name>_img**.
- Gradient is changed to filling by separated colors. Transparence of filling is not saved.
- Objects in hidden 167 state are not exported to AutoCAD, thus to exclude some objects from export - hide 267 them.
- Before export to AutoCAD **activate any of visible cameras**, adjust maximum distance 307 of view area of cameras with infinite view areas.
- When you export a drawing with the background in AutoCAD DWG/DXF format, VideoCAD constructions can be added to the background on separate layers 486 or the background can be added as an external links to the file of the background. In both cases the structure of the background is saved.
- Possible scheme of the combining AutoCAD + VideoCAD:
  1. Load drawing in AutoCAD format as a background;
  2. Adding cameras and constructions on special layers.
  3. Export the obtained drawing to AutoCAD format to work with it in AutoCAD.



See more: Work with background in AutoCAD format 631
More about export options to AutoCAD: Options box>Export>DXF,DWG,PLT,CGM,SWF,vPDF 485

***. wmf** format is very outdated, it does not support images of 3D models, semitransparent (blend) and gradient filling projections. ***. emf** format does not support gradient and blend filling.*

While saving to **vector *.pdf,** the transparency and rotation of **3D model projections** are not saved.

*An alternative way to export to ***.pdf** is to print* 215 *to a virtual printer, which produces printing result as a PDF file. In this method, the weight and color of lines* 475*, fonts* 477 *will match the values specified for printing.*

While saving to ***.gif,** color distortions are possible, while saving to ***.jpg** compression artefacts can be visible .

While saving to other formats, mentioned above and other distortions are possible.

Clicking a sub-item with extension name will open the Export 485 tab in the Options box 474. It is possible on the tab to adjust export parameters: exporting drawing scale, camera icon and illuminator icon sizes, size of nonscalable fonts, step of dash line and step of hatches.

After closing the Options box the dialog box **Save drawing as** appears enabling to choose a **filename** and a **saving directory**.
The file name coincides with the layout name by default.

*You can save the drawing with a frame and tittle-block. To do this chose **Print*** 226*, chose frame with a tittle-block then save the drawing.*

If export module of VideoCAD can not export drawing with a complex background in AutoCAD format, try the following:
1. Hide the background;
2. Export;
3. Combine the obtained dxf file with the original background in AutoCAD or any other program that

can do it.

Shift and rotation between background and drawing are possible when exporting drawing with a background in AutoCAD format with the active **User Coordinate System (UCS)**. The shift can be corrected in AutoCAD. To prevent the shift do not use as a background files with the active User Coordinate System. Use the files in the **World Coordinate System (WCS)**. Before loading a file with **UCS** as a background, open it in AutoCAD and use the **PLAN** command.

See also: Export of 3D view areas to DXF 354, *Work with background in AutoCAD format* 631, *Options box>Export* 485, *PDF Report* 216

Drawing > Save as background

The menu item is intended for converting graphics files and VideoCAD constructions in the **high resolution *.emf file**.
When converting, cameras images, titles and grid are excluded from the obtained file.

Thus, the obtained file contains:

- the loaded background 222;
- VideoCAD constructions 193.

If necessary to hide **constructions**, use the item Background only 226.

Drawing > Copy to clipboard

Copy drawing to **Windows clipboard**.

Choosing this item opens a submenu allowing to choose the **format** in which the drawing will be copied to the clipboard.

After that the drawing can be pasted into any document, e.g. into a project explanatory note.
A drawing is copied in a displayed size.

Drawing > Load background

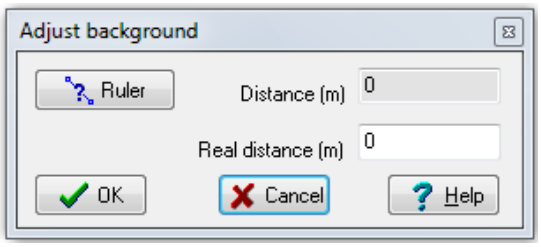
This item opens a submenu allowing to choose a **projection** to load a background.

After choosing item a **dialog box for choosing background file** appears. Graphic files of the following formats can be used as a **background**: ***.bmp, *.jpg, AutoCAD *.dxf, *.dwg, *.wmf, *.emf, *.emf+, *.gif, *.tif, *.png,**.pdf.

Choose the necessary file in the dialog box and click **OK**.

The **background** will appear in the chosen projection along with the dialog box Adjust background 223. Using its tools is necessary to bring an **image scale** on the background in correspondence with the **general VideoCAD scale**.

- Click the **Ruler** button
- Specify by clicking **2 points on the background image**, the distance between which is known to you (e.g., the length of a building, a wall, etc.). In the **Distance** box the measured distance at the current scale will appear.
- Enter the known distance into the **Real distance** box and click **OK**.



The background will be automatically scaled so that the **distance specified by you** will be equal to the **entered value of real distance**.

If the loaded background is in PDF format, the Adjust background dialog includes fields for selecting page in the PDF document and to set resolution of the PDF document. If the loaded background is in DXF or DWG format, the dialog includes tools to select a layout and to control visibility of layers of the background, as well as a checkbox to hide texts.

*If the background is **already loaded**, and you load a background without removing 226 the previous one, then the size, scale and location of a new background will remain the same as of a previous one. In this case, the proportion between the sides of a new background might be distorted.*
*If you **remove an old background beforehand**, then the new one will be automatically placed according to the size of a file and the current scale on the screen.*

The project includes background files themselves, therefore when moving the project file don't worry about the background files moving.

If VideoCAD can not read a file in AutoCAD format or reads it incorrectly, proceed as follows:

1. *Open your file in AutoCAD, check the scale, check the presence of remote from the main construction details, check for other abnormal details. If necessary, correct the detected errors.*
2. *Create a new blank file in AutoCAD*
3. *Copy from your file only those constructions that are necessary to accommodate the cameras.*
4. *Save the file as dxf version no later than 2015.*
5. *Load this file in VideoCAD as a background.*

See also: Adjust background 223, Move background 224, Hide background 224, Delete background 226, Thin lines of raster background 492.

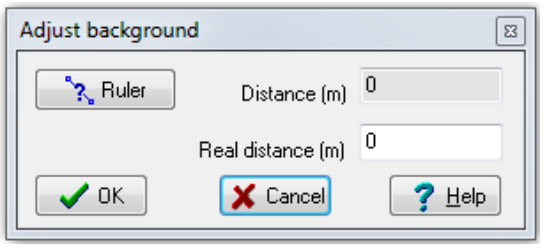
Drawing > Adjust background

This item opens a submenu allowing to choose a projection to **adjust** background.

After choosing item the dialog box **Adjust Background** appears. Using its tools is necessary to bring an **image scale on the background** in correspondence with the **general VideoCAD scale** .

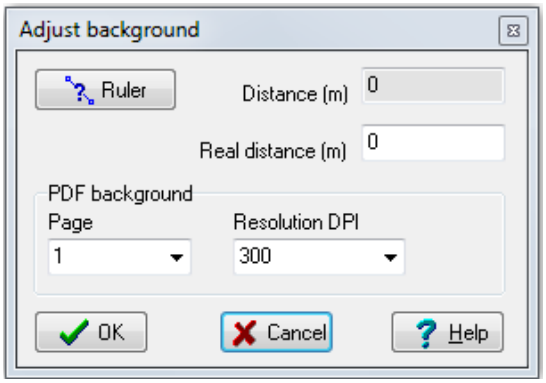
Sequence of actions:

- Click the **Ruler** button
- Specify by clicking **2 points on the background image**, the distance between which is known to you (e.g., the length of a building, a wall, etc.). In the **Distance** box the measured distance at the current scale will appear.
- Enter the known distance into the **Real distance** box and click **OK**.



The background will be automatically scaled so that the **distance specified by you** will be equal to the **entered value of real distance**.

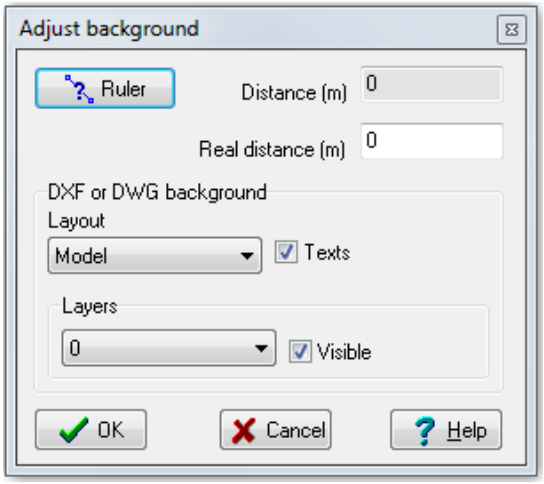
If the loaded background is in PDF format, the Adjust background dialog includes fields for selecting page in the PDF document and to set resolution of the PDF document.



If the loaded background is in DXF or DWG format, the dialog includes tools to select a layout and to control visibility of layers of the background, as well as a checkbox to hide texts.

To enable/disable layers: choose layers name in the **Layers** list, then mark or clear the **Visible** checkbox.

See also: Work with background in AutoCAD format 631, *Import DXF/DWG background* 224



Drawing > Move background

This item opens a submenu allowing to choose a projection to **move** background.

After choosing item clicking in the graphics area 162 specifies **new location of the background in the corresponding projection**.

Drawing > Hide background

This item opens a submenu allowing to choose a projection to **hide** background.

The **hidden background** and all its parameters are stored in memory, but the background is not displayed. It is convenient for increasing speed on weak computer or in some other cases.

If export module of VideoCAD can not export drawing with a complex background in AutoCAD format, try the following:

1. Hide the background;
2. Export;
3. Combine the obtained dxf file with the original background in AutoCAD or any other program that can do it.

Drawing > Import DXF/DWG background

Using this tool you can import 2D constructions from a background in AutoCAD formats to VideoCAD 3D constructions 193 automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions. Specially prepared background file is not required, but

if a background is pre-prepared in AutoCAD, then the efficiency of import will be higher.

Order of work:

1. Load 222 and adjust (scale) 223 the background, show it on the screen.

2. Choose Main menu>Drawing>Import DXF/DWG background

3. In the appeared box adjust the **Filter of constructions**, in order to make visible only constructions you want to import. You can filter constructions by layout, layer, line type, color, line weight, name.

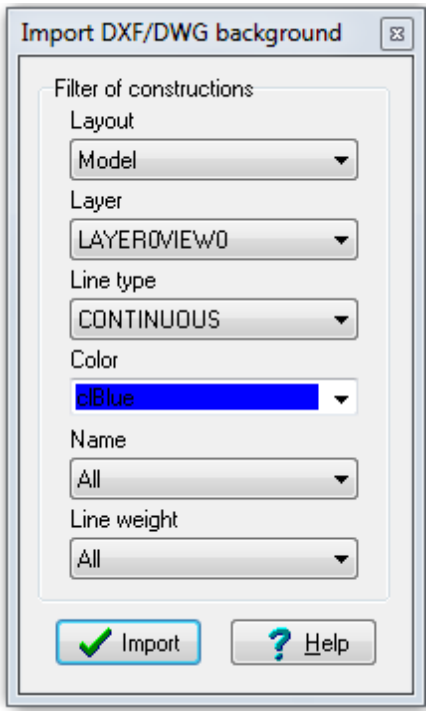
4. Make **active** a layer 276 of VideoCAD, to which you want to import.

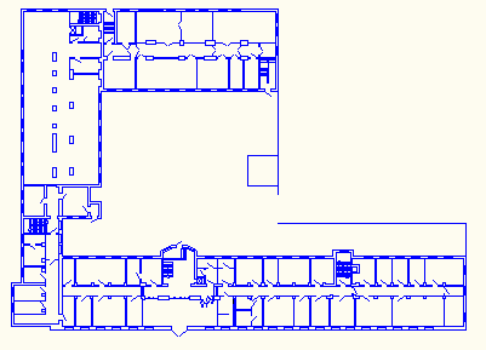
5. On the Toolbar 169 choose a type of VideoCAD construction to which you want to import filtered constructions from the background. You can import to Line segment 248, Polyline 249, Inclined rectangle 250, Double line 197, Wall 198, Aperture in wall 199.

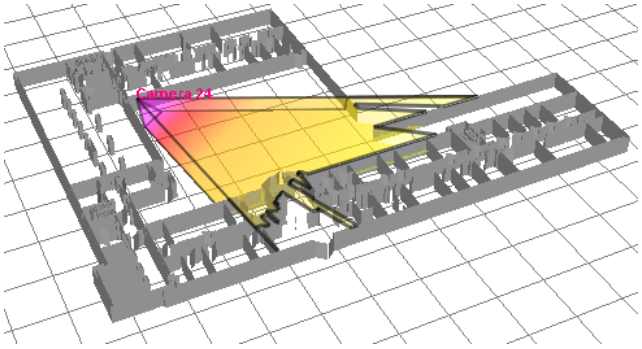
While importing to the Aperture in wall 199, you can cut gaps in existing walls. While importing to the Inclined rectangle 250 , you can make it semitransparent.

6. On the Current construction parameter panel 282 set parameters of the chosen VideoCAD construction (line type 280, Heights, Thickness of walls etc.).

7. Click **Import**. The result will be the same, as if you have outlined selected constructions manually.







Imported constructions are usual VideoCAD constructions 193, you can edit them.
*You can repeat steps **3..7 many times**, to import different constructions from the background to different construction types of VideoCAD, on different heights, to different layers, by different colors etc.*
*Not all types of background constructions can be imported. In VideoCAD8 you can import **lines** and*

polylines *on the layout or in blocks.*

See also: Work with background in AutoCAD format 631

Drawing > Delete background

This item opens a submenu allowing to choose a projection to remove background.

Choosing item from the submenu removes **background** and all its parameters from the project.

If the background is ***already loaded****, and you load* 222 *a background* ***without removing the previous one****, then the size, scale and location of a new background will remain the same as of a previous one. In this case, the proportion between the sides of a new background might be distorted.*
If you ***remove an old background beforehand****, then the new one will be automatically placed according to the size of a file and the current scale on the screen.*

Drawing > Background only

After choosing this item the background only will be displayed in the graphics area 162.

VideoCAD turns to a handy **program for graphic files viewing and printing**.
For all the rest to be displayed choose this item again.

Drawing > Layouts

Choosing this item opens a box with the list of current project **layouts**.
The project may contain up to **10** layouts. Originally one layout is created into project.

See more. Layout box 513

To switch between layouts, create, delete, rename layouts in the Graphics window it is convenient to use the Layouts tabs 274 *in the lower left corner and the pop-up menu of these tabs.*

Drawing > Layers

Show the Layers 276 panel. Cameras and constructions can be distributed by layers. On each Layout 513 unlimited number of layers can be. Control of layers is performed by the **Layers** panel.

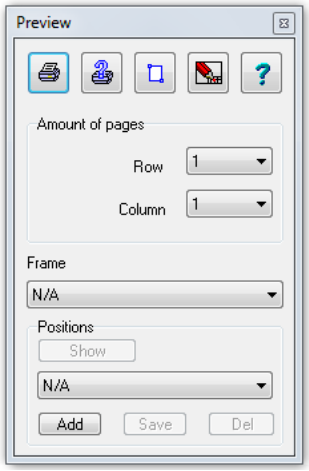
See more: Layers panel 276

Drawing > Printer setup

Choosing this item opens a standard dialog box of current printer setup in Windows.

Drawing > Print

After choosing this item the **borders of pages for printing** and the **Preview** box appear in the **graphics area**.



In the box you can choose the **number of pages horizontally and vertically** to print out current drawing. The obtained pages can be glued together forming a drawing of a larger format.

Using the mouse, **position** and **scale** the drawing as needed.
If **Ctrl** is not pressed at changing the scale, then the scale changes roughly which is convenient at navigation. If **Ctrl** is pressed, the scale changes with the less step which is convenient for the precise drawing positioning before printing or saving.

To exclude the certain areas of a drawing at printing, use the **Mask** button that duplicates the same button 202 on the **Tool bar**.

To change **settings of the current printer** click the **Printer Setup** button.

After the drawing preparation is completed click the button **Print** .

In case if any problem with printing try to choose *printing options in the Options box* 491.

Frames and Tittle blocks

To get the standard drawing sheet with the **frame** and the **Title-Block** choose the required frame in the **Frame** combo box. The frame should be created beforehand.

Frames are a files of **AutoCAD *.dxf** format. They can be created or edited using the **AutoCAD** or other program exporting to ***.dxf.** VideoCAD can be used too. Frame files are saved in the **\Frames** directory in the VideoCAD installation directory.
You may use the prepared frames with the filled Title Blocks, or you may fill the **Title Block** before printing.

To fill the **Title Block**:

- Click the **Fill Title-Block** button. As a result the frame becomes fixed to other constructions and at navigation is moved and scaled together with them. Current drawing location and scale are memorized;
- With the help of the mouse enlarge the Title-Block area and fill the fields with the text 255;
- Click the button **Title-Block** again. The drawing and frame will return to the memorized position.

Store positions of drawing

In the lower part of the panel there is the **Positions** area. By means of tools in this area it is possible to store the adjustments and positions of the drawing, and then quickly return to the stored positions. This option is useful in case of repeated printing the same view after editing is carried out.
After adjustment of the drawing's position and frame, before print, click the **Add** button and enter any name of the position.
At printing the same view for returning to the stored position it is enough to select only the position's name in the combo box.

To return to position in the combo box after displacement click **Show** button.
To store new position under the name selected from the positions' list click **Save** button.
To delete the selected position click **Del** button.

Printing on a virtual printer

An alternative way to export to PDF is printing on a virtual printer, which produces printing result as a PDF file. In this method, the thickness and color of lines 475, fonts 477 will match the values specified for printing.

However, not all virtual and hardware printers support printing transparent, gradient fills, hatches , transparent images . When printing on these printers , you can use an option Printing>Use buffer 491 in the Options box .
When using a raster buffer, initial printing is carried out on the buffer, and then raster buffer is sent to the printer.

Without using the buffer, an image is sent to the printer in vector form, as a set of drawing commands and if the printer does not support all commands, errors are possible on the printed image.

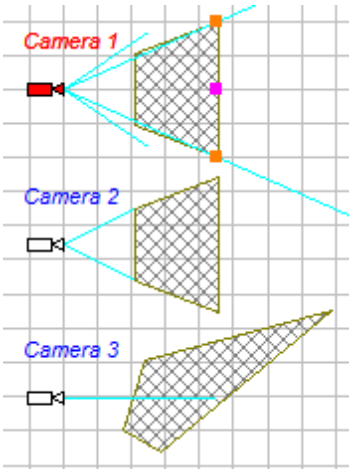
However not all printers can work with the **Use buffer** mode in all cases. In case of issues clear the Use buffer 491 checkbox. Try also to decrease printer DPI resolution, hide raster background. Try another virtual printer.

View > View area edges

Show the Active camera view area edges, calculated according to parameters 291 in the **Camera Geometry box**.

Line type can be changed in the options box 475.

When View area projection bounds 173 is disabled, but Shadows 178 is enabled, the View area edges 173 is shown simplified in the form of two rays if the angle of camera rotation around its axis 297 is multiple of 90 degrees (Camera 2) or in the form of one ray if the angle of camera rotation around its axis 297 is not multiple of 90 degrees (Camera 3).

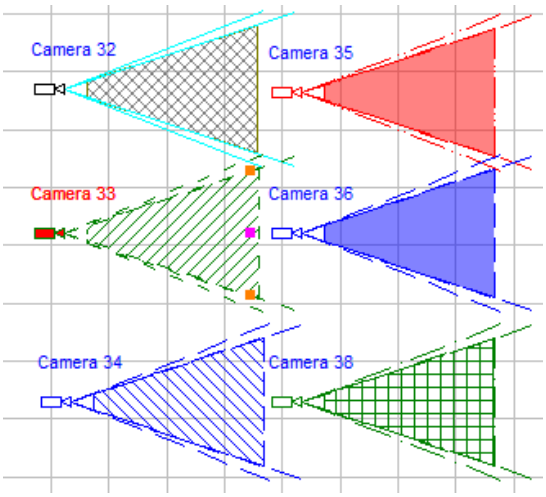


If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera the line type of View area edges is taken from the Options box>Lines>System line types>Bounds 475. This line type is assigned to new cameras by default (Camera 32 on the figure).

Default line type for cameras is Line 21.

If another line type was assigned to the camera, the View area edges of this camera is drawn by this line type assigned to the camera, as well as the View area projection bounds 175 and camera icon. (Camera 33...38).

Thus you can draw different cameras and their view areas by different colors, thickness and line style.



*A button state at the moment of camera saving determines whether the **view area edges** of the given camera will be displayed when this camera is inactive.*

If selected cameras exist on the current layout, except the active camera, this button changes view and operates the visibility of **View area edges** of all selected cameras simultaneously.

View > View area projection bounds

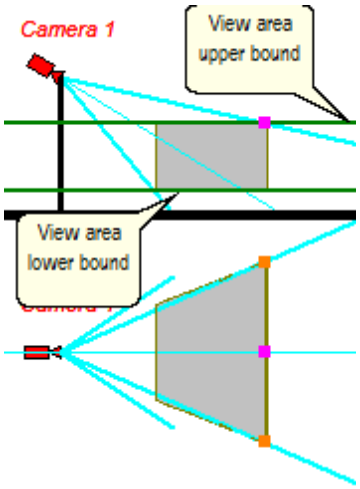
Show the bounds of the Active camera view area projections or sections of the view area on two levels calculated according to parameters 291 in the Camera Geometry box.

Submenu of the button:

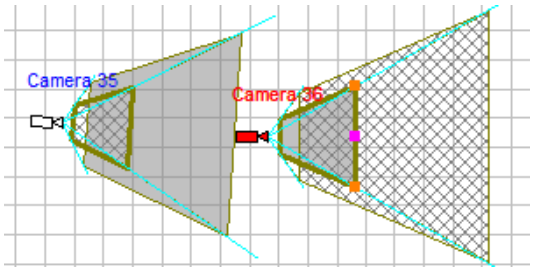
1. Projection - show View area projection bounds of the active camera.

Projection is calculated according to a simple rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.



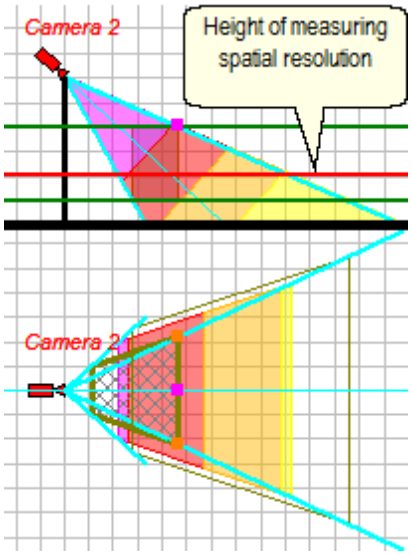
2. 2 levels - simultaneously show 2 sections of the view area by 2 horizontal planes, located on the height of the lower 300 and upper 298 bounds of the view area.



The upper section is shown by thick lines.

- If in the submenu of the Fill projections 175 button **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu of the Fill projections button **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).

When visualizing spatial resolution 177 with two levels, the lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



If the height 320 of measuring spatial resolution is set to **AUTO**, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in VideoCAD7 and earlier versions) .

*Difference between the **View area projection bounds** and Shadows 178 buttons is that the **View area projection bounds** are built without obstacles on the scene but the **Shadows** are built considering obstacles. Both buttons can be used simultaneously in various combinations.*

3. Off. - don't show.

When **View area projection bounds** is disabled, but Shadows 178 is enabled, the View area edges 173 is shown simplified in the form of two rays if the angle of camera rotation around its axis 297 is multiple of 90 degrees or in the form of one ray if the angle of camera rotation around its axis 297 is not multiple of 90 degrees.

*If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera the line type of **View area projection bounds** is taken from the Options box>Lines>System line types>Bounds 475. This line type is assigned to new cameras by default.*

*If another line type was assigned to the camera, the **View area projection bounds** of this*

camera is drawn by this line type assigned to the camera, as well as the View area edges 173 *and camera icon.*

A button state at the moment of camera saving determines whether the bounds of the given camera view area projections will be displayed when this camera is inactive.

If selected cameras exist on the current layout, except the active camera, this button changes view and operates the visibility of **View area projection bounds** of all selected cameras simultaneously.

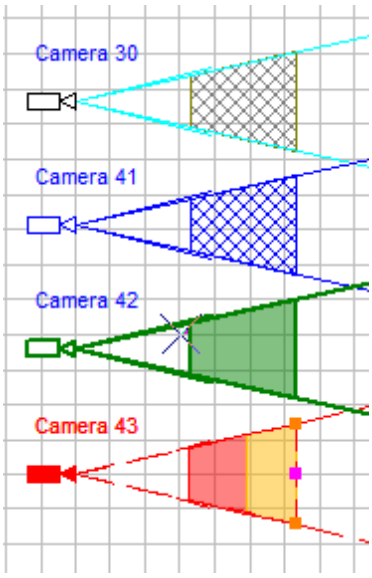
View > Fill projections

Hatch or fill by blend color view area projections of active camera 166 (if these projections exist) calculated according to parameters in the Camera Geometry 291 box.

If the line type of camera 171 *coincides with default line type for camera icons, specified in the* Options box 483*, then hatching (filling) projections of this camera is performed by grey color by default (Camera 30 on the figure).*

If another line type was assigned to the camera, then hatching (filling) projections of this camera is performed by a color of this line type assigned to the camera. (Camera 41,42).

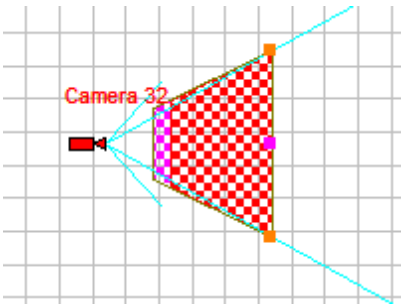
If the Spatial resolution 177 *is enabled, then colors of hatching (filling) projections is determined by Spatial resolution parameters (Camera 43).*



Drop-down menu:

1. Hatching - hatch projections.
2. Filling - fill projections by blend semitransparent color.

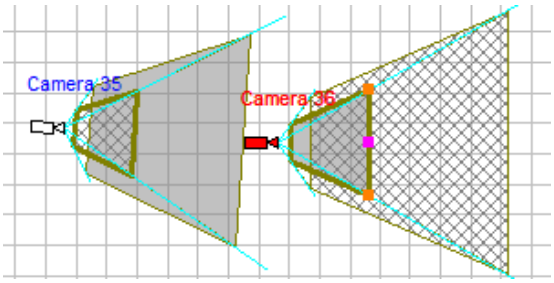
If the **Hatching** item is chosen, but in the drop-down menu of the Spatial resolution 177 button the **Gradient** item is chosen, then the projections will be hatched by a bold style of hatch without gradient.



Transparence of filling in the Graphics window can be adjusted in the Options box 483. Transparence of filling in the 3D World window can be adjusted in the 3D World 348.

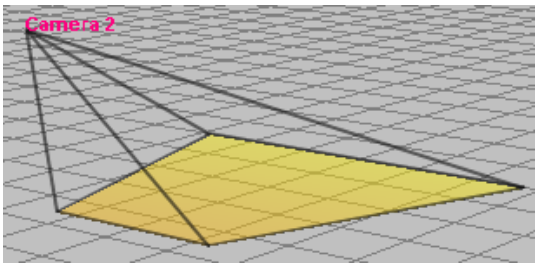
If in the submenu of the View area projection bounds 173 button, **2 levels** is chosen then:

- If in the submenu **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).



3. Off - don't hatch and fill view area projections.

If **Off** is chosen in the **Fill projections** and Shadows 178, then filling view area faces 346 in the 3D World 342 is not shown.

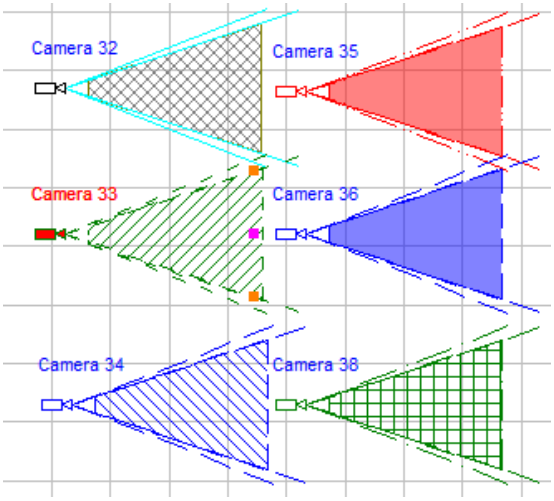


If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera Filling is performed by Gray color and Hatching by **DiagCross** style**.** *(Camera 32)*

Default line type for cameras is Line 21.

If another line type was assigned to the camera, then for this camera filling is performed by a color determined by ***color*** *of the line type and hatch style is determined by* ***style*** *of the line type (Camera 33...38).*

Thus you can fill and hatch projections of different cameras by different colors and hatch styles.

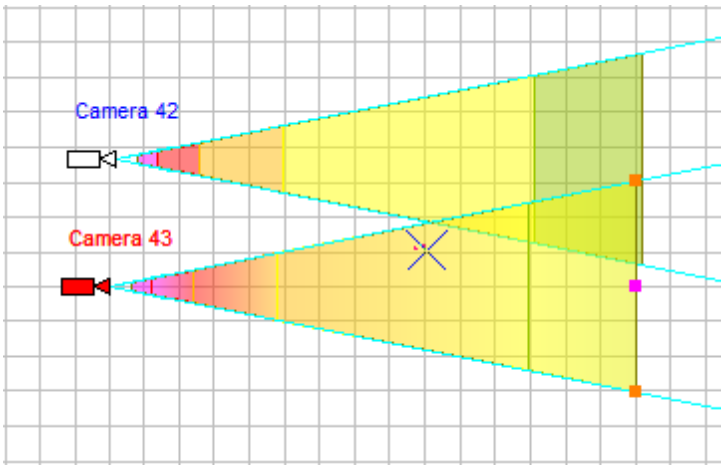


A button state at the moment of camera saving determines whether the filling or hatching of the view area projections of the camera will be displayed when this camera is inactive.

If selected cameras exist on the layout, except the active camera, this button changes view and operates the visibility of filling (hatching) projections of all selected cameras simultaneously.

View > Spatial resolution

Fill in different colors **regions** on the **view area projections of the active camera**, depending on the **spatial resolution** within these regions.
Colors of the regions and the boundary values of the spatial resolution are determined by the **spatial resolution pattern** assigned to the camera.
In the Spatial resolution box 316 you can edit the patterns and assign them to cameras.



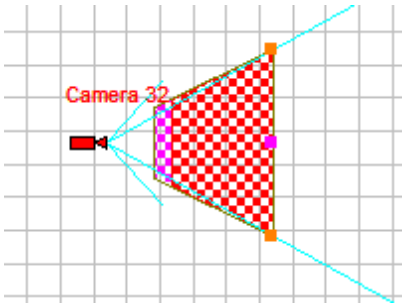
Drop-down menu:

1. Discrete colors - fill the regions in discrete colors in accordance with a spatial resolution at the far bounds of the regions.

2. **Gradient** - fill the view area projection in gradient color according to the spatial resolution at each point on the projection.

*In case of gradient color is chosen, the colors at the **far region bounds** equal to the colors of the **spatial resolution pattern**, but between the bounds color changes smoothly, as well as real spatial resolution.*
Gradient reflects the spatial resolution more accurately and looks impressive, but discrete colors are more intuitive and easy to use..

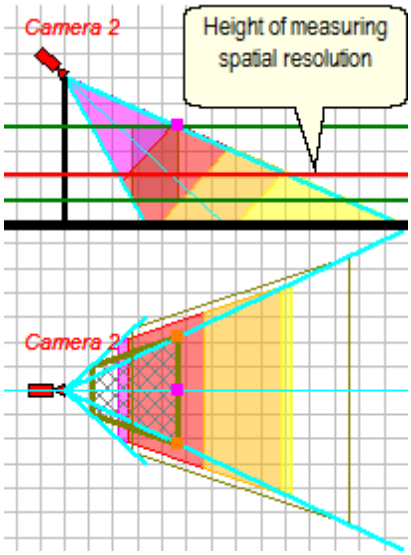
*If the **Gradient** item is chosen, but in the drop-down menu of the Fill projections 175 button the **Hatching** item is chosen, then the projections will be hatched by a bold style of hatch without gradient.*



Calculation of gradient demands a lot of resources and increases redraw time.

3. Off. - don't display spatial resolution

If in the submenu of Shadows 178 button or View area projection bounds 173 button (when Shadows is Off) the **2 levels** is chosen, then lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



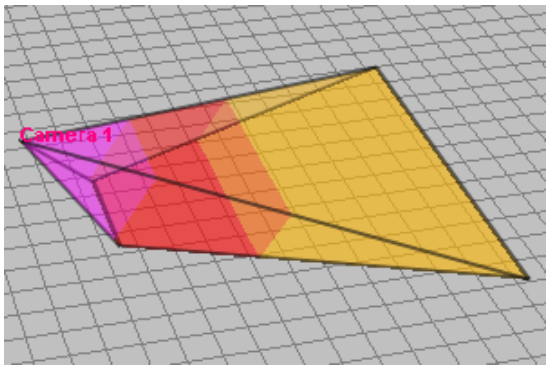
If the height 320 of measuring spatial resolution is set to AUTO, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in previous versions) .

In the active camera editing mode 167, the regions of spatial resolution can be displayed in the vertical projection, with the height 320 of spatial resolution measurement (horizontal red line).

*In the Dome 179 mode the **Spatial resolution** is calculated without taking into account pan and tilt angles of camera. It is assumed that the camera can pan and tilt freely, and spatial resolution is calculated at the center of the field of view.*

The Spatial resolution button controls displaying spatial resolution on 3D view area 346 and the Coverage 348 in the 3D World 342 window .



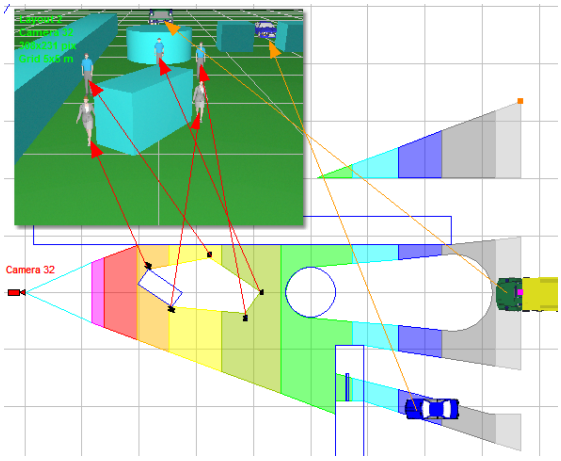
A button state at the moment of camera saving determines whether the spatial resolution of the camera will be displayed when this camera is inactive.

If selected cameras exist on the layout, except the Active camera 166, this button changes view ( ) and operates the visibility of spatial resolution of all selected cameras simultaneously.

See also: Spatial resolution box 316, Visualization of the camera control area projections and spatial resolution within them 580.

View > Shadow

Display horizontal projection of the view area **of the active camera** taking into account shading from constructions 193 and 3D models 202.



Shadows - a powerful yet easy-to-use tool of VideoCAD. Shadows are calculated for all positions of cameras, shading objects can be located at any point of space. You should only enable calculation of shadows with the help of this button.

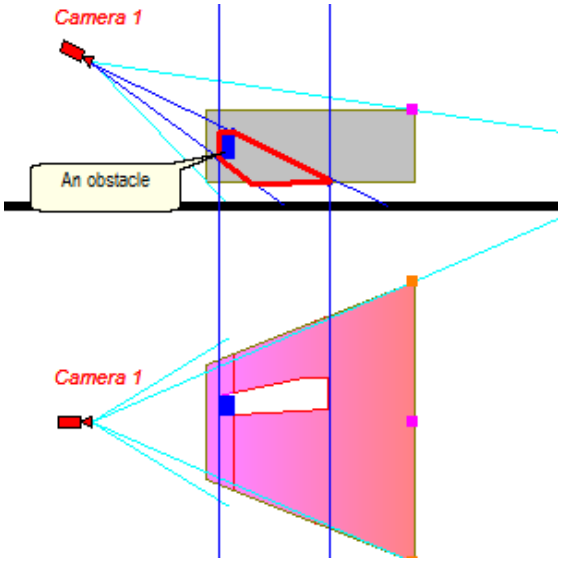
Shading takes into account the camera installation height and all 3 coordinate of constructions and 3D models (including heights).

Drop-down menu:

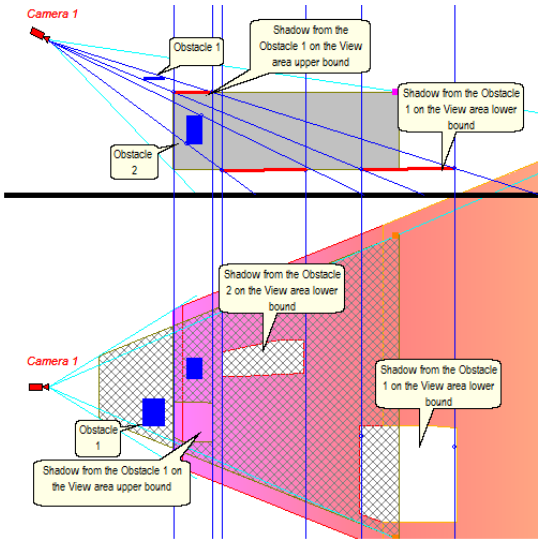
1. Within projection - display view area projection taking into account shadows. Shading is calculated according to a rule:

A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.

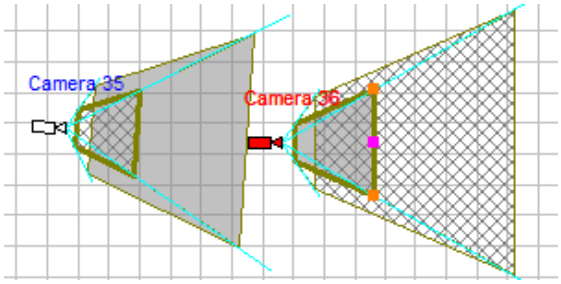
By the same rule the horizontal projections 173 of view area are calculated. Changing the height of the lower and upper bounds of view area could change conditions of calculation of shading.



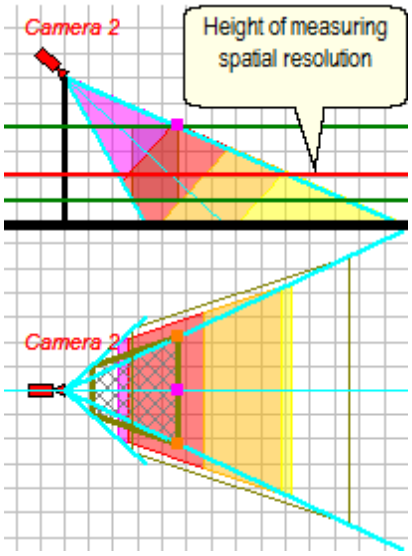
2. 2 levels -simultaneously show 2 sections of the view area by 2 horizontal planes, located on the height of lower 300 and upper 298 bounds of the view area. From the sections subtract shadows from obstacles



- If in the submenu of the Fill projections 175 button **Filling** is chosen, the section of the lower plane is displayed as filling, and the section of the upper plane as hatching (Camera 35).
- If in the submenu of the Fill projections 175 button **Hatching** is chosen, the section of the lower plane is displayed as hatching, and section of the upper plane as filling (Camera 36).



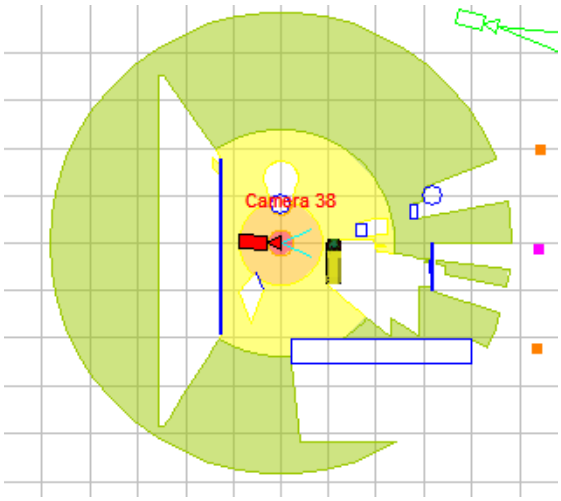
If in the submenu of the *Spatial resolution* 177 *button* ***Discrete colors*** *or* ***Gradient*** *is chosen*, then lower section is not at the view area lower bound but at the height of measuring spatial resolution 320, determined in the spatial resolution pattern 318 assigned to the camera. Spatial resolution is rendered on this level.



If the height 320 of measuring spatial resolution is set to AUTO, then:

- if the view area projection bounds 173 is set to **2 Levels**, the height of measuring spatial resolution is set at the view area lower bound 300;
- if the **view area projection bounds** is set to **Projection**, the height of measuring spatial resolution is set at the halfway between the lower and upper 298 bounds of the view area (as in VideoCAD7 and previous versions).

3. Dome - display projection of the territory controlled by the camera in 360 degrees, without view area borders, but only taking into account the shadowing.



When the **Dome** item is chosen, actually the **control area** of a **dome (PTZ)** camera is displayed.

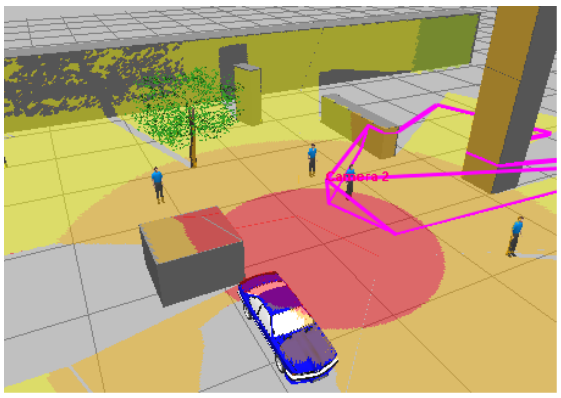
The **Dome** mode is also useful for choosing the best installation place for fixed cameras to make required areas reachable for the cameras.

In the **Dome** mode all shaded areas from the specified camera position become visible.

In the **Dome** mode the Spatial resolution 177 is calculated without taking into account pan and tilt angles of camera. It is assumed that the camera can pan and tilt freely, and spatial resolution is calculated at the center of the field of view

In the Graphics window calculation of shadows in the Dome mode is performed like in the Within projection 179 mode, ie according to the rule:
A point on the horizontal projection is considered visible if a vertical segment, formed by this point in the range of heights from the view area lower bound height 300 to the view area upper bound height 298, is visible wholly.

In the 3D World 342 in the **Dome** mode the territory controlled by the active 166 camera is displayed as coverage 348 on the environment. *The coverage in the 3D World is displayed for the **active camera** only.*



4. Off - disable shadow calculation and displaying.

*Difference between the **Shadows** and View area projection bounds 173 buttons is that the **View area projection bounds** are built without obstacles on the scene but the **Shadows** are built considering obstacles. Both buttons can be used simultaneously in various combinations.*

*The **Shadow button** works in conjunction with the Spatial resolution 177 and the Fill projections 175 buttons. Depending on the state of these buttons, shadows can be displayed in different ways: as filling, as shading, as a border lines, with mapping spatial resolution*

or not.

The calculation of shading - resource-intensive operation. *During the shadow calculation on the* ***Shadow button red frame flashes*** *.*
Automatic shadow calculation is performed only for the active 166 camera. To recalculate shading for a particular camera - activate this camera. To recalculate shading for all selected cameras, click Main Menu>View>Recalculate shadows 239.
To temporarily disable the automatic calculation of shading (keeping already calculated shadows visible) clear the item Main menu>View>Calculate shadows for active camera 239.

The calculation of shading from 3D models 202 is disabled by default to save resources. To enable the calculation of shading from the 3D models, check the Options box> Miscellaneous> Shadow>Calculate shadows for 3D models 491.
Additionally, for each 3D model, which must be taken into account when calculating the shading:
- *double click on the model to switch it to editing state 164;*
- *on the appeared* ***Current construction parameter panel*** *check Shadow 283 checkbox.*

To force to calculate shadows from a type of 3D model you can mark Shadows 402 checkbox on the 3D Models 397 window while editing the type of the 3D model.

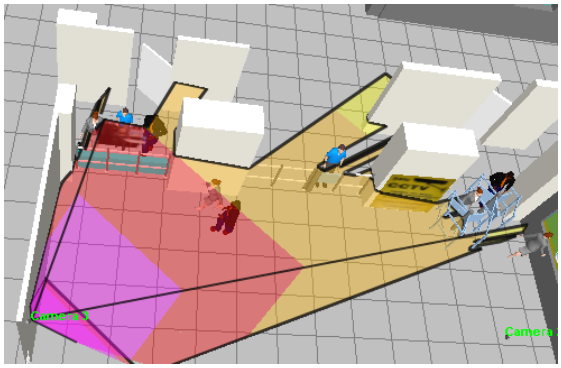
Whether or not a specific construction takes into account in the calculation of shading determines by the Shadow 475 checkbox of the line **type used** for the construction.

You can ignore constructions of specified layers 276 while calculating shadows, using the Shadows 277 row in the table of layers.

A button state at the moment of camera saving determines whether the shadows of the camera will be displayed when this camera is inactive.

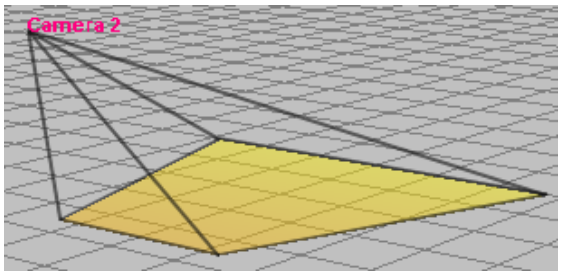
If selected cameras exist on the layout, except the Active camera 166, this button changes view (and operates the visibility of shadows of all selected cameras simultaneously.

When calculating 3D view areas 346 and coverage of the active camera 348 in the 3D World 342 window, shadows are calculated independently from shadows in the **Graphics window**. Calculation of shadows in the **3D World** is rougher, but much faster.



Accounting 3D models as obstacles in the 3D World window does not depend on the state of the Calculate shadows from 3D models 491 checkbox in the **Options** box.

If **Off** is chosen in the Fill projections 175 and **Shadows**, then filling view area faces 346 in the 3D World 342 is not shown.



See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Options box>Miscellaneous>Shadow 490, Layers>Shadow 277, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

View > Calculate shadows for active camera

Enable/ disable calculating shadows.

Automatic calculating shadows is performed for the active camera 164 only.
To temporary disable automatic calculating shadows (with keeping already calculated shadows) clear this menu item.

This item controls shadow calculation in the Graphics window only, it doesn't affect shadows 346 in the 3D World 342.

See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

View > Recalculate shadows

Recalculate shadows for all **selected 164 cameras**

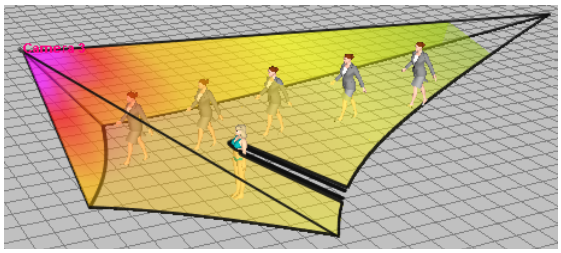
Calculating shadows is a **resource-intensive operation**. *Automatic calculating shadows is performed for the active camera 164 only. To* recalculate shadows for all **selected 164 cameras,** click this item.

See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

View > 3D view area

Show 3D transparent view area faces 346 and active camera coverage 348 area in the **3D World** window.

See details: 3D World>View>View area 346



Button state at the moment of camera saving determines whether the 3D view area of the given camera will be displayed when this camera is inactive.

If selected cameras exist on the current layout, except the Active camera 166, this button changes view and operates the visibility of **3D view areas** of all selected cameras simultaneously.

View > Person detection area

Show/Hide the active camera projections of person detection area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 498 of the active camera.

If the projections are present, a **lilac frame** round the button **Person detection area** appears.

The projections are displayed in **lilac color**.

Line type can be changed in the options box 475.

A item state at the moment of camera saving determines whether the projections of person detection area of this camera will be displayed when this camera is inactive.

Clicking this item will open person detection area size 495 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner**.** Person detection area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, *shadows* 178 *and lens distortion* 310.

See also: Person detection area size box 495, *Criteria editing box of person detection area* 498, *Spatial resolution box* 316

View > Person identification area

Show/Hide the active camera projections of person identification area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 500 of the active camera.

If the projections are present, a **orange frame** round the button **Person identification area** appears.

The projections are displayed in **orange color**.

Line type can be changed in the options box 475.

A item state at the moment of camera saving determines whether the projections of person identification area of this camera will be displayed when this camera is inactive.

Clicking this item opens person identification area sizes 496 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is

necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner. Person identification area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, shadows 178 and lens distortion 310.

See also: Person identification area size box 496, Criteria editing box of person identification area 500, Spatial resolution box 316

View > License plate reading area

Show/Hide the active camera projections of license plate reading area, calculated according to parameters 291 in the **Camera Geometry box** and the quality level criteria 503 of the active camera.

If the projections are present, a **bright green frame** round the button **License plate reading out area** appears. The projections are displayed in **bright green color**.

Line type can be changed in the options box 475.

A item state at the moment of camera saving determines whether the projections of license plate reading area of this camera will be displayed when this camera is inactive.

Clicking this item opens license plate reading area sizes 497 box.
Clicking once again close the box and hide the area projection displaying on the layout. If it is necessary to close only **the box**, and **area displaying on the layout** should be left, close the box by clicking Close in upper right corner. License plate reading area displaying will remain and the button will remain pressed.

This tool doesn't take into account camera rotation around its main optical axis 297, shadows 178 and lens distortion 310.

See also: License plate reading area size box 497, Criteria editing box of person identification area 500, Spatial resolution box 316

View > Titles

Show on the top left corner: **names of project** and **layout** and the **grid step** on the drawing. When the active camera is in the graphical editing state 210, the name of the active camera quality level 272 is shown in addition.

Font type can be changed in the Options box 477.

View > Camera names

Switch on/off the displaying cameras' names near their icons in the Graphics window. In the 3D World 342 window you can switch of cameras' names with the help of an appropriate checkbox. 350
.

Font type can be changed in the Options box 477.

View > Velocity vectors

Switching on/off displaying velocity vectors of 3D models.

See more: 3D model speed 203, 329

View > Active camera cables

Show/Hide cables 269 of the **active camera**.

View > All cameras' cables

Show/Hide the cables 269 of all the cameras.

*Only cables of the **active camera** can be edited.*

View > Cameras over constructions

When this item is checked, cameras icons and view areas are displayed over constructions, i.e. the constructions do not cover the cameras. This mode is convenient at operation with complex 3D models of rooms.
When the item is not checked, the constructions are displayed over cameras (by default).

See also: High resolution on top 242

View > High resolution on top

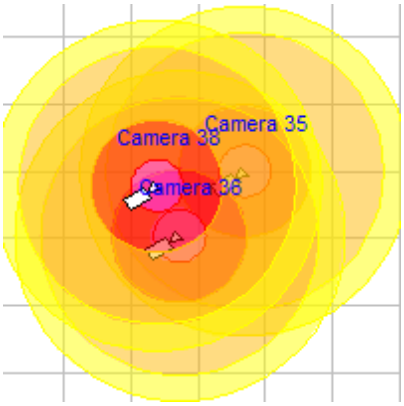
This Item controls overlay of view area projections of cameras with spatial resolution 316 visualization. If it is not checked, the cameras with view areas are drawn in the order of their numbers in the Camera list 509. Active camera 166 is drawn on top of all. In this case, cameras drawn above overlay previously drawn cameras.

In the Camera list 509 you can change the order of cameras in the list, which means the draw order.

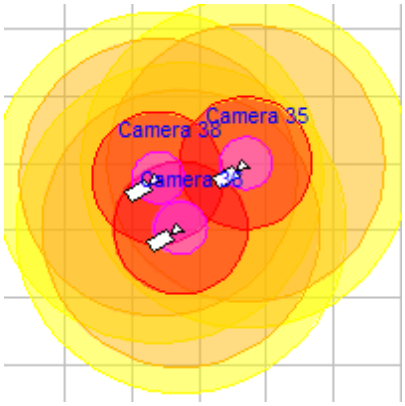
If this item is checked, then the order of drawing is more complicated:

- Below all cameras without spatial resolution 177 visualization are drawn;
- Then, regions of spatial resolution 316 with minimum resolution (remote regions) of all cameras are drawn;
- Then, all regions of spatial resolution of all cameras are drawn in ascending order of spatial resolution;
- Then, gradient 175 projections of view areas are drawn.
- On top the rest details of cameras are drawn (icons, name, edges).

In this case, all cameras are visible, despite the imposition of projections of different cameras and layout's areas controlled with high spatial resolution, are drawn on the top.



Usual drawing



High resolution on top

If this item is checked while export to AutoCAD format 219, then cameras are exported not as whole

block, but with dividing blocks of cameras on sub-blocks with regions of spatial resolutions. The Blocks of spatial resolution regions are exported in the same order as the **High resolution on top**.

See also: Cameras over constructions 242.

View > Camera geometry

Clicking this item will open Camera Geometry box 289. This box includes geometric parameters of the camera, lens and installation parameters of the camera.

See more: Camera geometry box 289

View > Sensitivity and Resolution

Show the Sensitivity and Resolution 329 box in which there are parameters of sensitivity and resolution of the active camera.

Sensitivity parameters take part in modeling only if the 3D Video 357 is opened and illumination modeling 372 is switched on.

See more: Sensitivity and Resolution 329

View > Spatial resolution

Show or hide the Spatial resolution box 316. In this box it is possible to create and edit patterns of spatial resolution and field of view size visualization. In the box there are prepared spatial resolution patterns according to the following criteria: Home Office Scientific Development Branch, Home Office Guidelines for identification, P 78.36.008-99, Australian Standard AS4806: Closed Circuit Television, European Standard EN 50132-7, ISO/IEC 19794 Biometric data interchange formats.. Also in the box there are examples of images of group of people are automatically displayed for each region of spatial resolution.

See more. Spatial resolution box 316, *Spatial resolution button* 177.

View > 3D Video

Show or hide the **3D Video** window. The **3D Video** displays the image from the active camera.

See more: 3D Video 357

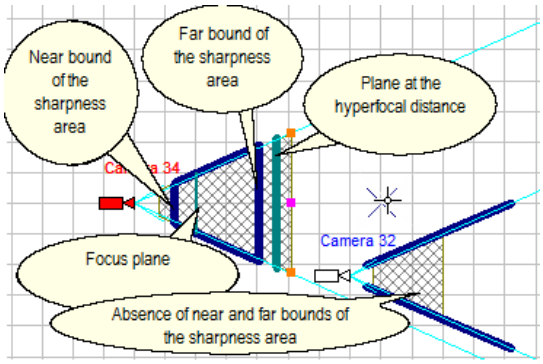
View > 3D World

Show or hide the **3D World** window. In the **3D World** the project layout with cameras and view areas is shown in 3D.

See more: 3D World. 342

View > Depth of field

Show or hide the **Depth of field calculation box**.



When the depth of field box is visible, next to all cameras in the horizontal projection the following lines are displayed:

- sharpness area bounds 457;
- focus plane 458;
- plane at the hyperfocal distance 458.

These lines are calculated according to the depth of field parameters 457 of each camera at the height of depth of field measurement 458.

If the **focus plane** or the **plane at the hyperfocal distance** not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then the **focus plane** or the **plane at the hyperfocal distance** are not displayed.

If the near or the far bound of the sharpness area 457 not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then this bound is not displayed.

The absence of near and far bounds of the sharpness area indicates that the sharpness area completely covers projection of view area, thus the depth of field does not reduce the resolution of the camera.

This tool doesn't take into account camera rotation around its main optical axis 297, shadows 178 and lens distortion 310.

See more: Depth of field calculation box 454, Control of Depth of Field in the horizontal projection 592.

View > Test object

Show the **test object of the active camera** with the sizes and location according to parameters in the test object box 507.
Clicking this button also opens this **box**.
Clicking this button once again close the **test object box** and hide test object on the layout. If it is necessary to close only **the box**, and **test object on the layout** should be left, close the box by clicking **Close** in upper right corner. **Test object** will remain and the button will remain pressed.

*A **test object** can be displayed only in the graphical editing state 167 of active camera.*

See more: Test object box 507

View > Monitor window

Show or hide the **Monitor window**. In the Monitor window images from any quantity of cameras are displayed simultaneously. Monitor window allows modeling monitors of video surveillance system.

See more: Monitor window 407

View > Hide vertical projection

With this item chosen a **horizontal projection** is only present in the graphics area 162.
To display a **vertical projection** click this item again.

View > Hide horizontal projection

With this item chosen a **vertical projection** is only present in the graphics area 162.
To display a **horizontal projection** click this item again.

View > Grid

Choosing this item opens a submenu of **grid displaying control**. The submenu enables to set a certain grid step up, switch a mode of **automatic grid step selection** on/off and switch the grid displaying off.

See also: "Grid" control element group 188

View > Origin

This item opens the submenu of **origin selection**.

The graphics area 162 allows to use **2 coordinate systems**:

- **Fixed coordinate system**
- **Float coordinate system attached to the active camera**

In case of **the fixed coordinate system**, the **origin of coordinates** does not vary when changing the active camera. The origin is displayed as two icons in horizontal and vertical projections. It is possible to change a point of origin after choosing the menu item **View > Set origin** 245.

In case of the **coordinate system attached to the active camera**, the **origin of coordinates** always coincides with the active camera location. It is convenient when studying its view area.

A grid 188 is fixed to the **origin of coordinates**, and the counting of the cursor current coordinates in the status bar 275 starts from the origin.

View > Set Origin

After choosing this item clicking on the **horizontal projection** sets up a new **origin** **of the Fixed coordinate system** 163.

In the vertical projection horizontally the Origin coincides with the one set in the horizontal projection, and vertically it coincides with the ground.

View > Black-and-white

Switch **black-and-white** drawing mode on/off.

This mode is useful when printing a drawing out on black-and-white printer.

View > Options

Choosing this item opens a dialog box of the program options 474.

See more: Options box 474

Scale > Zoom in

Clicking this item increases a drawing **scale**.

Using the **Intellimouse** you can change the drawing **scale** with the simultaneous zooming in the image sections pointed by the cursor.

If **Ctrl is not pressed** at changing the scale, then **the scale changes roughly** which is convenient at navigation. If **Ctrl is pressed**, **the scale changes with the less step** which is convenient for the precise drawing positioning before printing or saving.

When the Show active camera 210 button is pressed, changing drawing scale is not allowed and this item is unavailable.

If input focus is on the graphics area, scale can be changed by + and - buttons on the keyboard.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

Choosing an item of the pop-up menu appearing when clicking the graphics area 162 with the right mouse button performs the command as well.

Scale > Zoom out

Clicking this item reduces a drawing **scale**.
Using the **Intellimouse** you can change the drawing **scale** with the simultaneous zooming in the image sections pointed by the cursor.

If **Ctrl is not pressed** at changing the scale, then **the scale changes roughly** which is convenient at navigation. If **Ctrl is pressed**, **the scale changes with the less step** which is convenient for the precise drawing positioning before printing or saving.

When the Show active camera 210 button is pressed, changing drawing scale is not allowed and this item is unavailable.

If input focus is on the graphics area, scale can be changed by + and - buttons on the keyboard.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

Choosing an item of the pop-up menu appearing when clicking the graphics area 162 with the right mouse button performs the command as well.

Scale > Move drawing

With this item chosen you can move a drawing within the graphics area 162 using the mouse.
To do that press and hold down the **left mouse button** at any spot of drawing and then move the mouse holding the button down. To stop moving the drawing release the mouse button.

If your mouse is an **Intellimouse** or other **Wheel mouse** you can move the drawing at any time by pressing and holding the **middle button** down.

When the Show active camera 210 button is pressed, moving drawing is not allowed and this button is unavailable.

When Alt is pressed 287, it is possible to move drawing in the Graphics window using arrow keys and change scale using plus and minus keys irrespective of the input focus.

Scale > Show all

Show all cameras and other constructions on the current layout. At this the scale and view are chosen automatically. The function is not operable in the *editing active camera mode* 210.

Scale > Find text

After choosing this item the **Find text box** will appear. In the box **any text can be entered**.

After clicking the button **OK, all cameras and text markers** 255 **on the current layout**, in which designation the entered text is included, will become **visible** and selected 164. At this the scale and view are chosen automatically.
Even only one letter can be entered, and at this all cameras and text markers on the current layout, in which designation the entered letter is included will become visible.

It is convenient to mark the upper left and the lower right corner of the required areas with **text markers**. After that as the result of searching the marked area will be displayed on the full screen.

When clicking the button **Save** the entered text string will be saved, and it will be enough later on just to choose it from the list to find the corresponding objects.
Text strings are saved in the project in separate lists for each layout, i.e. are saved between computer rebooting and project moves.

When clicking the button **Delete** the displayed text string will be deleted from the project.

The function is not operable in the *editing active camera mode* 210.

Constructions > Point

When this button is pressed, clicking on the graphics area places a point.
The status bar 275 displays the coordinates of this **point** relatively to the origin of coordinates 245.

In the 3D Video 357 and 3D World 342 the vertical segment will be displayed in the points place.

Default minimal and maximal heights of the segment are determined by the line type 475, which constructs the point. The heights can be set separately for each point by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the point in numeric values.

See also: "Constructions" button group 193

Constructions > Horizontal line

When this button is pressed, clicking on the graphics area 162 specifies a point through which a **horizontal line** is passes.

The status bar 275 displays the line **height** or its **shift** from the origin of coordinates 245 according to the projection being clicked.

In the 3D Video 357 and 3D World 342 at the place of the horizontal line 2 horizontal lines will be displayed.

Default minimal and maximal heights of the lines are determined by the line type 475, which constructs the horizontal line. The heights can be set separately for each horizontal line by means of current construction parameters panel 282, on which it is also possible to set coordinates of the horizontal line in numeric values.

See also: "Constructions" button group 193

Constructions > Vertical line

When this button is pressed, clicking on the graphics area 162 specifies a point through which a

vertical line is passes.

The status bar 275 displays the **distance** from the origin of coordinates 245.

In the 3D Video 357 and 3D World 342 at the place of the vertical line 2 horizontal lines will be displayed.

Default minimal and maximal heights of the lines are determined by the line type 475, which constructs the vertical line. The heights can be set separately for each vertical line by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the vertical line in numeric values.

See also: "Constructions" button group 193

Constructions > Focal plane

When this button is pressed, clicking on the graphics area 162 in the vertical projection specifies a point through which a plane vertical projection passes. This plane is perpendicular to the **main optical axis** of the active camera lens (parallel to the **lens focal plane**).

The status bar 275 displays the coordinates of the clicked point **relatively to the active camera**.

When changing camera location the position of the obtained plane changes correspondingly.

Generally speaking, the obtained plane is not a focal one, being only parallel to it.

In the 3D Video 357 and *3D World* 342 *the Focal plane is not displayed.*

See also: "Constructions" button group 193

Constructions > Optical axis

When this button is pressed, clicking on the graphics area 162 specifies a point through which an **optical axis** of the active camera lens passes.

The status bar 275 displays the coordinates of the clicked point **relatively to the active camera**.

When changing a camera location the position of the obtained axis changes correspondingly.

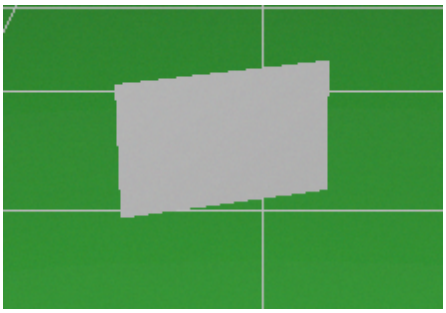
In the 3D Video 357 and *3D World* 342 *the Optical axis is not displayed.*

See also: "Constructions" button group 193

Constructions > Line segment

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **line segment.** Second clicking specifies the end point of the **line segment.**

The status bar 275 displays the segments length and its projection to distance and height.
Both clicks are to be made in the same projection. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing a drawing the segment is attached to the projection with its **initial point**.



In the 3D Video 357 and 3D World 342 a vertical rectangle will be displayed at the segment place.

Default minimal and maximal heights of the rectangle are determined by the line type 475, which constructs the line segment. The heights can be set separately for each line segment by means of current construction parameters panel 282, on which it is also possible to set coordinates of the line segment in numeric values.
Color of the rectangle is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the segment**: coordinates of the first and second points, length, angle.

*A segment can be also used to **measure distances** on layouts without clicking for the second time in this case.*

*Line segments can be used for modeling cables with subsequent cable length calculation. Use separate **line types** to draw each cable type. For length calculation use the Length calculation of line segments 517 tool.*

See also: "Constructions" button group 193

Constructions > Polyline

This tool allows to draw line segments continuously. The end of each segment is the start of the next one. To stop drawing lines, press **ESC.**
In other respects this tool equals to the Line segment 195 (see. above).

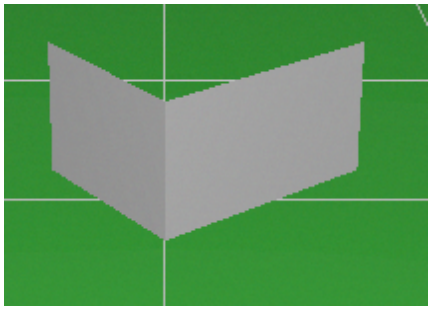
See also: "Constructions" button group" 193

Constructions > Angle

When this button is pressed, the first clicking on the graphics area 162 specifies the **vertex** of an **angle.** Second and third clicking specify its **arms.**

The status bar 275 displays the angle value in **degrees**.

If the angle **vertex** and **arms** are constructed in **different projections**, when changing drawing the angle is attached to the projection with its vertex.



In the 3D Video 357 and 3D World 342 2 vertical rectangles will be displayed at the angle place.

Default minimal and maximal heights of the rectangles are determined by the line type 475, which constructs the Angle. The heights can be set separately for each Angle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the line segment in numeric values.
Color of the rectangles is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the**

angle: coordinates of the first, second, third points, length, angle value in degree.

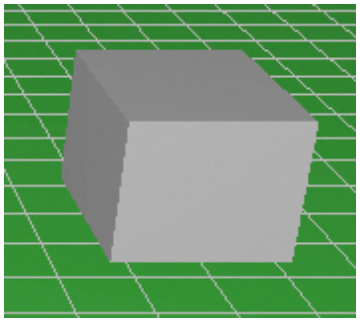
*The **angle** tool is also used to measure angles on layouts.*

See also: "Constructions" button group 193

Constructions > Rectangle

When this button is pressed, the first clicking on the graphics area 162 specifies the first corner of a rectangle**.** Second clicking completes the rectangle construction**.**

The status bar 275 displays the information on the rectangle sizes and location.



In the 3D Video 357 and 3D World 342 a parallelepiped will be displayed at the rectangle place.

Default minimal and maximal heights of the parallelepiped are determined by the line type 475, which constructs the rectangle. The heights can be set separately for each rectangle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the rectangle in numeric values.
Color of the parallelepiped is determined only by line type 475, which is used at constructing.

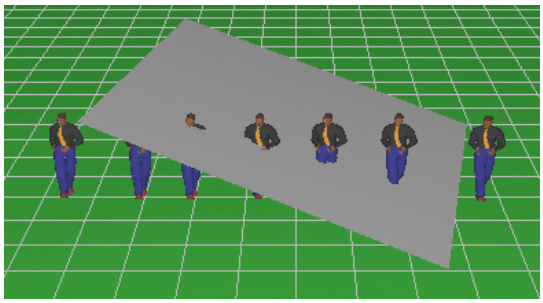
On the **current construction parameters panel** it is possible to set and fix **parameters of the rectangle**: coordinates of the first points, height, width.

*Rectangles are also used for creating rectangular **horizontal planes** in the **3D Video**, for example a ceiling or floor.*

See also: "Constructions" button group 193

Constructions > Inclined rectangle

When this button is pressed, clicking on the graphics area 162 specifies first corner of an inclined rectangle.



Inclined rectangle is similar to a rectangle 196 and differs from it that in 3D Video 357 and 3D World 342 it is displayed in the form of **inclined rectangle**. The **minimal height of rectangle** corresponds to the **lower side** of this rectangle, and the **maximal height** - to the **upper one**.

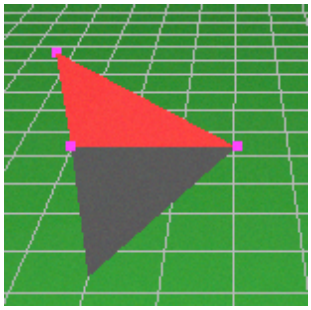
In the **Graphics window** the upper side of inclined rectangle is displayed by **thick line**.

For modeling complex objects it is possible to edit 189 inclined rectangle by points, moving its vertexes.
*When moving separate vertexes press **Ctrl**.*

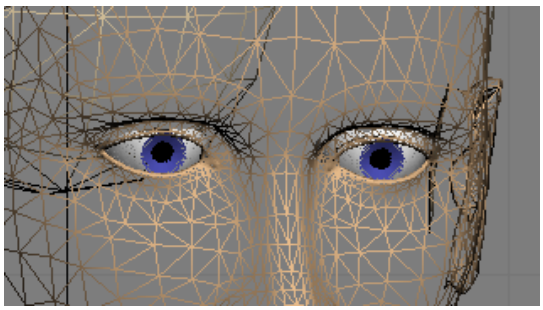
Inclined rectangle can be made transparent by 70 %. For this purpose it is necessary to mark the **Transparence** checkbox on the Current construction parameter panel 282.

Inclined rectangle is very universal tool. Using the inclined rectangles it is possible to model any 3D objects.

It can be useful to combine inclined rectangles in pairs thus to get triangles with independent vertexes in the 3D space. Meanwhile two vertices of each inclined rectangle must coincide. The rest two vertices of first inclined rectangle must coincide with the other two vertices of second inclined rectangle.



Using obtained triangles you can theoretically build any 3D surfaces, although it can be not simple in practice.
For example, all 3D models in VideoCAD consist of triangular mesh only.



See also: "Constructions" button group 193

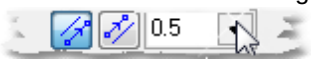
Constructions > Double line

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **double line.** Second clicking specifies the end point of the **double line.**

The **length** and the **width** of the double line appear in the status bar 275.

In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the distance between lines of the double line.

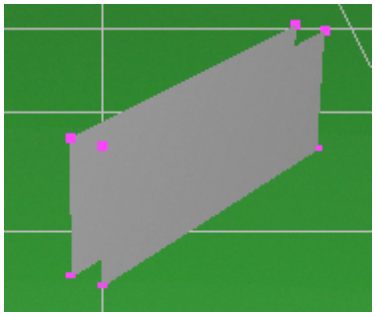
Two buttons allow switching the **orientation of the second line** relatively to the first one



.

You can also switch the orientation quickly by pressing the **Space bar**.

In the 3D Video 357 and 3D World 342 2 vertical rectangles will be displayed at the double line place.



Default minimal and maximal heights of the rectangles are determined by the line type 475, which constructs the double line. The heights can be set separately for each double line by means of current construction parameters panel 282, on which it is also possible to set coordinates of the double line in numeric values.
Color of the rectangles is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the double line**: coordinates of the first, second points, length, angle.

See also: "Constructions" button group 193

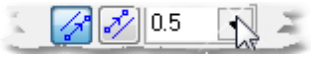
Constructions > Wall

The Wall tool is intended for drawing walls with specified thickness and height. In these walls you can make apertures 199 of any shape, for example for doors and windows.

When this button is pressed, the first clicking on the graphics area 162 specifies the start point of a **Wall.** Second clicking specifies the end point of the **Wall.**

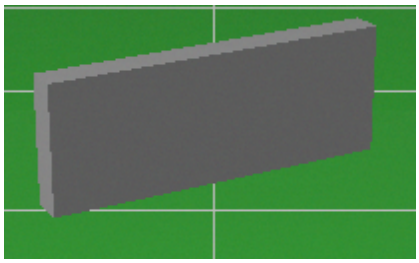
The **length** and the **width** of the wall appear in the status bar 275.

In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the thickness of the wall.

Two buttons allow switching the **orientation** of the second wall side relatively to the first one 

.

You can also switch the orientation quickly by pressing the **Space bar**.



In the 3D Video 357 and 3D World 342 a parallelepiped will be displayed at the wall place.
Default minimal and maximal heights of the wall are determined by the line type 475, which constructs the wall. The heights can be set separately for each wall by means of the current construction parameters panel 282, on which it is also possible to set coordinates of the wall in numeric values.
Color of the parallelepiped is determined only by line type 475, which is used at constructing.

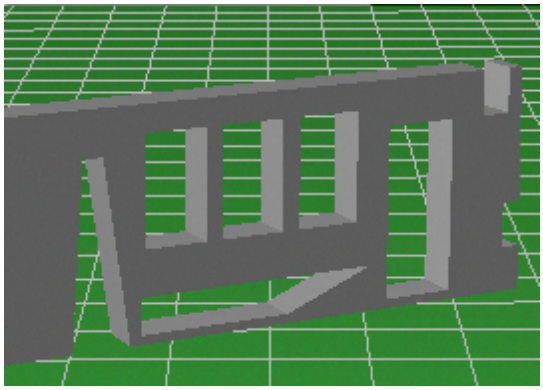
On the **current construction parameters panel** it is possible to set and fix **parameters of the wall**: coordinates of the first, second points, length, angle.

In walls it is possible to make apertures for doors and windows using the Aperture in Wall 199 *tool.*

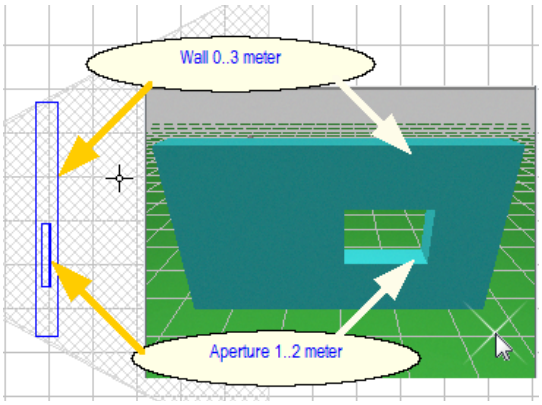
See also: "Constructions" button group 193

Constructions > Aperture in Wall

The Aperture in Wall tool designed to easily create apertures (openings) of various shapes in the walls, built by the Wall 198 tool.



In order to an aperture will appear in the 3D space, it must intersect the horizontal projection of the wall.

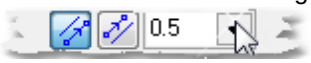


The Aperture in Wall tool is similar to the Inclined rectangle 196 tool. But the **Inclined rectangle** creates a **flat rectangle** in 3D space, but the **Aperture in Wall** placed inside the **Wall**, cuts an aperture in the wall. This aperture equals to the projection of the same **flat rectangle** on the plane of the wall.
The **minimal height of aperture** corresponds to the **lower side** of this rectangle, and the **maximal height** - to the **upper one**.

In the **Graphics window** the upper side of aperture is displayed by **thick line**.

In line type panel 280 that appeared below **graphics area** there is a box in which it is possible to choose from the list or enter from keyboard the thickness of the aperture.

The Thickness of the wall affects only the shape of aperture projection in the Graphics window. In the 3D Video the apertures always cut through a wall at its full thickness.

Two buttons allow switching the **orientation** of the second aperture side relatively to the first one 

.

You can also switch the orientation quickly by pressing the **Space bar**.

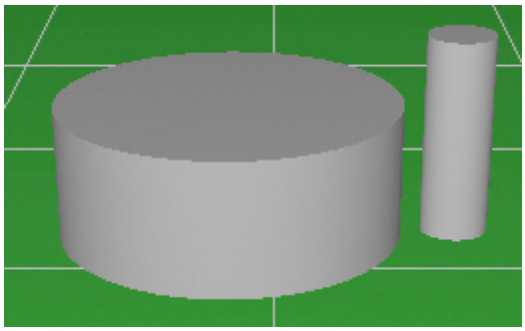
For modeling complex apertures it is possible to edit 189 the Apertures by points, moving its vertexes.
*When moving separate vertexes press **Ctrl**.*
You can create complex apertures using several intersecting apertures.

See also: Wall 198, "Constructions" button group" 193

Constructions > Circle

When this button is pressed, the first clicking on the graphics area 162 specifies the **center of a circle.** Second clicking completes the **circle** construction**.**
The status bar 275 displays the information on the sizes and location of the circle.

To switch the **circle** into the **editing state** you need to double-click on **its center** or on the **point on its radius** that appears during the process of construction.



In the 3D Video 357 and 3D World 342 a cylinder will be displayed in the circle place.

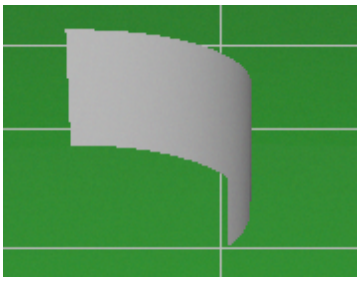
Default minimal and maximal heights of the cylinder are determined by the line type 475, which constructs the circle. The heights can be set separately for each circle by means of current construction parameters panel 282, on which it is also possible to set coordinates of the circle in numeric values.
Color of the cylinder is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the circle**: coordinates of the center and second point, radius, angle.

See also: "Constructions" button group 193

Constructions > Arc

When this button is pressed, the first clicking on the graphics area 162 specifies the **center** of an **arc.** Second and third clicking specify its **ends.**.
To switch the arc into the **editing state** you need to double-click on **its center** or on either of its two ends.



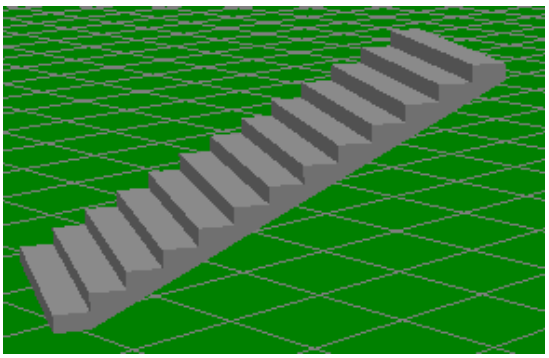
In the 3D Video 357 and 3D World 342 the arc stretches, creating a cylindrical surface.

Default minimal and maximal heights of the cylindrical surface are determined by the line type 475, which constructs the arc. The heights can be set separately for each arc by means of current construction parameters panel 282, on which it is also possible to set coordinates of the arc in numeric values.
Color of the arc is determined only by line type 475, which is used at constructing.

On the **current construction parameters panel** it is possible to set and fix **parameters of the arc**: coordinates of the center, first and second points, radius, angle.

See also: "Constructions" button group 193

Constructions > Stairs



Stairs is similar to the Inclined rectangle 196 and differs from it that in the 3D Video and 357 3D World 342 windows it is shown in the form of stairs

On the **current construction parameters panel** the minimum height corresponds to the pedestal of the stairs, maximum height corresponds to the top of the stairs.

In the **Graphics window** the upper side of stairs is displayed by **thick line**.

The number of steps is calculated automatically from the height of one step equals to 15 cm.

See also: "Constructions" button group 193

Constructions > Text

When this button is pressed, clicking on the graphics area 162 specifies the place for a text string. At this point a **pop-up frame** with cursor will appear.
The necessary text is to be entered within a frame. To separate the lines use **Enter**.

The font type panel 281 appears below in the graphics area allowing to change the font type 477. A **pop-up menu** is available within a frame, appearing at clicking the right mouse button.

The entered text is a text marker and can be quickly found using the Find text 247 tool. This is a very convenient and quick means for navigation on big layouts.

In the 3D Video 357 and *3D World* 342 *Texts are not displayed.*

See also: "Constructions" button group 193, *Find text* 247

Constructions > Mask

When this button is pressed, the first clicking on the graphics area 162 specifies the first vertex of **rectangular mask.** Second clicking completes the mask construction**.**

The status bar 275 displays the information on the mask sizes and location.

Using **masks** allows to cover any image parts. Constructions 193 and texts 201 can be drawn over masks.

To cover **separate construction fragments** you can also use **line of white color**.
In the **3D Video** masks are not shown.

In the 3D Video 357 and *3D World* 342 *the Mask is not displayed.*

See also: "Constructions" button group 193

Constructions > Filling

Filling is similar to a mask 202, but can be of any color, and also in the form of **different hatch type**. Color of filling is defined by the **color of line type**, by which the filling is made, and **type of hatching** or its absence - by **style of this line type**.

Fillings, as well as other objects, could be edited 189 *by moving separate vertexes, and thus could be stretched on various objects.*

In the *3D Video* 357 and *3D World* 342 fillings are not shown.

See also: "Constructions" button group 193

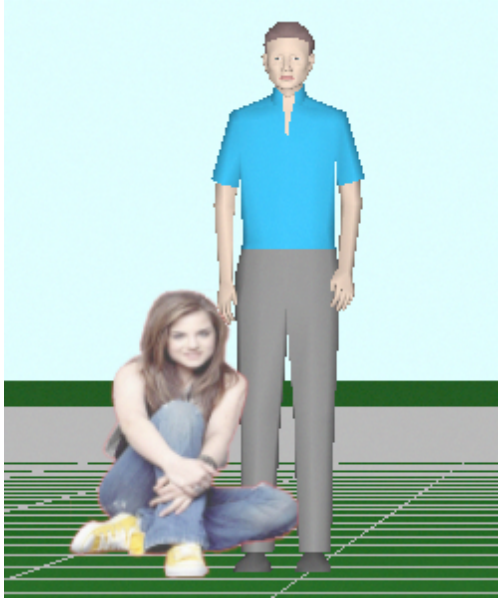
Constructions > 3D image

This tool is similar to Inclined rectangle 196. As well as the **inclined rectangle** it allows to place a rectangle in three-dimensional space at any angle.

But this rectangle can be "covered" by any raster image in *.bmp , *.jpg, *.gif, *.tiff, *.png formats. The image can be a photo or a figure. In *.bmp and *.jpg files, pixels of the image can be transparent if they have a color ***coincided*** with the **color of the left bottom pixel.** Thus the image border can take any form.

In *.png files transparent pixels will be displayed transparent.

In many cases raster images can replace 3D models 202 which are difficult to make. They can be used for modeling many objects from banknotes and plates up to a complex background.



After choosing this button the **Loading 3D image** dialog box appears. After choosing a file in *.bmp,*.jpg,*.jpeg,*.png,*.gif,*.tif or *.tiff format place **3D image** in the same way as Inclined rectangle.
On the Current construction parameter panel 282 the minimal height corresponds to the bottom bound of this rectangle and the maximal height - to the top bound.

In **the Graphics window** the top of 3D images is displayed by **thick** line.

Later **3D image** can be edited 189 by moving its grips. It is possible to change **3D image** sizes on the Current construction parameter panel, delete and change the image file using buttons and . on **the Current construction parameter panel.**

To make transparent pixels with color ***coincided*** with **color of left bottom pixel** (or transparent pixels of *.png file), check **Transparence checkbox** on **the Current construction parameter panel.**

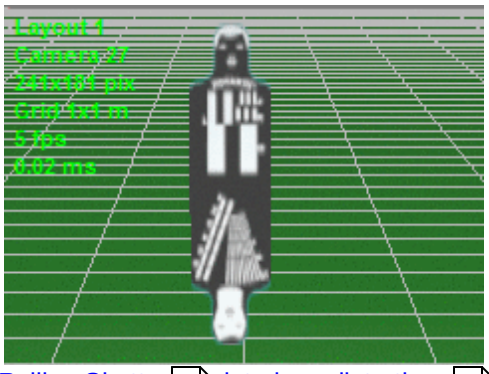
*To get the transparence of *.bmp or *.jpg file, the image file has to be specially prepared by means of any graphic editor, for example **Paint**. **Pixels that should become transparent have to be filled by color that coincides with the color of left bottom pixel.***

See also: "Constructions" button group 193

Constructions > Rotakin

Rotakin - an animated rotating test target for visual estimation of spatial resolution and motion distortions on the 3D images.
\
In the **horizontal plane** the Rotakin automatically turns towards the active camera.

In the **vertical plane** the Rotakin rotates with a specified speed about an axis passing through its center (in **Professional** version only).



Rotakin rotates when modeling exposure time 377, Rolling Shutter 378, interlace distortions 376 and

creation of animated images 386.

To place the Rotakin specify a place for the Rotakin by clicking.
On the **current construction parameters panel** it is possible to set minimal and maximal heights of the Rotakin.
In the Options box 482 it is possible to change rotation speed of all Rotakin objects.

*Rotating test target named **Rotakin** is used in field testing of video surveillance systems by the techniques developed by the **Home Office Scientific Development Branch** 'Performance **Testing of CCTV Perimeter Surveillance Systems (Using the Rotakin Standard Test Target)** ". The Rotakin model meets the requirements of the document.*

See also: "Constructions" button group 193

Constructions > Illuminator

The tool is designed to model illuminators with photometric accuracy.

As a result of clicking this button the **Illuminator calculation box** appears.
You can specify internal parameters of an illuminator in the box.

See more: Illuminator calculation 461.

You can open the Illuminator calculation box 461 by the button on the Current construction parameter panel 282 during placing or editing Illuminator.

On the Line type panel 280 it is possible to choose the line type 475, by which the Illuminator's icon will be drawn. Later line type can be changed using Change line type 268 tool.

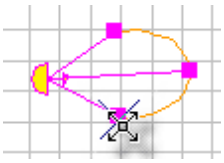
On the **Current construction parameter panel** it is necessary to specify **Illuminator height** relative to the base height 277 of a layer to which the illuminator belongs and **Inclination angle** (for projectors).

See more. Current construction parameter panel> Illuminator 284.

After assigning the parameters in the **Illuminator calculation box** and on the **Current construction parameter panel**, specify an Illuminator place by the first clicking in horizontal projection. Then specify a radiation axis direction by the second clicking (for projectors).

If graphic specifying **angle of radiation** and **Light intensity distribution curve (LIDC)** are not required, click for the third time on any point in the graphics area.
To specify **angle of radiation** and **LIDC** graphically after the second clicking clear **Angle** box on the **Current construction parameter panel**. After that by the third clicking specify **angle of radiation** and **light intensity concentration** on an axis of radiation.

***Light intensity distribution curve** is displayed by orange line.*
Light intensity distribution curve represents relative light intensity distribution. The curve does not depend on absolute values.



It is possible to specify parameters after the Illuminator placement. To set parameters click **Edit** button and set parameters on the **Current construction parameter panel**. To open **Illuminator calculation box** click the button.
In order to edit angle of radiation and concentration by moving pink grips, press and keep **Ctrl** pressed.

Created Illuminator will take part in 3D image modeling from some camera only if for this camera:
- Illumination modeling is switched on 372;

- Illuminators are enabled 373;
- The Illuminator is switched on 286.

While modeling Illuminators VideoCAD considers only direct light. Reflected light can be considered only approximately by specifying a part of light from this Illuminator diffused on the scene. Shadows cannot be modeled in VideoCAD.

See also: Illuminator calculation 461, Current construction parameter panel 282.

Constructions > Field-of-view size

When this button is pressed, moving the cursor in the vertical projection of graphics area 162 a field-of-view size value passing through the cursor point is indicated on the Status bar 275.

The **field-of-view size** depends on **height** and **distance**, therefore measuring in the **vertical projection** is allowed only.

The button is available in the graphical editing state 167 only.

*If no other measurements made after the **field-of-view size** is marked at a point, with changing a camera position, the values in the status bar change correspondingly, thus representing the current **field-of-view sizes** at a point.*

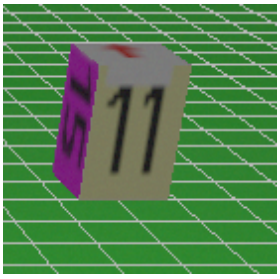
See also: "Constructions" button group 193

Constructions > Test object location

When this button is pressed, clicking on the graphics area 162 specifies the **test object location**. The parameters of **test object location** in the test object dialog box 507 change correspondingly.

The button is available in the graphical editing state 167 only.

Test object can be seen in the 3D Video 357 in the **graphical editing state**.



See also: Test object box 507

Constructions > Global snaps

Choosing this item opens a submenu enabling to switch global snaps on/off and display the snap panel, with the help of which it is convenient switch the snaps fast when drawing.

Snaps enhance the convenience in drawing. As a result of the snaps' functioning the cursor "sticks" to the certain **points**, **lines** or **directions**.

- **Points** - the cursor sticks to base object points.
- **Lines** - the cursor sticks to objects lines.
- **Angular** snap functions at construction of line segments, angles, cables, and at moving and rotating as well. After that the subsequent construction points are leveled from the previous points horizontally and vertically.
- **Extension** - the cursor sticks to the virtual horizontal and vertical lines passing through base

objects points.

The snap Extension is disabled for hidden 267 objects and in the Select/Edit 189 mode.

- **At grid** - the cursor sticks to grid nodes.

*In the Options box 490 you can change **snap sensitivity**.*

- **Show panel** - display the **snap panel**, with the help of which it is convenient switch the snaps fast while drawing.

The **pop-up menu** appearing when clicking the graphics area 162 with the right button of the mouse contains an item **Local snap**. The **local snaps** have the same function as the global ones though working **during one operation**.

Constructions > Lock constructions

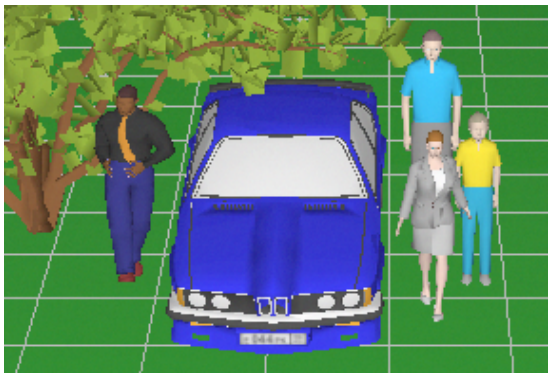
After modeling the environment the cameras' placement stage begins. At this stage displacement of constructions is not required any more, and their casual selection can cause inconveniences. If this item is marked, the selection of constructions is locked. To release the locking, click this item once again.

3D models > 3D Model

The item opens submenu, in which there are **3D models** which are present in the program library.

When any item in the submenu is chosen, clicking in the graphics area 162 specifies the place for a **3D model**.

***3D models** placement is possible in the horizontal and vertical projections, however only 3D models placed in **the horizontal projection** will be visible in the* 3D Video 357 and 3D World 342.



In the horizontal projection the **3D models** are displayed in the **top view**, in the vertical projection **-** in the **side view**, and in the 3D Video 357 and 3D World 342 models are as **3D objects**.

Horizontal and vertical projections 399 for displaying in the **Graphics window** can be created in the 3D Models 397 window.

3D models can be **moved**, **rotated, copied**, changed draw order 267 as other VideoCAD objects.

The default **height of the 3D models** above the ground is determined by the **maximal height of the line type** 475 which was chosen when the **3D model** was being placed. The height can be set separately for each **3D model** using the current construction parameters panel 282.

T**o change 3D model height** above the ground, select 262 the 3D model, then change line type 268 or switch the 3D model to editing state by double clicking on it and change value in the **3D H** box on the **Current construction parameters panel.**

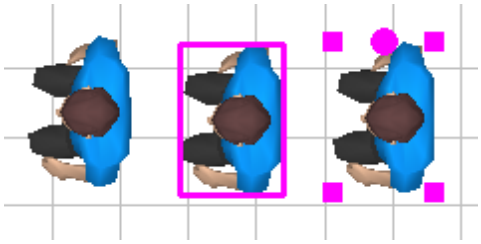
By default the **3D models** are on the ground and constructed by the **line type** with the number, specified on the Lines 475 tab of the Options box 474. This line type has the **maximum height**

equal to 0.
*Heights can also take on **negative values**, in this case **3D model plunges under ground**.*
*For example, **to place a 3D model on a surface:** construct the surface by the rectangle 196 tool using **line type** with the required maximum height, place the 3D model on it, and then change 3D model **line type** to the line type of the surface.*

In multilevel 3D projects heights are calculated relative to the base height of a layer 277 the which the 3D model belongs. By changing the base height a layer you can move up or down all 3D models and constructions on the layer

In the Editing state 164 using the **Current construction parameters panel** you can resize 3D models separately on axes.
To do this, enter new values into X, Y, Z boxes during 3D model editing. If the box is marked, change of any size leads to proportional change of other sizes, thus model proportions are not broken. 3D model **height above the ground** is displayed and can be changed in **3D H** box.

In the editing state 164, 3D models are displayed with square grips and pink circle.
You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.

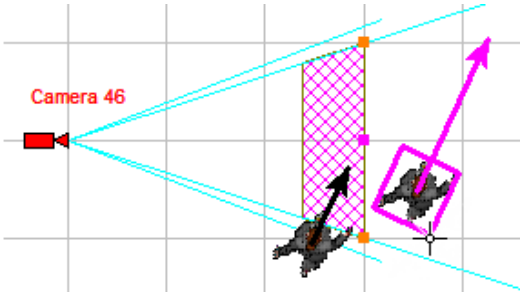


Moving 3D models

3D models can have velocity vectors. Model with specified nonzero speed will move with this speed along a specified direction when modeling exposure time 377, Rolling Shutter 378, interlace distortions 376 and creation of animated images 386.
To set speed to 3D model you should enter a nonzero value in the Speed 283 box in the Current construction parameter panel during the placement or editing 3D models.

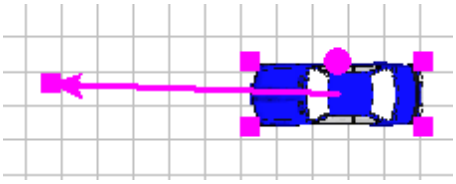
If a 3D model 202 has non zero speed, then the **velocity vector** is displayed.

If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model pass per second (crimson arrow)**.
If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the Active camera 166 (black arrow).**



** the length of the **velocity vector** of a **3D model in the normal state** is inversely proportional to the frame rate 375 of the active camera. Thus we can see how many times the moving 3D model gets into the frame of the active camera.*

You can edit the **velocity vector** of 3D model in editing state by moving its terminus.



\
You can hide the **velocity vectors** of all 3D models using the Velocity vectors 241 menu item.

License plate of cars

Let's consider 3D models - cars with license plates. License plate type, the same for all car models, is determined by the file **number.bmp** file in the directory **\Models**, and the **plate size** - by the corresponding settings in the **Options box** on the 3D modeling 480 tab. This opportunity allows using the same models in different countries with different license plates.

To make cars appear in the 3D Video with the license plate of your country:
- create a ***.bmp** file with the image of you license plate;

!! The size of file sides, in pixels, must be equal to powers of two: 16,32,64,128,256,512,1024,2048 ....
- replace the file **number.bmp** by your file;
- specify the sizes of your license plate in the **Options box**.

3D models of terrain

You can use 3D model of terrain of video surveillance, for example: buildings, territory etc. Cameras, constructions, other 3D models can be placed inside the 3D model-territory. VideoCAD offers special tools 397 for working with 3D models-territories

See more: *3D Models window* 397, *3D World window* 342, *Work with 3D model-territory* 602.

Adding new 3D models, manage 3D models

You can add new 3D models to the library using Add 3D Model 262 menu item.

You can add, delete, duplicate 3D models, distribute 3D models by directories in menu, get projections of 3D models for the Graphics window using the 3D Models 397 window.

Files of 3D models in ***.vcm** format can be exported from **SketchUP** and **3ds max** using plugins. Custom 3D models for VideoCAD can be created in **SketchUP** and **3ds max**.

See more: Importing 3D models from SketchUp and Autodeck 3ds Max 599

See also: 3D Video 357, *3D World* 342, *3D Models* 397, *Options box>Lines* 475, *Options box>3D modeling* 480.

3D models > 3D Models window

Open the **3D Models** window. This window is intended for working with 3D models 202, add, delete,

duplicate, make projections etc.

See more: 3D Models window 397

3D models > Add 3D model

Add a 3D model to the program library. In the dialog box, select a file of 3D model ***. vcm** format and click **Open**.

Files in ***. vcm** format can be obtained by exporting from SketchUP and 3ds max using plugins. For details, see IImport of 3D models from SketchUp and Autodesk 3dsMax 599

If VideoCAD library already has a 3D model with the same name or ID, you will be prompted to add the model under a different name or ID.
Then you will see the 3D Models window 397, in which you can create the projection 399 of the 3D model to display it in the Graphics window 161 and menus 202. To do this click the **Save projection button** and close the **3D Models** window. After this, icons of the 3D model will appear in menus and the 3D model can be placed in the graphics area.

*For other features of the **3D Models** window, see 3D Models window* 397

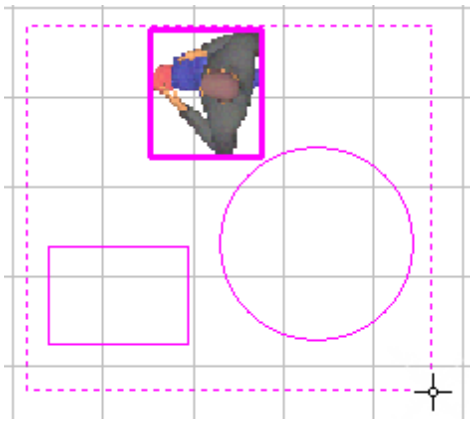
If your 3D model has **textures**, in the same directory where the ***.vcm** file is opened from, a folder with textures must be. The folder should be named **<model name> _textures**. VideoCAD plugin for SketchUP automatically creates the folder with the textures in the directory of saving exported model.

Edit > Select All

Select all constructions, models, cameras, cables and illuminators on the current layout.

Edit > Select/Edit

With this button chosen the first corner of **selection window** appears when clicking any empty place of graphics area 162 once. Clicking it again completes the designation of **selection window**.
All the **objects**, which hit in the **selection window** and reside on the **projection** coinciding with one being clicked for the first time, will be selected 164. However, the earlier **selected objects** not hitting in the **selection window** will revert to normal state 163.



*If **Ctrl is pressed** at clicking, the **objects** within the **selection window** are inverted, on the contrary, state of those not hitting in the **selection window** remains the same.*

It is possible **to select objects by one** by clicking their image once, thus enabling the earlier selected **objects** to revert to normal state.
*If **Ctrl** is pressed at clicking, the **objects** are inverted, and the state of the rest remains the same.*

You can make a *3D model* 202 *insensitive to mouse click by Lock checkbox* 402 *in the 3D Models window.*

During construction 3D scenes 357 it is often necessary to place some constructions one over another at a different height, made by means of different line types 475.
To select one or more construction, located one over another, made by means of different line types:
- make the line type panel 280 visible, for example by double clicking any construction;
- choose on the panel the line type of construction you want to select;

select the construction by clicking.

Just repeat clicking at the same place without moving the cursor. Thus objects under the cursor will be selected sequentially.

Layers 185 are very useful for multi-level constructions.

An object can be *inaccessible for selection if it belongs to a not enabled layer* 276

To move objects on the foreground or background use menu items: Bring to front 267, Send to back 267.

Selected objects can be moved. To move the selected objects, bring the cursor to the selected one, press the left mouse button and move the selected objects. After finishing the moving, release left mouse button.

To cancel selection click this button again.

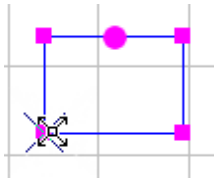
*To **select all objects** on the current layout use **Ctrl+A** shortcut.*

*For switching to Select / Edit mode from any mode use also **Esc** button.*

See also: Selected state 164

Editing state of objects

To translate an object into editing state 164 double-click its image.
After that **pink grips** appear on the object base points.
When moving the cursor over this point its image changes.



To edit an object click beside a base point with a grip and move the cursor. After clicking for the second time, the changed object is set up.
If on one side of a construction a **circle** is displayed, the construction can be rotated around its axis by catching the circle by mouse.

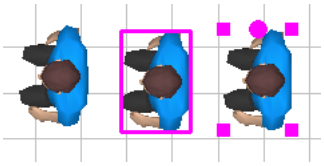
To switch the circle 253 into the editing state you need to double-click on its center or on the point on its radius that appears during the process of construction.
To switch the arc 254 into the editing state you need to double-click on its center or on either of its two ends.

When editing a rectangle 196 or a mask 202, then several points will move at a time, the rectangle or the mask remaining square.
If **Ctrl** is pressed when editing a rectangle or a mask, then one point will move only.

When editing a Double line 197 or Wall 198, the whole Double line or Wall will be moved.
If **Ctrl** is pressed when editing the double line or wall, only one line will be moved.

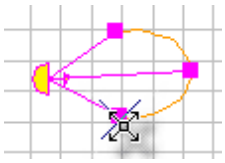
When clicking the text 201 twice the pop-up frame appears allowing to edit text in it. When clicking the right mouse button the pop-up menu of text editing appears in the frame.

In the editing state, 3D models 202 are displayed with square grips and pink circle.
You can rotate the 3D model by the mouse using the circle, scale 3D model on X and Y axis using the square grips. You can move the 3D model by pressing the left mouse button on the 3D model, as well as in the selected state.



To switch illuminator 206 to editing state click on its center.

Thereupon, the Light intensity distribution curve (LIDC) becomes visible. To edit the curve by moving grips on the layout press Ctrl.



It is possible to change object's parameters in editing state on the current construction parameters panel 282 which automatically appears in the bottom of graphics window.

See also: Editing state 164

Activate cameras

When double-clicking the camera lens the following actions are performed:

- the Active camera 166 is saved.
- the camera being double-clicked will become active.

It is convenient to pan and tilt the active camera by moving the grip in the middle of the view area upper bound.
In a similar way by moving grips on the ends of the view area upper bound it is possible to change lens focal length 294 of the camera.

If a model 419 is assigned to the camera, the focal length changing is possible only in the limits specified in model parameters 438.

Changing the lens focal length, and therefore the calculated values of view angles of a camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking into account the changed values of calculated view angles.

See also: Active camera 166

See also: "Edit" button group 188

Edit > Cut

Cut the selected objects 164 into the VideoCAD internal clipboard.

It is possible to cut **objects** of different projections at a time, and to cut any quantity of constructions 193, 3D objects 259, **cameras,** illuminators 206, texts 201 and **cables**.

When cutting the Active camera 166 it is copied.

See also: Cut with base point 265

Edit > Copy

Copy the selected objects 164 into the VideoCAD internal clipboard.

It is possible to copy **objects** of different projections at a time, and to copy any quantity of constructions 193, 3D objects 259, illuminators 206, texts 201 and **cables**.

See also: Copy with base point 265.

Edit > Cut with base point

Cut the selected objects 164 into the VideoCAD internal clipboard relative to a base point. After clicking this button specify the **base point** of cutting.

It is possible to cut **objects** of different projections at a time, and to cut any quantity of constructions 193, 3D objects 259, texts 201, **cameras,** illuminators 206 and **cables** as well.

When cutting the active camera it is copied.

See also: Cut 264.

Edit > Copy with base point

Copy the selected objects 164 into the VideoCAD internal clipboard relative to a base point. After clicking this button specify the **base point** of copying.

It is possible to copy **objects** of different projections at a time, and to copy any quantity of constructions 193, 3D objects 259, texts 201, **cameras,** illuminators 206 and **cables** as well.

See also: Copy 265.

Edit > Paste

Paste the **objects** from the VideoCAD internal clipboard.
After clicking this button specify the **base point** of paste in the projection being clicked when **cutting** or **copying**.

It is possible to paste into different layouts 513, paste **cables** of one camera while another camera is active (in this case the pasted cables belong to a camera which is active during paste), and to paste any quantity of constructions 193, 3D objects 259, **cameras,** illuminators 206, texts 201 and **cables** at a time.

It is available to **copy** and **paste constructions**, **cables** and **texts between the projects**. To this effect make a copy in one project, then open another project or create a new one and paste what you have copied.

Be careful when copying and pasting **cables**. You can copy only **cables of Active camera** 166, and when pasting, these cables will belong to the **camera which is active during pasting**.

*If a camera is being pasted a **new camera** with parameters of the pasted camera is created automatically. **This is an alternative way to create new cameras.***

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but pasted camera doesn't become active. Therefore the view area of the pasted camera is displayed without shadows. To calculate shadows - activate 166 the camera after pasting.

Pasting is always performed to the active layer 276. *At the moment of placing new camera 171 or pasting 191 copied camera, its base height 298 is set to the base height of the active layer 277.*

Edit > Move

Move the selected objects 164.
After clicking this button the first click in a graphics area 162 designates the starting moving point, the second click - the final one.

*When moving take into account the **projection** to which the objects are attached. A simultaneous moving objects in different projections vertically is locked as being incorrect.*

Selected 164 objects or cameras can be moved in Select / edit 189 mode. In order to move place the cursor above the selected object, press left mouse button, move, after moving is finished release the left mouse button.

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but moved camera can be not active. If the camera is not active, the view area of the moved camera is displayed with old shadows. To recalculate shadows - activate 166 the camera after moving.

Edit > Rotate

Rotate the selected objects 164.
After clicking this button the first click in a graphics area 162 designates the rotation **center**, the second click specifies the initial rotating point, and the third click specifies the final rotating point.

*When rotating take into account the **projection** to which the objects are attached. The selected objects, attached to the projection with a rotation center designated, can rotate only.*

*The scalable 477 fonts can rotate only. If a font is not scalable then its **initial point** rotates only, **the text remaining horizontal**.*

The active camera can be rotated in Select / edit 189 mode by moving the grip in the middle of the view area upper bound.

Shadows 178 in the Graphics window 161 and in the 3D World 342 are calculated for the active camera 166, but rotated camera can be not active. If the camera is not active, the view area of the rotated camera is displayed with old shadows. To recalculate shadows - activate 166 the camera after rotating.

Edit > Scale

Change scale of selected 164 constructions relative to the center of scaling.

After clicking on this button, the first click on the graphics area 162 specifies the **center of scaling** .

Then moving the cursor up increases sizes of selected constructions, moving the cursor down decreases sizes of selected constructions.

In the Status bar 275 the current scale factor is displayed.

When required sizes will be achieved, click for the second time to complete scaling operation. To cancel the scaling press **ESC**.

This tool does not scale 3D models 202. 3D models can be scaled in editing state 164 with the help of the Current construction parameter panel 283.

Edit > Mirror

Mirror the selected 164 constructions relative to the horizontal or vertical line passing through the

specified point.

After clicking on this button, the first click on the graphics area 162 specifies the point through which a mirror line must be passed.

Then moving the cursor changes position of the mirror line.

When required position of the mirroring objects will be achieved, click for the second time to complete mirroring operation. To cancel mirroring press **ESC**.

Edit > Bring to Front

Move selected objects 164 on the foreground, then other objects will not shadow them.
To move cameras over constructions use the Cameras over constructions 242 item.

Changing the objects' draw order can be required at operation with large 3D models 259 of rooms, and also at operation with constructions placed one over another.

Edit > Send to Back

Move selected objects on the background, then selected objects will be covered by other objects.
To move cameras over constructions use the Cameras over constructions 242 item.

Changing the objects' draw order can be required at operation with large 3D models 259 of rooms, and also at operation with constructions placed one over another.

Edit > Hide

Hide the selected objects 164.

With this item chosen the **selected objects** proceed into hidden state 167. In the **hidden state** the objects in the **Graphics window** are displayed on the background in **light grey** color. The rest characteristics are similar to those of normal state 163.

In the 3D World 342 and 3D Video 357 windows the hidden objects are not displayed. Hidden objects are not exported to *AutoCAD formats* 219, *therefore to exclude some objects from export - hide them.*

The **hidden state** is used to conceal the temporarily interfering objects.

To return to **normal state** select 262 the **hidden objects**.

The snap Extension 258 is disabled for **hidden objects**.

When working with a separate **object** it is convenient to **select all** the objects in layout 226 using the shortcut **Ctrl+A** and **hide** them. After that **select** the objects needed.

See also: Layer - Hidden 277;

Edit > Align

Align the selected objects 164.

Because limited accuracy of computer calculations, sometimes after a rotation objects' form is being distorted a little.
The effect of choosing this item is alignment of the form of selected objects.

Efficiency of alignment depends on a scale. Vast scale provides the minimum of efficiency, small scale - the maximum. At high degree of efficiency small objects can be distorted.

Edit > Change Line type

After choosing this item at the bottom of the graphics area 162 appears the line type panel 280.
In the **line type panel** you can choose line type 475 for the selected 164 constructions 193 **and cameras**.

If during changing the line type of selected objects by the **Change line type** tool, to press and hold **Ctrl**, then the selected objects will also change their minimum and maximum height according to the chosen line type . If **Ctrl** is not pressed, the heights remains unchanged.

For changing line type with returning heights to values set in the new line type parameters 476, use the Line type panel 280 in editing state 164 of one construction.

Edit > Move to active layer

Move to active layer all selected 164 objects.

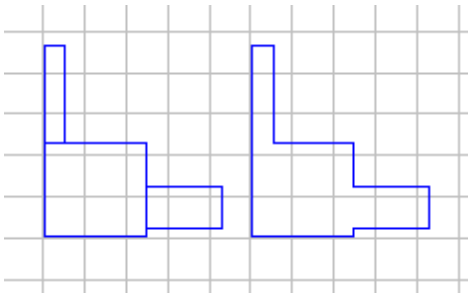
See more: Layers 276

Edit > Combine to block

Combine to a block all selected 164 constructions. The block will behave as one object. Combining is convenient at modeling complex objects and their subsequent moving, rotating and copying.
To destroy the block use the Destroy 268 tool.

Edit > Merge contour

Merge contours of selected 164 constructions. This tool works with walls 252 and rectangles 250.
Merging improves appearance of drawing of buildings. To destroy merged contours use the Destroy 268 tool.



Line type 475 of the contour is determined by line type of the first construction of the contour. You can create multiple contours of different constructions with different line types.

Edit > Destroy

Divide selected blocks 268 or contours 268 to separate objects.

Edit > Switch ON illuminators

Switch ON selected 262 illuminators 257.

For one camera no more than 7 illuminators could be switched on 286 simultaneously. Switched on illuminators are saved in camera parameters, therefore it is possible to switch on and switch off different illuminators for each camera.

Edit > Switch OFF illuminators

Switch OFF selected 262 illuminators 257.

Edit > Undo

Undo the last operation.

VideoCAD stores several **last operations including Undo operation**. When clicking this button successively VideoCAD retraces to the last states and a state before the button **Undo** was clicked for the first time.
The quantity of the stored operations can be adjusted in the Options box>Miscellaneous>UNDO depth 492.

Edit > Redo

Redo the last operation undone by the UNDO 211 tool.

Edit > Erase

Erase the selected objects 164.

If there are no **selected objects** this item is disabled.

Use also **Del**.

You can not erase the active camera.

Edit > Erase all

Erase all constructions 193.

If there are no **constructions** this item is disabled.

Cables > Signal cable

When this button pressed, you can draw the **signal cable** of the **active camera** by successive clicks in the **graphics area**. The end of each segment is the start of the next one. To stop drawing cable, press **ESC.**

The status bar 275 displays the segment length and its projection to distance and height.

Both clicks are to be made in the **same projection**. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing the drawing the segment is attached to the projection with its **initial point**.

A cable consists of **segments**, allowing to draw it in different projections and layouts, representing an actual scheme of laying accurately.

When copying 191 the **cable segments** between **cameras** and layouts 513 a process of cable drawing is accelerated considerably even in complex CCTV systems.

When drawing a cable the menu item Cable laying 271 might be used. When choosing it a float panel of the same name appears enabling to choose a shift of segment ends for a level parallel

cable drawing along the walls, columns etc.

The type and parameters of **line designating the Signal cable** can be changed in the options box 475.

VideoCAD summarizes the lengths of all the segments, considers the **reserves** and calculates the **total length of cable**. To change the default parameters and obtain the calculation results double-click the image of any cable segment or click **Signal cable** again.
A dialog box of the same name appears after that.
*You can open this box by choosing **Calculate** item near **Signal cable** item.*

The results of the cables' calculation on each individual camera and on the project as a whole are included into the text file obtained by Text report 216, Table of cameras 443 and Cable report 271.

In multi-layer drawings, cables belong to the same layer 276 as a camera to which the cables belong.

It is possible to use Line segments 195 for cable modeling with subsequent cable length calculation. Use separate line types 475 for drawing a cable of each type. For length calculation use the Length calculation of line segments 517 tool and the Cable report 271.

See also: "Constructions" button group 193, View>Active camera cables 242, View>All camera cables 242, Cable laying 271, Length calculation of line segments 517, Cable report 271.

Cables > Power cable

When this button pressed, you can draw the **power cable** of the **active camera** by successive clicks in the **graphics area**. The end of each segment is the start of the next one. To stop drawing cable, press **ESC.**

The status bar 275 displays the segment length and its projection to distance and height.

Both clicks are to be made in the **same projection**. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing a drawing the segment is attached to the projection with its **initial point**.

A cable consists of **segments**, allowing to draw it in different projections and layouts, representing an actual scheme of laying accurately.

When copying 191 the **cable segments** between **cameras** and layouts 513 a process of cable drawing is accelerated considerably even in complex CCTV systems.

When drawing a cable the menu item Cable laying 271 might be used. When choosing it a float panel of the same name appears enabling to choose a shift of segment ends for a level parallel cable drawing along the walls, columns etc.

The type and parameters of **line designating the power cable** can be changed in the options box 475.

VideoCAD summarizes the lengths of all the segments, considers the **reserves** and calculates the **total length of cable**. To change the default parameters and obtain the calculation results double-click the image of any cable segment or click **Power cable** again.

A dialog box of the same name appears after that enabling to choose a **cross-section area of power cable** to fit the requirements of **camera voltage supply**. It is assumed that the conductor material is **copper** and the conductor temperature is **+ 50° C**
*You can open this box by choosing **Calculate** item near **Power cable** item.*

The results of the cables' calculation on each individual camera, each individual section area and on the project as a whole are included into the text file obtained by Text report 216, Table of

cameras 443 and Cable report 271.

In multi-layer drawings, cables belong to the same layer 276 as a camera to which the cables belong.

It is possible to use Line segments 195 for cable modeling with subsequent cable length calculation. Use separate line types 475 for drawing a cable of each type. For length calculation use the Length calculation of line segments 517 tool, Cable report 271.

See also: "Constructions" button group 193, View>Active camera cables 242, View>All camera cables 242, Cable laying 271, Length calculation of line segments 517, Cable report 271.

Cables > Cable laying

With this item chosen a **float panel** of the same name appears enabling to choose a shift of segment ends for a level parallel cable drawing along the walls, columns etc.

See also: View>Active camera cables 242, View>All camera cables 242

Cables > Length calculation of line segments

Clicking this item will open a box allowing calculate total length of any line segments 248. This tool allows using line segments for modeling cables.

See more: Length calculation of line segments 517. See also: Cables 269

Cables > Cable report

Choosing this item opens a box with a text report of all line segments 195 and cables 208 made by **line types** with marked Cable 475 box in the parameters of the line type.
These **line types** are considered as **cable brands**. These line types can be assigned to the Signal cable 514 and the Power cable 515 of any camera.

You can simply draw cables as **line segments** on layouts using these line types. In this case, the cables are considered as **main cables** which are not attached to any camera.

The Cable report includes the cables attached to cameras and the **main cables** as well. Cable lengths is calculated for each brand (line type) separately.

See also: Length calculation of line segments 517, Calculation lenght of cables and getting the Cable report 590, Signal cable length calculation box 514, Power cable electrical parameters and length calculation box 515, Cables summary 521.

Criteria > Person detection area

Display a box with the **person detection criteria**.

See more: Criteria editing box of person detection area 498

Criteria > Person identification area

Display a box with the **person identification criteria**.

See more: Criteria editing box of person identification area 500

Criteria > License plate reading area

Display a box with the **license plate reading criteria**.

See more: *Criteria editing box of license plate reading area* 503

Criteria > Quality levels

Open a box to edit the **quality levels**. This box allows to edit quality level criteria values and assign a quality level to the active camera.

See more: *Quality level box* 505

Help > About VideoCAD

Open the About box with the general information of VideoCAD version and the Authors.

Help > Help contents

Open the contents of this Help file.

Help > Language

Choose the language.

All the text resources of the program are stored in ***.lng** files in the VideoCAD installation directory.
We are interested in translating the program to other languages.
If you can do it, could you please contact us.support@cctvcad.com

We offer big discounts for the translations.

How to add a new interface language

There is English.lng file in a directory of VideoCAD (or VideoCADdemo) installation. All text elements of the interface are loaded from this file.
For creation of new interface language it is necessary:
1. Copy English.lng (Russian.lng) file under a new name <YourLanguage>.lng
2. Accurately translate each line in the file. Don't change positions of the lines, don't delete or create new lines! Each position corresponds to some interface element. Don't translate lines which begin from '///' - they are labels. It is necessary to keep all blanks between lines.
3. Copy the obtained new file to the directory of VideoCAD(VideoCADdemo) installation and start VideoCAD (or VideoCADdemo).
4. Choose Main menu> Help> Language><YourLanguage>
5. Check up new interface. Correct the <YourLanguage>.lng file if necessary.

Don't hesitate to contact us in case of any troubles.

Help > Home page

Visit CCTVCAD Software home page in the Internet.

Help > Order

Visit CCTVCAD Software Order page in the Internet.

Help > User forum

Visit CCTVCAD Software User forum in the Internet.

Help > Contact us

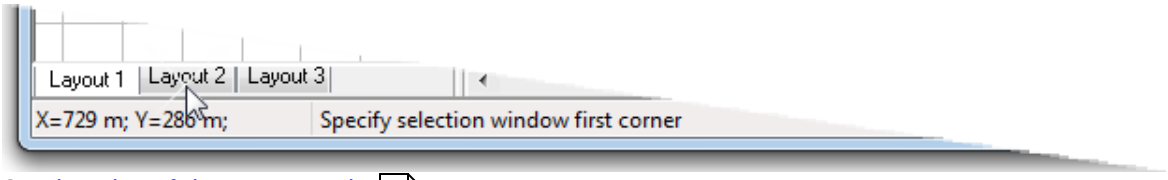
Send us an email message.

Help > Change registration code

Open the Enter key box to change the registration code.

Ability to change the registration code might be usefull for users with multiple licenses with USB dongles. Each USB dongle corresponds its own registration code. Message "The Dongle does not fit the License." means that the USB dongle does not match registration code, which registered the program. You need to change or a USB dongle, or enter the code corresponding to the dongle connected.

9.1.4 Layout tabs



See location of the Layouts tabs 161

There are **Layouts tabs** in the bottom-left corner of the Graphics area 162. Each tab corresponds to the separate layout created in the project.

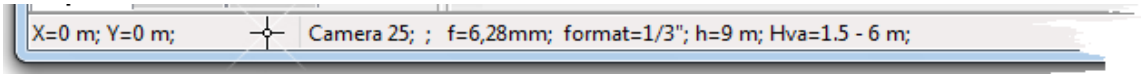
The layouts are separate sections of monitored object (building, room, territory and storey). A layout contains the horizontal and vertical projections locating backgrounds, **cameras**, cables 269 and constructions 193. Each camera can be displayed in one **layout** only, but camera **cables** may pass through several layouts.
The project may contain up to **10** layouts. Originally one layout is created into project.

To show any layout, click the tab with its name.

Using the pop-up menu, which appears by right clicking on the tab, you can create, delete, and rename layouts or show the current layout completely.
The **original layout** and any layout with the cameras present in it can not be deleted.

See also: Layouts box 513, *Layers* 276

9.1.5 Status bar



See: location of the Status bar 161

Graphics window 161 **status bar** is situated in the bottom of the **graphics window** and consists of two parts.

The left part is constantly displaying the **current coordinate of the cursor** relatively to the origin of coordinates 245.
If the **origin** coinciding with the active camera is set up, then the coordinates have the following values:

- .If the cursor is in the **vertical projection**, then it is the **distance to the camera location** and its **height above the ground**. If the cursor is in the **horizontal projection**, then it is the **distance to the active camera location** in horizontal and vertical.

  If there is no **active camera** in the layout displayed, then the values of coordinates have no sense.

- The right part is displaying the **measurement results** and the **hints**.

  *The **construction coordinates** are displayed relatively to the chosen origin of coordinates 245. The coordinates of constructions **belonging to one camera only** (focal plane 171, optical axis 171, field-of-view size 171, test object 171, change view area upper bound 210) are always displayed **relatively to the active camera**.*

At moving the cursor nearer to the camera icon the name, model name and basic camera parameters are displayed.

During graphical depth of field calculation 458, at moving the cursor over view area in vertical projection in the right part of the Status bar, resolution at cursor point is displayed (in LPH).
When moving the cursor over view area in horizontal projection, distance from the active camera and resolution at the point of cursor are displayed.
The resolution in horizontal projection is measured at the height of measuring Depth of Field 458.

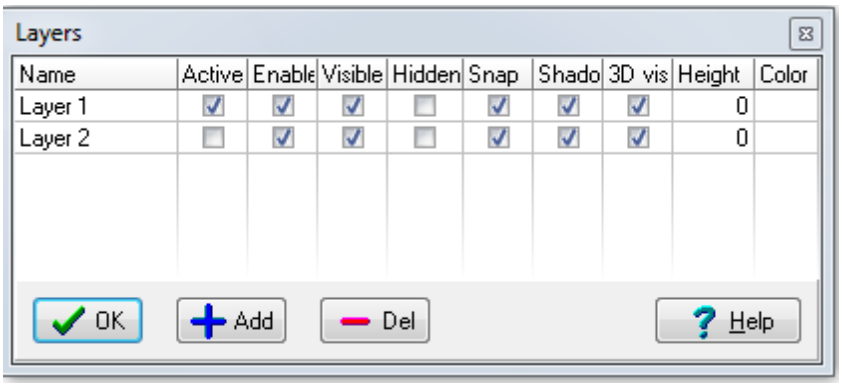
During measuring field-of-view size 207 at a point, when moving the cursor over view area in vertical projection, in the right part of the Status bar field-of-view size at cursor point is displayed.

During scaling 192, in the right part of the Status bar the **current scale factor** is displayed.

9.1.6 Layers

Graphics window
Tool bar
Layers

Cameras, constructions and 3D models can be distributed by layers. On each layout 513 unlimited number of layers can be. The layers are managed using the **Layers panel**, which can be caused by the Main menu>Drawing>Layers 226. item.



By default, a single layer - Layer 1 is created. To create a new layer , click the **Add** button
To delete a layer, select a row with the layer in the table and click **Del**.

If there is a construction or camera on the layer , the layer can not be deleted. Firstly you must delete or move 268 to another layer the construction or camera from this layer.
The active 276 layer can not be deleted. Firstly you must make active another layer.

Cables 208 are in the same layer as a camera to which they belong .

You can move cameras and constructions from one layer to another using the Move to active layer 268 menu item.

Layers have the following parameters. You can edit them, by checking checkboxes and editing values in the Table of layers.

Name

The layers are named automatically. To rename select the field and enter new name by keyboard.

Active

New cameras and constructions as well as pasted 191 ones are placed to the active layer. Active layer can not be deleted. Only one layer can be active, other options can be applied to several layers simultaneously. Always one of layers is active. Active layer must be **visible**, **enabled** and not **hidden**.

Enabled

Cameras and constructions on an enabled layer can be selected 189 and then edited, copied or deleted.

Visible

Cameras and constructions on an **visible** layer are visible in the Graphics window 161.

Hidden

Cameras and constructions on **visible** but **hidden** layer are displayed in the Graphics window 161 by grey color on background, like objects in the hidden 167 state. In contrast to the **hidden** state, at attempt to select the objects remain hidden. In addition, objects on hidden layers remain visible in 3D Video 357 and 3D World 342 windows.

Snaps

On a layer with marked **Snaps** field the snaps 209 are enabled. By clearing this field, you can disable **snap** for objects on this layer.

Shadows

Objects on a layer with **shadows** marked are considered as obstacles in calculation of shadows 178, if they are obstacles according to their other setting. Using **shadows** field it is possible to exclude certain layers from shading calculation. The option works on the Graphics window 161 and the 3D World 342. To enable shadows calculation other options must be enabled, see *shadows* 178.

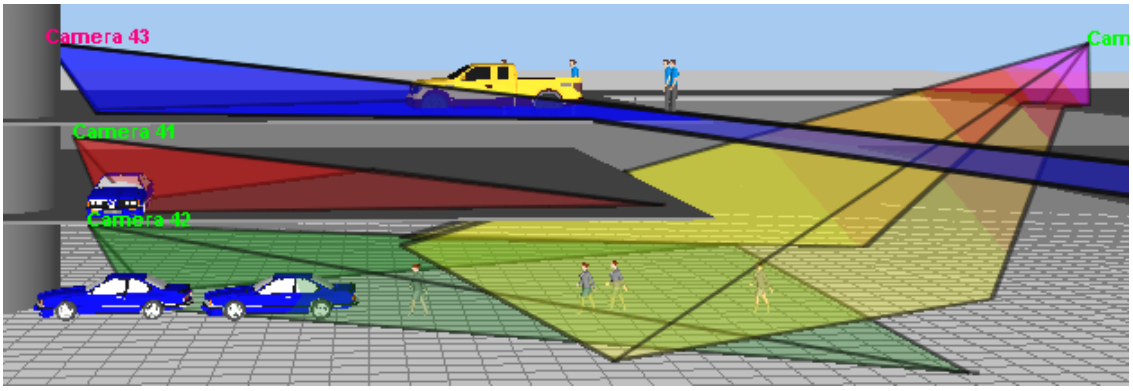
See also:Shadows 178, *Main menu>View>Calculate shadows for active camera* 239, *Main Menu>View>Recalculate shadows* 239, *Line type>Shadow* 475, *Layers>Shadow* 277, *Options box>Miscellaneous>Shadow* 490, *Options box>Calculate shadows from 3D models* 491, *Current construction parameter panel>3D model>Shadows* 283, *3D Models window>Shadows* 402, *Choosing the best place for PTZ (dome) camera* 583, *Visualization of the camera control area projections and spatial resolution within them* 580

3D visible

Objects on a **3D visible** layer are visible in the 3D Video 357 and 3D World 342 windows.

Height

Base height of objects on the layer relative to the zero height. Heights of constructions on each layers are calculated relative to the **Base height**. The **Base height** is taken into account in the 3D Video 357 and 3D World 342 windows and in calculation of shadows 178. With the **Base height**, layers are very convenient for multi-level projects.



*Heights of cameras and their view areas are not associated with the **base height of layer**, they are calculated from the base height 298 of each camera. But when placing a new camera 171 or pasting 191 copied camera, the **cameras base height** is set equal to the base height of the active 276 layer.*

Color

In this field you can specify a color, by which constructions, cameras, cables, and text placed on this layer will be displayed in the **Graphics window**. To call the color dialog click on the field. If you set **white color** then constructions, cameras, cables, and text will be displayed by their own colors.

See also: Working with layers and multilevel constructions 600, Working with 3D model-territory 602

9.1.7 Pop-up panels

See location of the Pop-up panels 161

Pop-up panels appear automatically in the bottom of the Graphics window during creating or editing constructions and texts.

Line type panel 280
Font type panel 281
Current construction parameter panel 282

9.1.7.1 Line type panel

The panel is designed for choosing line types 475 and displaying parameters of the **current line type**.

The panel appears automatically in the bottom of the graphics area 162 when clicking the construction buttons 193, when choosing the correspondent **menu items** or when editing 188 **constructions**.

The panel hides automatically in other modes. You can hide the panel by choosing the **Hide panel** item in the **pop-up menu** appearing when right clicking the panel.

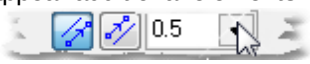
The panel contains the following items:

- Line type number box
- Line type name box

Choosing values in these boxes changes the **current line type**.

*As a result of changing **line type** of a construction using this tool, the minimum and maximum heights 282 will be returned to values set in parameters 476 of the new line type.*
For changing a line type without changing heights, use Change line type 268 tool.

When drawing a Double line 251 Wall 198 or Aperture in Wall 199, in the right part of **line type panel** appear additional elements:



- Box in which it is possible to choose or enter from the keyboard the **width of the double line (wall or aperture)**.
- Two buttons allow switching the **orientation of the second line** relatively to the first one.

*You can also switch the orientation quickly with the help of the **Space bar**.*

Other items display parameters of the **chosen line type**. The parameters can be changed in the options box 475 launched by double-clicking the **line type panel** or by choosing the item **Edit line type** in the **pop-up menu** which appears when right clicking the panel.

9.1.7.2 Font type panel

The panel is designed for choosing **font types** and displaying parameters of the **current font type**. The panel appears automatically in the bottom of the graphics area 162 when clicking the button Text 201, when choosing the correspondent **menu items** or when editing 188 **text**.

The panel hides automatically in other modes. You can hide the panel by choosing the item **Hide panel** in the **pop-up menu** appearing when right clicking the panel.

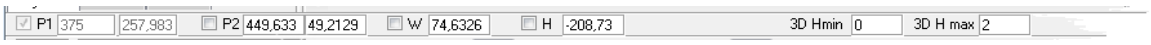
The panel contains the following items:

- Font type number box
- Font type name box

Choosing values in these boxes changes the **current font type**.

Other items display parameters of the **chosen font type**. The parameters can be changed in the options box 477 launched by double-clicking the **font type panel** or by choosing the **Edit font type** item in the **pop-up menu** which appears when right clicking the panel.

9.1.7.3 Current construction parameter panel



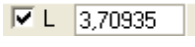
The Panel is intended to set and edit **parameters of constructions, 3D models and Illuminators**. The Panel appears automatically at the bottom of the Graphics area 161 when drawing or editing constructions.
The set of the parameters for each kind of construction (point, line, rectangle, etc.) differs.

For example:
- *for a point it is coordinates of the point, and its heights in the 3D Video;*
- *for a line segment it is coordinates of the segment's ends, length, angle and its heights in the 3D Video;*
- *for a rectangle it is coordinates of corners, height, width and its heights in the 3D Video, etc.*

Options of the panel in **Construction** and **Editing** 164 modes differ.

In the Construction mode:

It is possible to draw constructions, having set the parameters sufficient for complete definition of this construction.
For example, for a line segment it is enough to set coordinates of the first and second point, or coordinates of the first point, an angle and length.

It is possible to fix some parameters of construction, having marked check boxes nearby these parameters 

. At moving the cursor, the construction will be drawn in such a manner that the fixed parameter will remain constant.

For example, for a line segment it is possible to fix length or angle, for a rectangle - width or height, etc.

After a construction has been drawn, in the right end of the panel Edit 

button appears. Clicking this button allows editing just created construction.

In the Editing mode:

It is possible to edit any parameters of construction from keyboard, thus the result of changing will be visible at once.

In both modes it is possible to change the **minimal and maximal heights** of the construction in the 3D Video irrespective of parameters of line type 475, by which the construction is drawn.

In multi-level projects, the height are calculated relative to base height of a layer 277 to which the construction belongs.

3D model, Illuminator, 3D image, Inclined rectangle, transparency

During placing or editing 3D models 202, special parameter set on the Current construction parameter panel is displayed.

See details: ***3D models*** 283.

During placing or editing Illuminators 206, special parameter set on the Current construction parameter panel is displayed.

See details: ***Illuminator*** 284

During drawing or editing 3D images 205 using the **Current construction parameter panel** it is possible:

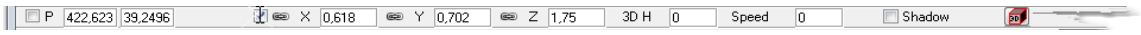
- Load raster image by **Load image** button;
- Delete image by **Delete image** .button;
- Mark **Transparence** box to make pixels transparent, which color coincides with the color of the left-bottom pixel.

During Inclined rectangle 196 drawing or editing it is possible to make it transparent by 70 %. To do this mark **Transparence** box.

*Transparence of **3D images** and transparence of **Inclined rectangle** have different purport. Inclined rectangle becomes completely transparent by 70 %, what makes possible modeling glass.*

*On **3D image,** if its raster image is not ***.png,** pixels become completely transparent, which color coincides with color of the left- bottom pixel. Other pixels remain opaque.*
*If its raster image is ***.png**, then transparent pixels of png file will be transparent in VideoCAD (*.png format supports transparency).*
*Thus, you can model objects of irregular shape using **3D images**.*

9.1.7.3.1 3D models



Current construction parameter panel
3D models

You can resize 3D models separately on axes.
To do this, enter new values into **X, Y, Z** boxes during 3D model editing. If the box is marked, change of any size leads to proportional change of other sizes, thus model proportions are not broken.

3D model **height above the ground** is displayed and can be changed in the **3D H** box.

In multi-level projects, the height are calculated relative to base height of a layer 277 to which the 3D model belongs.

If the **Shadow** box is checked and the Shadow calculation 239 is enabled and 3D models are taken into account 491 in calculating shadows, then the **editing 3D model** will be considered as an obstacle during calculating shadows.

Calculating shadows from complex 3D models - very resource - intensive operation which can take a lot of time.

See also:Shadows 178, *Main menu>View>Calculate shadows for active camera* 239, *Main Menu>View>Recalculate shadows* 239, *Line type>Shadow* 475, *Layers>Shadow* 277, *Options box>Miscellaneous>Shadow* 490, *Options box>Calculate shadows from 3D models* 491, *Current construction parameter panel>3D model>Shadows* 283, *3D Models window>Shadows* 402, *Choosing the best place for PTZ (dome) camera* 583, *Visualization of the camera control area projections and spatial resolution within them* 580

The button allows to open the 3D Models 397 window with edited 3D model loaded in it.

Speed of 3D model

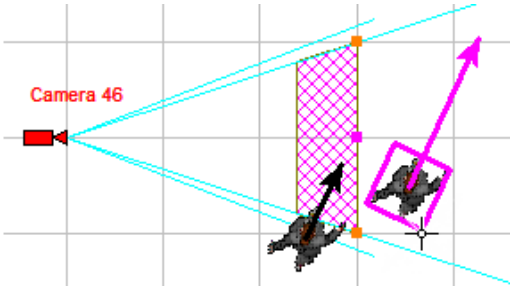
In the **Speed** box you can specify speed of moving 3D model, in meters (foot) per second.

Model with specified nonzero speed will move with this speed along a specified direction when modeling exposure time 377, Rolling Shutter 378, interlace distortions 376 and creation of animated images 386.
To set speed to 3D model you should enter a nonzero value in the **Speed** box during the placement or editing 3D models.

If a 3D model has non zero speed 203, then the **velocity vector** is displayed.

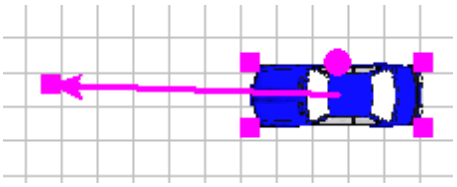
If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model passes per second (crimson arrow)**.

If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the active camera 166 (black arrow).**



*The length of the **velocity vector** of a **3D model in the normal state** is inversely proportional to the frame rate 375 of the active camera. Thus we can see how many times the moving 3D model gets into the frame of the active camera.*

You can edit the **velocity vector** of 3D model in editing state by moving its terminus.



See also: Selecting frame rate on the basis of known target's positions and velocities 575.
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

9.1.7.3.2 Illuminator

Current construction parameter panel
Illuminator

During illuminator 206 creating and placing on **the Current construction parameter panel** it is possible to set or change following illuminator parameters:

- Coordinates of Illuminator in horizontal projection (C) 285
- Height 285
- Rotation angle/angle of radiation 285
- Inclination angle in the vertical plane (Incl.) 285
- Light flux (lumen)/Illumination(lux) 285
- Flux/Illum. check box 285
- Illuminator calculation 286
- ON check box 286
- Dispersion combo box 286

Coordinates of Illuminator in horizontal projection (C)

Coordinates of Illuminator center.

Height

Height of Illuminator center above the ground.

In multi-level projects, the height are calculated relative to base height of a layer 277 to which the illuminator belongs.

Rotation angle/angle of radiation

*For specifying both angles one **Ang** box on the panel is used. During specifying illuminator's direction, **the rotation angle in horizontal plane** appears in this box. During specifying **light intensity concentration** or **editing** illuminator, **angle of radiation** in degrees appears in the same box.*

It is recommended to specify angle of radiation in the Illuminator calculation 467 box.

Inclination angle in the vertical plane (Incl.)

An angle between the axis of radiation and the horizontal.

Light flux (lumen)/Illumination(lux)

There are **2 types** of illuminators in VideoCAD:

- **Real illuminators** having a **finite total light flux** (lumen) and **angle of radiation** (degree). Illumination on a scene, produced by real illuminator, diminishes inversely as the square of distance from the illuminator (**inverse-square law**) and is simulated in VideoCAD. For models of real illuminators total light flux of illuminator (lumen) is displayed in this box.

  It is not recommended to set light flux in this box. Use Illuminator calculation 461 box to calculate light flux from lamp and illuminator parameters.

- **Virtual illuminators,** which are placed **far enough from a scene** in order to neglect illumination diminishing with distance. **Total light flux** and **distance** up to virtual illuminator may be unknown, but **illumination** (lux), created on a scene by the virtual illuminator should be known.

  For virtual illuminators, **illumination** (lux) created on a scene by such illuminator is showed in this box. Virtual illuminators can be used for modeling known illumination in some parts of the scene.

  Typical virtual illuminator - the Sun.

For **infra-red (IR) illuminators** the light flux and illumination **cannot be measured in lumens and luxes**. Therefore, **Radiant flux (watt)** instead of a light flux (lumen) is showed in this box, and **irradiance (watt/square meter)** is showed instead of illumination (lux).

See more: Infa-red illuminators 469

Flux/Illum. check box

Illuminator type can be specified in this box: Real 285 (the box is marked) or Virtual 285.

Illuminator calculation

The button is intended to activate Illuminator calculation 461 box in which you can specify internal parameters of **real** illuminators.

*The button is accessible only for **real** illuminators.*

*The only parameter in **Illuminator calculation** box, which is valuable for virtual illuminators - Lamp type 463. To specify **lamp type** for virtual illuminator, switch 285 it to **real** temporarily, set **lamp type**, and then make it to **virtual** again.*

See more: Illuminator calculation 461.

ON check box

You can switch on and off the illuminator using this box.

*For switching on or off several illuminators simultaneously, select 189 them, right click on the Graphics area, and choose in the pop-up menu **Switch ON illuminators** or **Switch OFF illuminators**.*
You can use items 268 with the same names in the Main menu.

For one camera no more than 7 illuminators could be switched on 286 simultaneously. Switched on illuminators are saved in camera parameters, therefore it is possible to switch on and switch off different illuminators for each camera.

Dispersion combo box

During illumination modeling, VideoCAD takes into account only **direct light** from illuminators. The light **reflected from objects** on a scene is ignored. However, setting value in this box, it is possible to specify what part of the light from this illuminator re-reflects and is present on the scene as diffused illumination.

At diffused light modeling, the distance from the illuminator up to the center of camera view area is considered.

See also: Illuminator calculation 461, Lamp parameters 463, Luminaire parameters 465, Infa-red illuminators 469, Illuminator 206, 3D Video>Image parameter panel>Scene 371.

9.1.8 Keyboard shortcuts

Keyboard shortcuts allow fast activation of various commands, by pressing shortcuts on the keyboard.

VideoCAD has:

- Predefined shortcuts 287 which cannot be changed;
- Customizable shortcuts 288 which can be adjusted according to users' preferences.

Predefined shortcuts

F1 Call Help information of interface element, box or window, which has the input focus.

Ctrl+A Select all objects 163 in the current layout 513.

Ctrl+TAB Switch to the next **layout** in turn.

Ctrl+Space bar Save the *active camera* and activate the next camera in turn in the current *layout*. If there is no active camera in the current **layout**, then a camera with the minimal number will be activated.

ESC Stop the current operation, if an operation is executed. If no operation is executed, switching to the Select/Edit 189 mode.

DEL Delete selected 189 objects.

Spacebar Pressing **Spacebar** when constructing a double line 197, wall 198, aperture in wall 199 enables to switch the **orientation of the second line (side)** relatively to the first one quickly.

+ (plus on the digital keypad) Zoom in, if the input focus is on the Graphics area 162.

- (minus on the digital keypad) Zoom out if the input focus is on the **Graphics area**.

When **Alt** is pressed, it is possible to move drawing in the Graphics window using **arrow keys** and change scale using **+ plus and - minus** keys irrespective of the input focus.

Ctrl has several purposes:

- Changes the selection logic 189
- Allows moving the **horizontal projection** vertically apart from the vertical one using the **middle mouse button** or the button Move drawing 211.
- If **Ctrl** is not pressed, then the **whole drawing moves**, if **Ctrl** is pressed, the **horizontal projection moves only**.
- If **Ctrl** is pressed and held down when editing rectangle 196, mask 202, inclined rectangle 196, filling 202 or 3D image 205 by moving pink grips, then one point move only. If **Ctrl** is not pressed when editing these objects, then several points will move at a time, the editing object remain square.
- If **Ctrl** is pressed when editing a double line 197, wall 198, aperture in wall 199 then **only one line** will be moved. If **Ctrl** was not pressed when editing these objects, the **whole double line (wall, aperture)** will be moved.
- If **Ctrl** is pressed during Illuminator 206 editing by moving pink grips, then **angle of radiation** and **light intensity distribution curve** will be changed. If **Ctrl is not pressed**, then illuminator will be rotated as a whole.
- If **Ctrl is not pressed** at changing the common **scale**, then the scale changes roughly which is convenient at navigation. If **Ctrl is pressed**, the scale changes with the less step which is convenient for the precise drawing positioning before printing or saving. The effect of reducing

zoom step presents in the Graphics window 161, in the 3D Models 397 and 3D World 342.

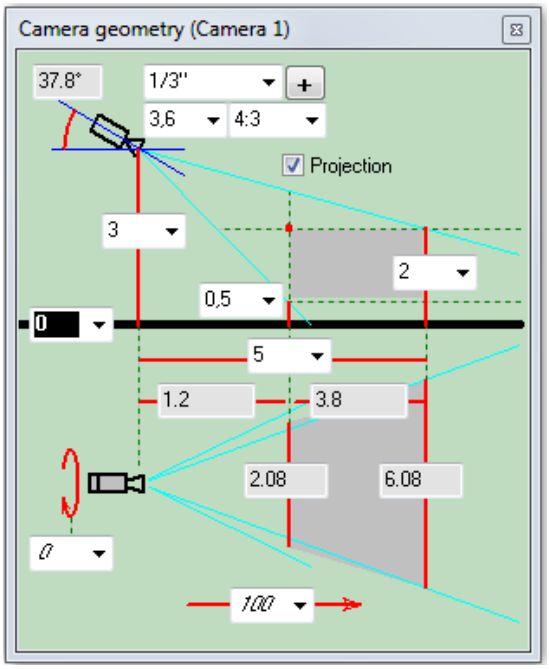
- If during changing the line type of selected objects by the Change line type 268 tool, to press and hold **Ctrl**, then the selected objects will also change their minimum and maximum height according to the chosen line type . If **Ctrl** is not pressed, the heights remain unchanged.

Customizable shortcuts

Customizable shortcuts are seen in the Main menu 213 of the **Graphics window** during the program operation. These shortcuts can be changed on the Keyboard 479 tab in the **Options box**. Shortcuts can be assigned to any item of the **Main menu** of the **Graphics window**.

9.2 Camera Geometry

Camera Geometry box includes geometric parameters of active camera 166, lens and installation parameters of the camera.



In the **Camera Geometry box,** geometric parameters of the active camera view area in the horizontal and vertical planes are displayed.

The image in the **Camera Geometry box** represents two projections of view area, parted by the horizontal black line corresponds to the ground in the vertical (upper) projection.

In multi-level projects, the ground is *the base height of active camera* 298.

The red lines mark the **sizes**, the green dash lines specify **auxiliary constructions**, the dark blue lines designate the camera tilt angle, and the turquoise ones mark the space bounds of camera view area.

The **actual projection** of view area as a result of calculations is filled by grey color.

The camera location and **calculated** parameters are displayed in the **text boxes** next to the camera icon and the red dimension lines. The parameters in the white boxes can be changed, by choosing them from list or by typing. When any of the parameter is changed, the values of the rest parameters are recalculated.

*You can change any parameters **of all selected cameras simultaneously**. For this purpose:*

- *Select* 189 *necessary cameras on the layout*
- *Right click on the combo box, then click on the **Assign to selected cameras** pop up item.*

The parameters in the **grey** text boxes are results of calculation and can be changed only through changing the parameters in the white boxes.

The linear parameters are entered and outputted in **meters** or feet according to the measurement system 215 set in the project, if not specified otherwise on the image. The angular parameters are inputted and outputted in **degrees**.

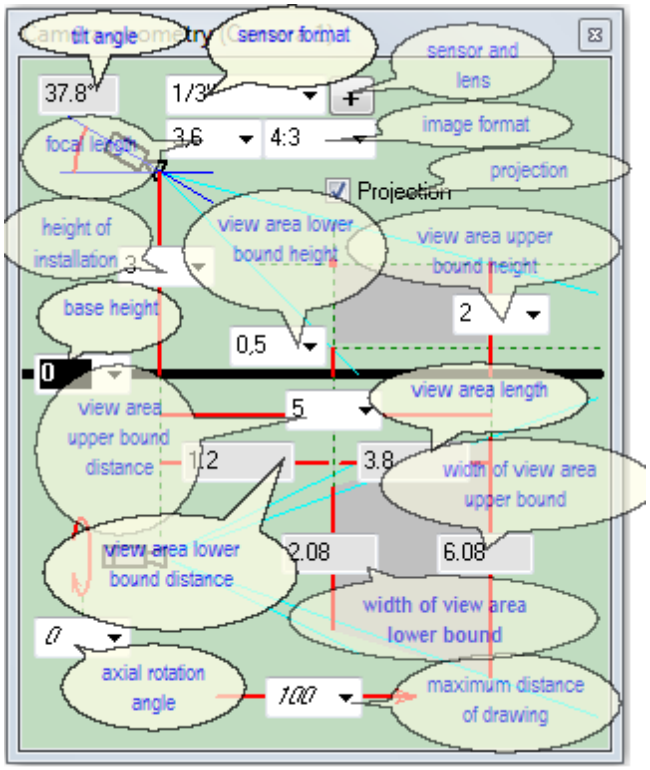
When an **incorrect value** is entered the box turns **red**. When an incorrect value ratio is ensued from the input, all boxes with the values of mutually incorrect ratio turn red. If calculation with incorrect values is still possible and has sense, the program nevertheless performs it. In this case check the results carefully. You can see the source of mistake in the graphics window 161.

If the image of view area **changes radically** with new values, the image in the **Camera Geometry box** changes correspondingly, thus the arrangement of parameter boxes are changed too. Watch carefully the image changed, since with the image alteration the parameter boxes might interchange their positions.

The parameters in the **Camera geometry box** can not reflect the shape of view area *rotated around its main optical axis* 297, it is impossible to reflect changing projections under the influence of *lens distortion* 310. So the lens distortion and rotation around an axis within + -45 degrees does not affect the parameters. The parameters of the Camera geometry box continue to show values as if the camera is not rotated.
When the rotation angle is more than 45 degrees, the parameters abruptly change their values to ones corresponded to the camera rotated on 90 degrees. When the rotation angle is more than 135 degrees, the parameters will reflect the initial position of the camera.

See also: *Parameters in the Camera Geometry box* 293
External link: *"The principles of CCTV design in VideoCAD. Part I. Camera view area"(*.pdf) .*

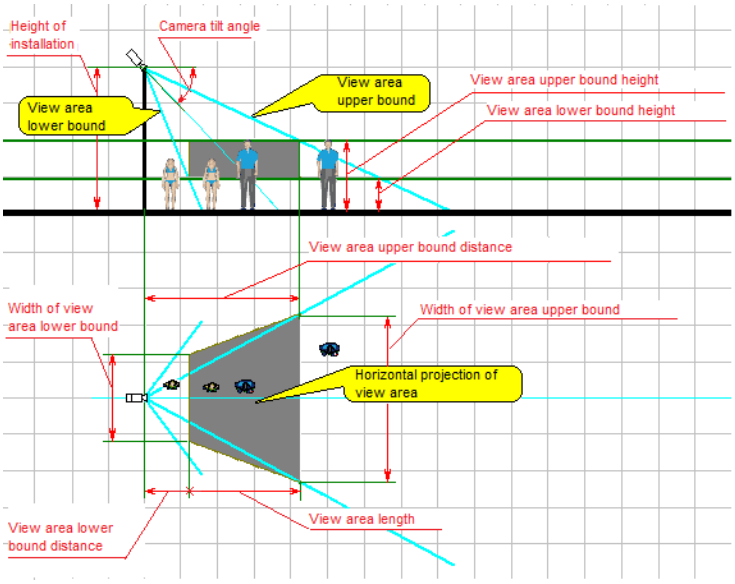
9.2.1 Parameter list



Camera parameters

Camera installation parameters

View area limitations



9.2.2 Parameters

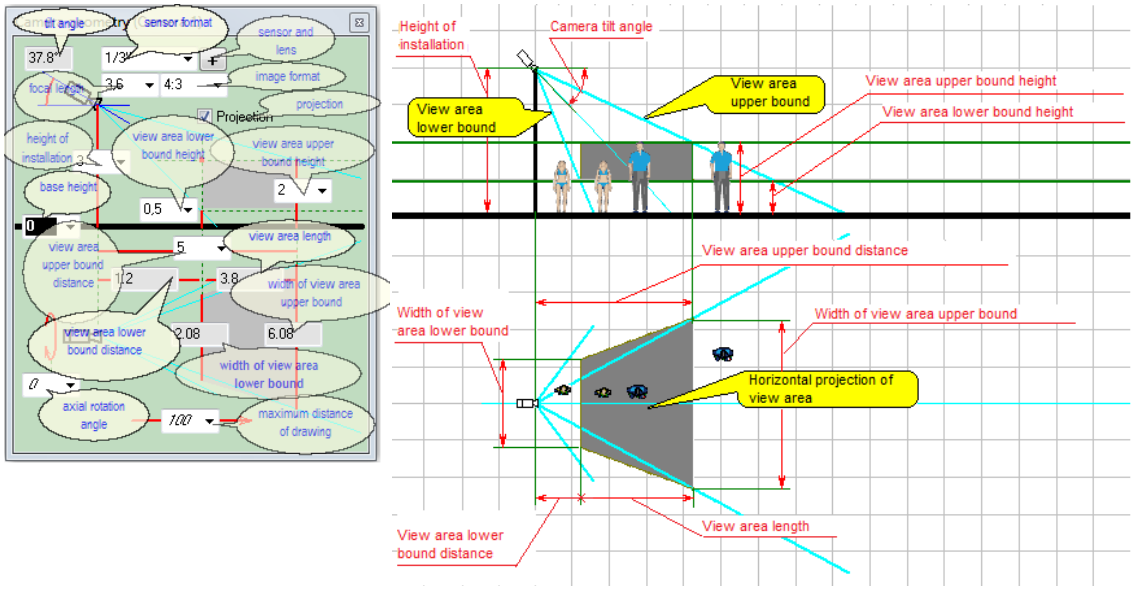


Image sensor size

In the box, you can specify the **size of the Image sensor** or the size of Active area of the Image sensor 293.

See more: Image sensor and Active area of image sensor

The **Image sensor size** can be specified by any of the following ways:

- Choosing a standard format (type) from the list 1/10",1/8",1/6",1/5",1/4.5",1/4",1/3.6",1/3.2",'1/3','1/2.7",'1/2.5",1/2.3",1/2",1/1.8",1/1.7",1/1.6",2/3",1/1.2",1",4/3",1.5";

This traditional way of setting Image sensor size can be unaccurate for modern cameras 636.

- Entering a custom format in inches, in the form of **X/Y"**. For example: **1/7.31**";

If you enter a format which does not exist in the list, the box turns yellow, and the Image sensor size will be calculated by VideoCAD.

- Entering diagonal size of the image sensor in millimeters, in the form of **dX.Y**. For example: **d6.0.**

See more: Specifying image sensor size through its diagonal and aspect ratio 639

- Entering **sensor side sizes** in millimeters horizontally and vertically separated by hash, in the form of **W#H**. For example: **4.8#3.6;**

See more: Direct specifying image sensor side sizes 639

After **format** or **length of diagonal**, separated by space character, you can specify the **aspect ratio of the image sensor** in the form of **W:H.** For example: **1/3" 16:9** or **d6 16:9.** If the aspect ratio of the image sensor is not specified, it is assumed equal to **4:3**.

See more: Direct specifying active area size of the image sensor 638

Active area side sizes of the image sensor can be specified in millimeters horizontally and

vertically separated by asterisk, in the form of **W*H**. For example: **4.8*3.6;**

See more: Direct specifying active area side sizes of the image sensor 638
See also: Sensor and Lens>Image sensor 308, *Specifying active area size of the image sensor/* 636

When moving the cursor to the image sensor box the information on horizontal and vertical view angles of lens appears.

*Changing the **Image sensor size**, and therefore the calculated values of view angles of camera with enabled modeling lens distortion* 310 *will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles* 310, *taking into account the changed values of calculated view angles.*

Lens focal length

The values can be chosen from the list or typed by keyboard, e.g. when using the **varifocal lenses**.

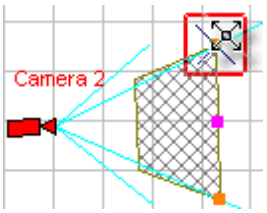
Choose a value given in the lens **specification** in this box.
It is assumed that the **lens format** equal to or larger than the camera **Image sensor format** is used.
The **lens focal length** influences all the **calculated** parameters.

When moving the cursor to the lens focal length box the information on **calculated** view angles appears.

If in lens' specification there are view angles which are different from the calculated ones, then probably the lens has **distortion**. For precise modeling such lens you should enable and adjust simulating distortion 310.

Focal length can be chosen from the list or typed into this box or duplicate boxes on the Tool bar 185 of the Graphics window and on the 3D Video 365.

It is convenient to change lens focal length of active camera on layout in the Select/Edit 189 mode, by moving grips at the corners of view area projection.

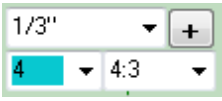


If a model 419 is assigned to the camera, and the model has fixed 438 focal length lens, then you can not change the focal length.

If a model is assigned to the camera, and the model has a lens with limited 438 variable focal length, then you can change focal length within the limits only. When approach to the limit values, the box will become crimson.

You can change focal length in wide range of 0.5-1000mm of cameras, which have not assigned model or the assigned model have not specified limits of the lens focal length.

If the active camera is panoramic 312 then the lens focal length box is colored by aqua-green.



Changing the **lens focal length** and therefore the calculated values of view angles of camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking

into account the changed values of calculated view angles.

You can change lens focal length **of all selected cameras simultaneously**. For this purpose:
- Select 189 necessary cameras on the layout
- Right click on this combo box, then click on the **Assign to selected cameras** pop up item.

See also: Sensor and Lens>Lens 310

Aspect ratio (of output image)

Aspect ratio of the **output image** of the camera**:** 4:3,16:9, 16:10 etc.

The **Aspect ratio** of the **output image** equals to the **Aspect ratio of the active area of the image sensor** and may be different from the **Aspect ratio of the image sensor**.

The Aspect ratio of the image sensor can be specified in the Image sensor size 293 box.

See more: Specifying the Aspect ratio of output image 641

You can enter custom values from keyboard in the form of <width> **:**<height>, for example **11:4**.

By specifying formats **3:4** or **9:16**, you can specify the so-called **corridor format** in which the height of the frame is larger than its width.

For correct simulation resolution in the corridor format you must also swap the number of pixels horizontally and vertically in the camera parameters 332 and image processing 381 settings.

Separated by space character after the **Aspect ratio** you can set the **crop factor** - the ratio of cropping active area size of the image sensor when the active area does not touch the edges of the image sensor. The Crop factor can be set as a vulgar fraction (separated by slash) or a real number. For example **4:3 0.67** or **16:9 720/1080**. If the Crop factor is not specified, it is taken to be unity.

See more: Specifying the crop factor 641

If the camera has directly assigned active area sizes, then this box shows 'custom' and it becomes unavailable. To make it available, set the size of image sensor by any way except of direct specifying its active area size.

For correct calculation of person detection 498, identification 500 and license plate reading 503 areas and spatial resolution 316, after changing the Aspect ratio it is necessary to check and adjust vertical number of pixels 332 in the Sensitivity and Resolution box 329 and Image size 381 on the Processing 381 tab on the Image parameter panel 370.

Changing the aspect ratio and therefore the calculated value of vertical view angle of camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking into account the changed values of calculated view angles.

See also: Sensor and Lens>Image sensor's active area 309, Specifying active area size of the image sensor 636

Sensor and Lens

Clicking this button will open **Sensor and Lens** box. In the box it is possible to specify any image

sensor size 308, active area size 309, specify lens distortion 310 and adjust modeling active camera as a panoramic camera 312.

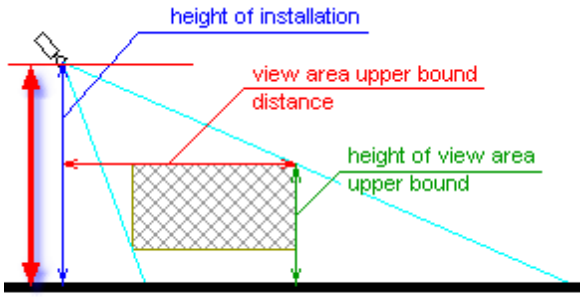
See more: Sensor and Lens 308, Specifying active area size of the image sensor 636

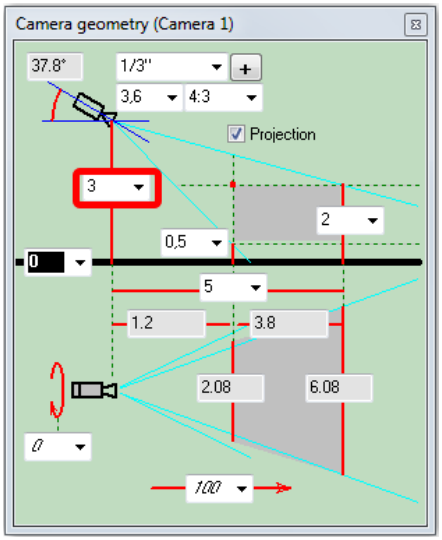
Height of installation

Height of installation can be chosen from the list or typed. The height of installation influences all calculated parameters.

In multi-level 3D projects, in 3D Video 357 and 3D World 342, as well as in calculation of shadows 178, the height of installation, heights of view area lower 300 and upper 301 bounds are calculated relative to the Base height 298

Height of installation can be negative.



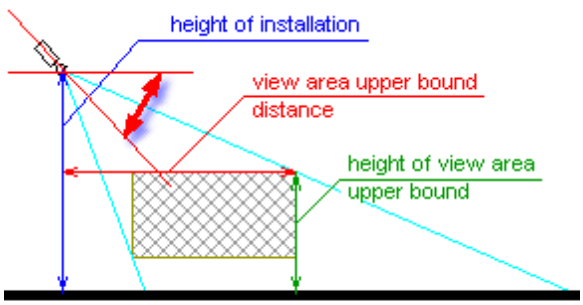


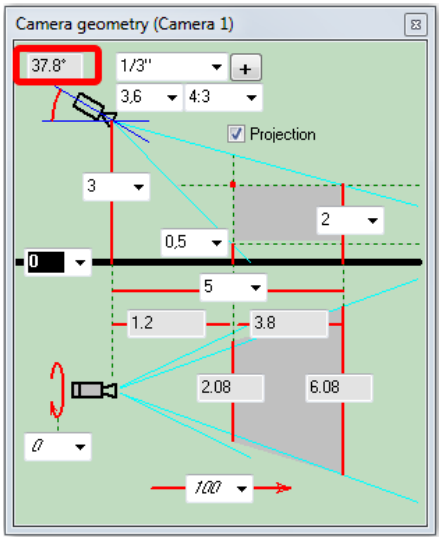
Camera tilt angle

Camera tilt angle is a calculated parameter and can not be edited directly. The camera tilt angle is an angle between the **main optical axis** of camera lens and a horizontal.

Camera inclination is defined not by the tilt angle but by the three parameters:

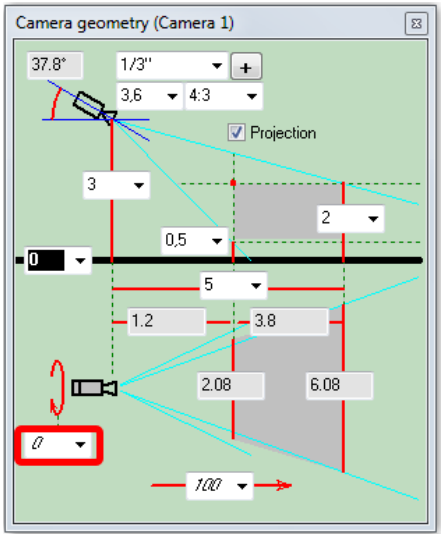
- Height of installation 296;
- View area upper bound distance 301
- View area upper bound height 298





Axial rotation angle

In the box you can specify the camera rotation angle around its main optical axis, in degrees.

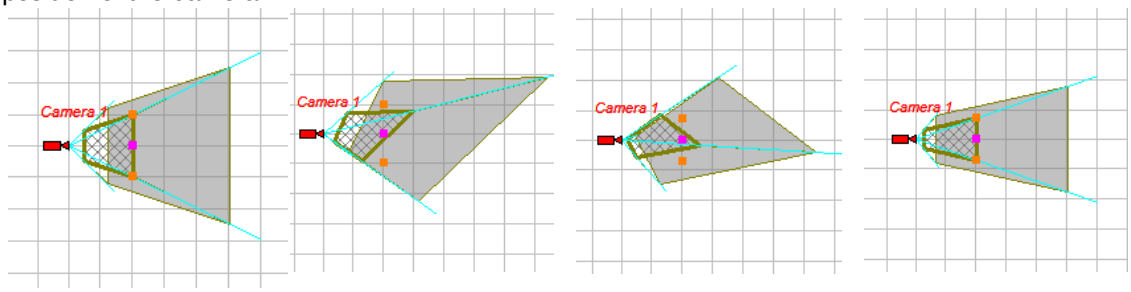


The parameters in the **Camera geometry box** can not reflect the shape of view area *rotated around its main optical axis* 297, it is impossible to reflect changing projections under the influence of *lens distortion* 310. So the lens distortion and rotation around the axis within + -45 degrees does not affect the parameters. The parameters of the Camera geometry box continue to show values as if the camera is not rotated.

When the rotation angle is more than 45 degrees, the parameters abruptly change their values to ones corresponded to the camera rotated on 90 degrees.

In this position the lateral faces of the view area will become the upper and lower faces, and upper and lower faces will become lateral ones.

When the rotation angle is more than 135 degrees, the parameters will reflect the initial position of the camera.



If a camera is rotated by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution**

(pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.

When calculating the spatial resolution 316, rotation of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box .

In the Graphics window 161, 3D Video 357 and 3D world 342 windows rotation of camera is displayed accurately. However, each passing through a multiple of 45 degrees angle, camera tilt angle 296 is changed so as to keep the values of the View area upper bound height 298 and the View area upper bound distance 301, taking into account the fact that a view area face appeared on top, becomes the upper bound of the view area.

When you rotate the camera around its axis the view area projection changes its shape, sometimes becomes infinite. To limit the distance of drawing view area, use the Maximum distance of drawing view area 307.

For a fuller picture of rotated view area projections it is recommended to set the Level 2 in pop up menu of the View area projection bounds 173 and Shadow 178 buttons.

See also: Using camera rotation around its own axis 616

Base height

The base height allows to change the height of installation 296 of the camera together with heights of lower 300 and upper 298 bounds of its view area and the other heights. These heights are calculated **relative to the base height**. Therefore, changing the base height does not affect the other parameters in the the **Camera geometry box**.

Changing the base height can be represented as lifting or lowering the camera from floor to floor with all the other parameters.

The **base height** affects the position of the camera along the vertical, relative to other cameras and constructions in the 3D Video 357 and 3D World 342 windows, as well as in the calculation of shadows 178 in the Graphics 161 window.

At the time of placing a new camera 171 or pasting 191 copied camera, its base height is automatically set equals to the base height 277 of the active 276 layer .

Height of criteria of person detection 498 and person identification 500, license plate reading 497 are considered relative to the base height of the camera, which the projections of identification, detection, license plate reading areas belong to.

The **base height** is calculated relative to the Zero ground and can be negative .

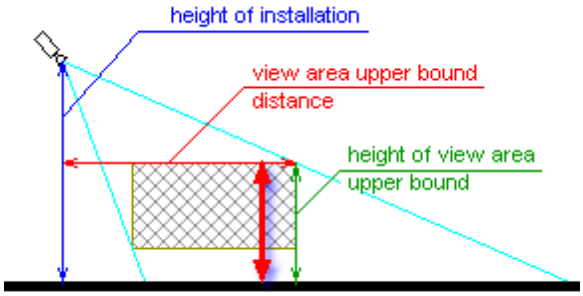
See also: Working with layers and multi-level projects 600, Layers>Height 277

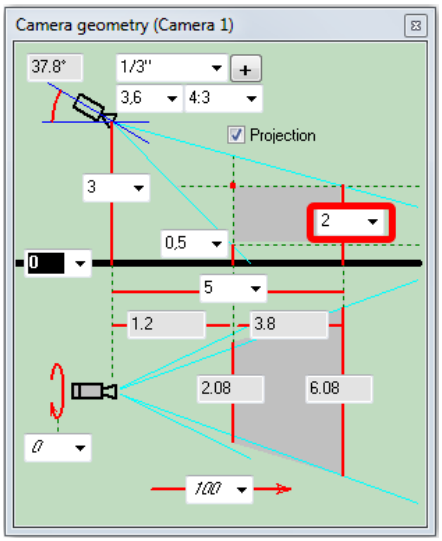
View area upper bound height

The **height of view area upper bound** can be chosen from the list or typed. In the horizontal projection of the calculated view area the space above the upper bound height is not taken into

consideration.

Together with view area upper bound distance 301 it completely determines a camera tilt angle and all **calculated** parameters through it.





The **height of view area upper bound** influences the projections of the person detection, identification and the license plate reading areas only through changing the **camera tilt angle**. The individual values of lower and upper bounds are customized in these projections' calculation criteria. For instance, when identifying a person the default lower bound is 1.5 m and the upper one is 2.2 m.

In multi-level 3D projects, in 3D Video 357 and 3D World 342, as well as in calculation of shadows 178, the height of installation, heights of view area lower 300 and upper 301 bounds are calculated relative to the Base height 298

Height of view area upper bound can be negative.

Height of calculating Spatial resolution, Shadows and Depth of Field

Heights of the upper and lower bounds of view area are taken into account when calculating *shadows* 178. If in the menu of the Shadow 178 tool **Within projection** is chosen, then a point in the horizontal projection is considered as shaded if at least partially shaded the vertical segment, formed by this point in the altitude range from the **view area lower bound height to the view area upper bound height**.

If in the menu of the Shadow 178 tool **2 levels** is chosen, then the 2 sections of the view area by 2 horizontal planes are simultaneously shown, located on the height of lower 300 and upper 298 bounds of the view area. From the sections subtract shadows from obstacles

If in the *Height* 458 box of the **Depth of field box**, **AUTO** is chosen, then calculation of depth of field in the horizontal projection is carried out at the middle height between the **heights of the view area lower bound and the view area upper bound**.

If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **Within projection** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the middle height between the **heights of the view area lower bound and the view area upper bound**.

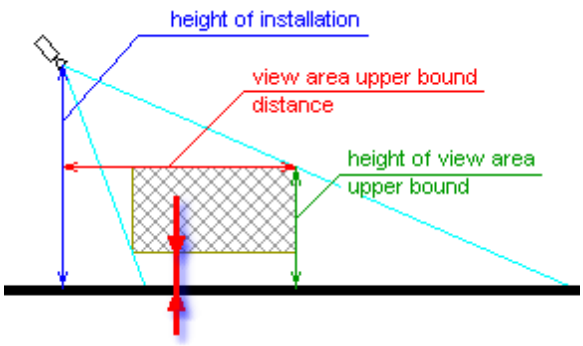
If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **2 levels** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the **height of the view area lower bound**.

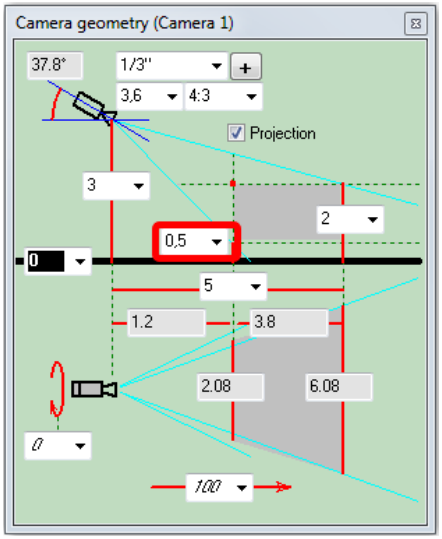
View area lower bound height

The **height of view area lower bound** can be chosen from the list or typed. In the horizontal projection of the calculated view area the space below the lower bound height is not taken into consideration.

The height of view area lower bound influences the following **calculated** parameters:

- View area lower bound distance 302
- View area lower bound width 306





The height of view area lower bound doesn't influence the projections of the person detection, identification and license plate reading areas. The individual values of lower and upper bounds are customized in these projections calculation criteria. For instance, when identifying a person the default lower bound is 1.5 m and the upper one is 2.2 m.

In multi-level 3D projects, in 3D Video 357 and 3D World 342, as well as in calculation of shadows 178, the height of installation, heights of view area lower 300 and upper 301 bounds are calculated relative to the Base height 298

Height of view area lower bound can be negative.

Height of calculating Spatial resolution, Shadows and Depth of Field

Heights of the upper and lower bounds of view area are taken into account when calculating *shadows* 178. If in the menu of the Shadow 178 tool **Within projection** is chosen, then a point in the horizontal projection is considered as shaded if at least partially shaded the vertical segment, formed by this point in the altitude range from the **view area lower bound height to the view area upper bound height**.

If in the menu of the Shadow 178 tool **2 levels** is chosen, then the 2 sections of the view area by 2 horizontal planes are simultaneously shown, located on the height of lower 300 and upper 298

bounds of the view area. From the sections subtract shadows from obstacles

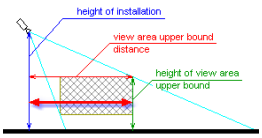
If in the *Height* 458 box of the **Depth of field box**, **AUTO** is chosen, then calculation of depth of field in the horizontal projection is carried out at the middle height between the **heights of the view area lower bound and the view area upper bound**.

If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **Within projection** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the middle height between the **heights of the view area lower bound and the view area upper bound**.

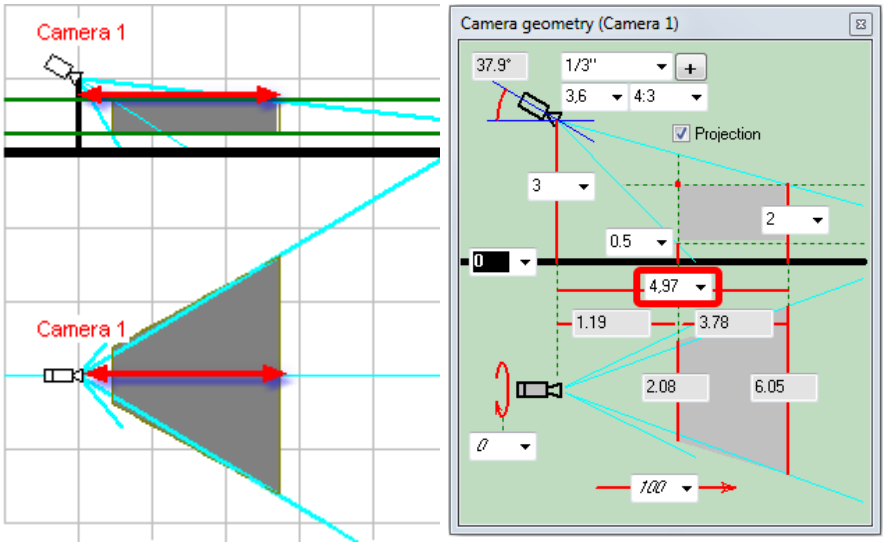
If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **2 levels** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the **height of the view area lower bound**.

View area upper bound distance

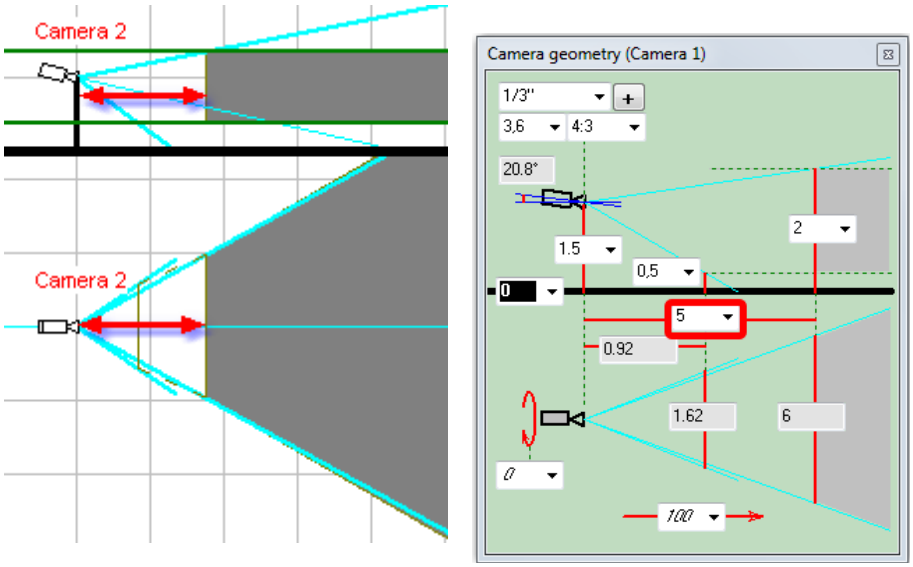
Together with the height of view area upper bound 291, the **view area upper bound distance** completely determines the camera tilt angle and all the calculated parameters via it.



When the camera is located above the view area upper bound 291, a **view area upper bound distance** is the **maximal distance of surveillance**. The view area upper bound distance is chosen from the list or typed. The **view area** is calculated up to this distance.



When the camera is located below the view area upper bound 291, the **view area upper bound distance** can become the **minimal distance of surveillance**.



When a camera is located above the **view area upper bound**, a **view area upper bound distance** is the **maximal distance of surveillance**. The view area upper bound distance is chosen from the list or typed. The view areas are calculated up to this distance. Together with the height of view area upper bound 298, the **view area upper bound distance** completely determines the camera tilt angle and all the calculated parameters through it.

The **view area upper bound distance** influences the projections of the person detection, identification and the license plate reading areas only through changing the **camera tilt angle**. The maximal distances of the person detection, identification and the license plate reading can differ from the lower and upper bounds distance both to a smaller or larger extent.

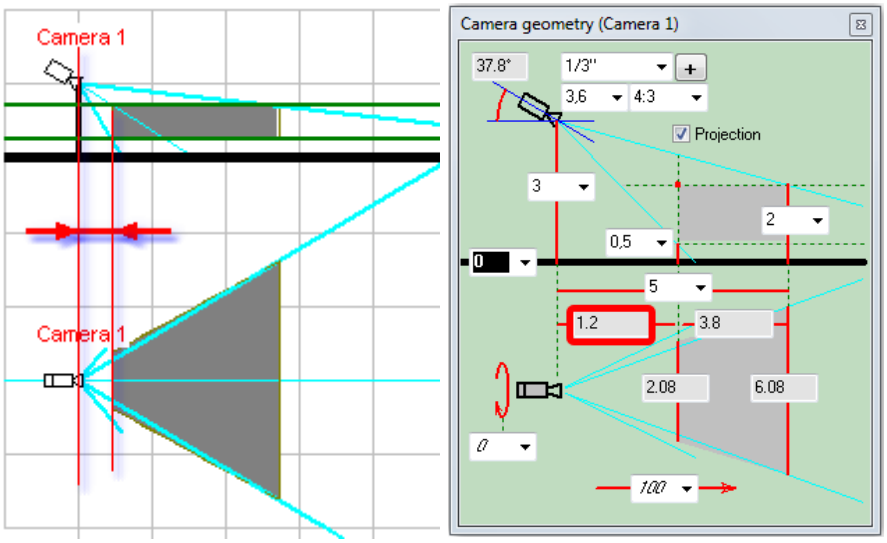
When you rotate the camera around its axis, each pass through a multiple of 45 degrees angle, the camera tilt angle 296 is changed so that a view area face appearing on top, becomes the view area upper bound.

See also: *Maximum distance of drawing view area* 307

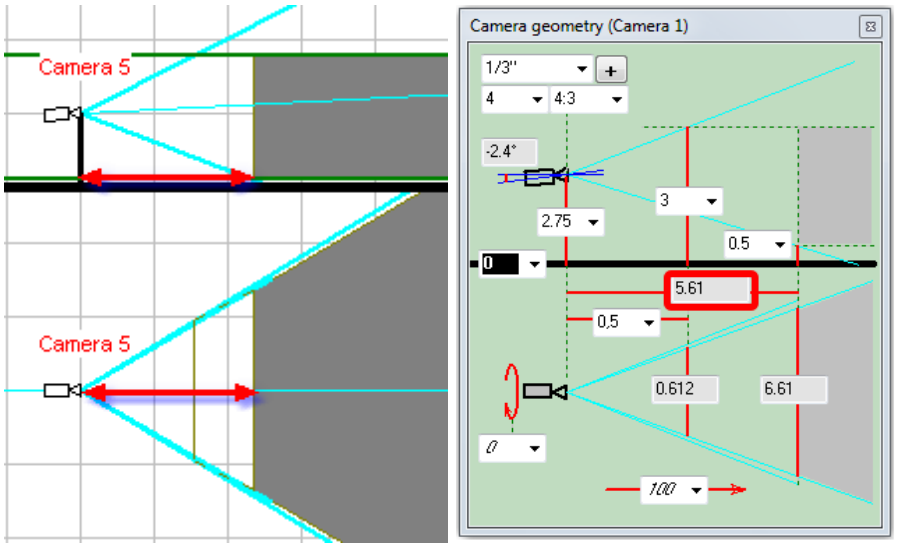
View area lower bound distance

The **view area lower bound distance** is a **calculated parameter** and can not be edited.

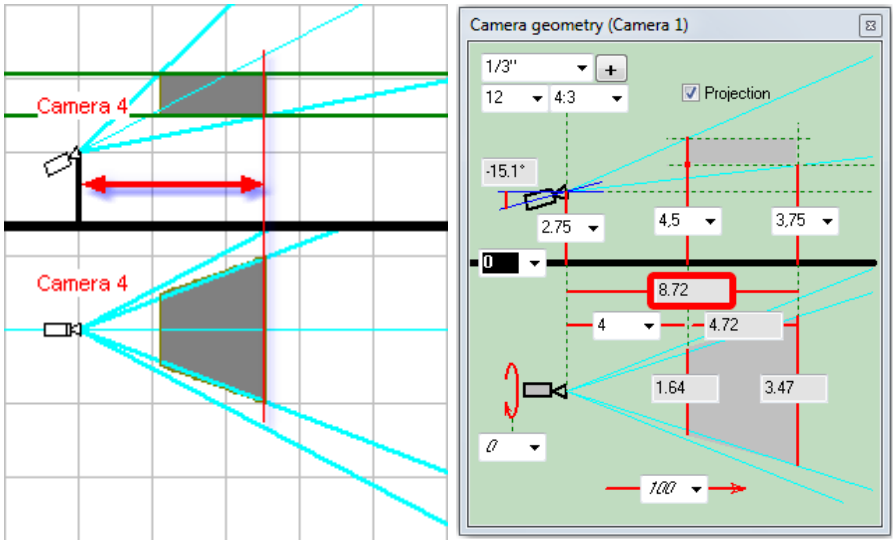
When the camera is located above the view area upper bound 291, the **view area lower bound distance** is the **minimal distance of surveillance (dead zone** of surveillance).



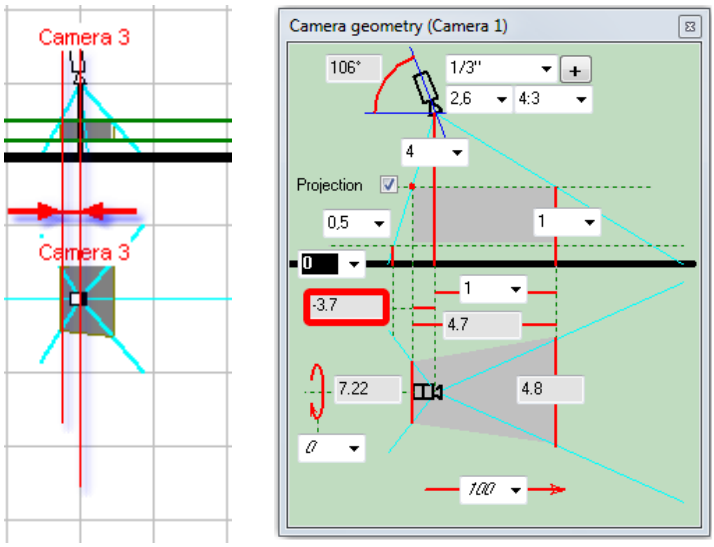
When the camera is located below the view area upper bound 291, in some positions the **view area lower bound distance** is the **minimal distance of surveillance** too.



In some positions the **view area lower bound distance** can be the **maximal distance of surveillance**.



The **view area lower bound distance** can be negative.



The **view area lower bound distance** doesn't influence the person detection, identification and the license plate reading area projections. The minimal distances of the person detection, identification and the license plate reading can differ from the lower and upper bounds' distance both to a smaller or larger extent.

This parameter reflects the correct value only if:

- *Camera is not rotated around its axis or the rotation angle 297 is multiple of 90 degrees;*
- *Lens distortion 310 is not considered.*

*In other cases, the projection of view area has a more complicated form and displayed graphically in the **Graphics window**.*

View area projection length

The **view area projection length** is a **calculated** parameter and can not be edited.

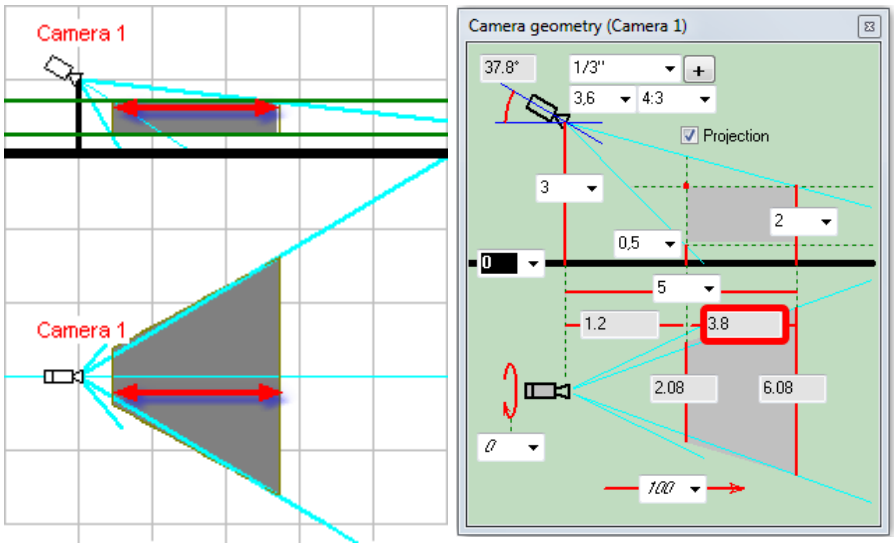
When there is an **actual view area projection**, the view area projection length displays the absolute value of difference between the upper and the lower bound distances of view area projection.

When there is no **actual view area projection**, the parameter doesn't have any sense and is not displayed. The parameter displaying enhances the convenience in use when it is required to obtain the length of view area projection.

This parameter reflects the correct value only if:

- *Camera is not rotated around its axis or the rotation angle 297 is multiple of 90 degrees;*
- *Lens distortion 310 is not considered.*

*In other cases, the projection of view area has a more complicated form and displayed graphically in the **Graphics window**.*



Width of view area projection upper bound

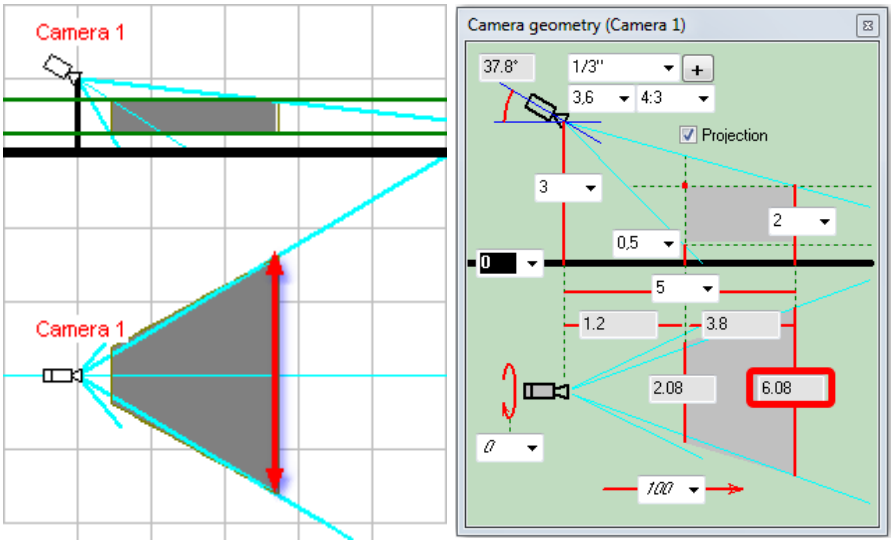
The **width of view area projection upper bound** is a **calculated** parameter and can not be edited.

According to the "Projection 306" switcher state the **width of view area projection upper bound** displays the camera view area width at the point of intersection between the camera view area bound and the view area projection upper bound, or the view area projection edge width between the lower bound and the upper one.

This parameter reflects the correct value only if:

- *Camera is not rotated around its axis or the rotation angle 297 is multiple of 90 degrees;*
- *Lens distortion 310 is not considered.*

*In other cases, the projection of view area has a more complicated form and displayed graphically in the **Graphics window**.*



Width of view area projection lower bound

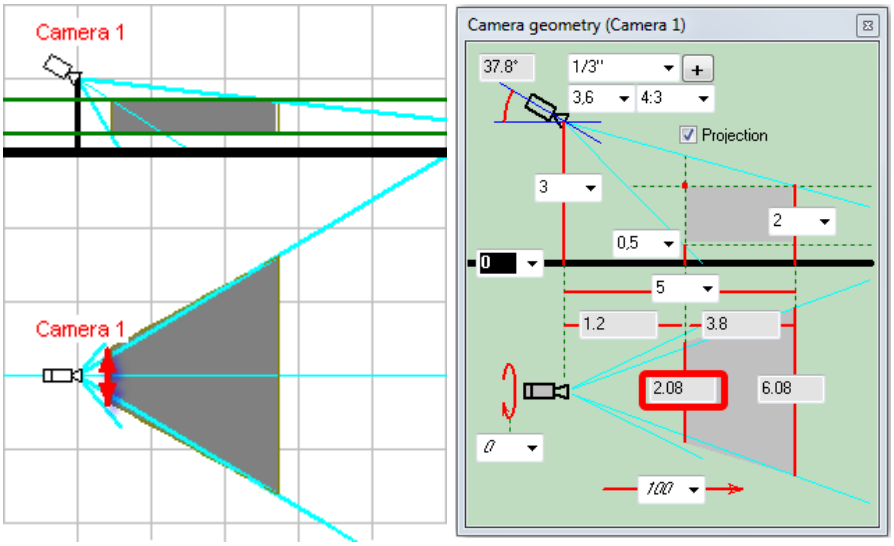
The **width of view area projection lower bound** is a **calculated** parameter and can not be edited.

According to the "Projection 306" switcher state the **width of view area projection lower bound** displays the camera view area width at the intersection point between the camera view area bound and the view area projection lower bound, or the view area projection edge width between the lower bound and the upper one.

This parameter reflects the correct value only if:

- *Camera is not rotated around its axis or the rotation angle 297 is multiple of 90 degrees;*
- *Lens distortion 310 is not considered.*

*In other cases, the projection of view area has a more complicated form and displayed graphically in the **Graphics window**.*



Projection

A "**Projection"** is a switcher determining a way of calculation:

- The view area lower bound distance 302 and the view area lower bound width 306 when the view area is narrowing upwards on the **view area lower bound distance**;
- The view area upper bound distance 301 and the view area upper bound width 305 when the view area is narrowing downwards on the view area **upper bound distance**;

When the switcher is checked, the view area bound distance and width are calculated according to narrower level of the view area opposite bound. In this case all the points of the calculated view area horizontal projection from the lower bound up to the upper one hit in the camera view area.

When the switcher is not checked, the distance up to the camera view area bound intersection with the upper or lower bounds and the width of this bound are calculated.

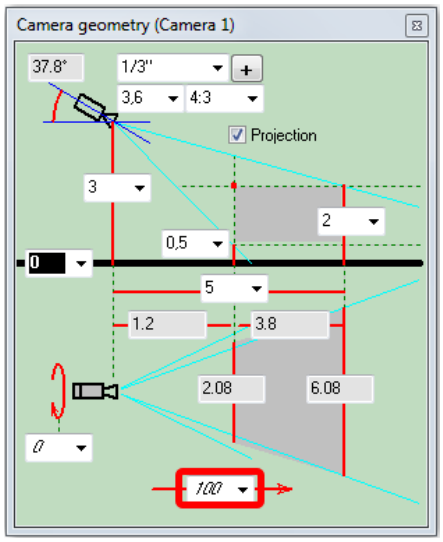
When the view area is not narrowing towards the opposite bound, the switcher doesn't have any sense and is not displayed.

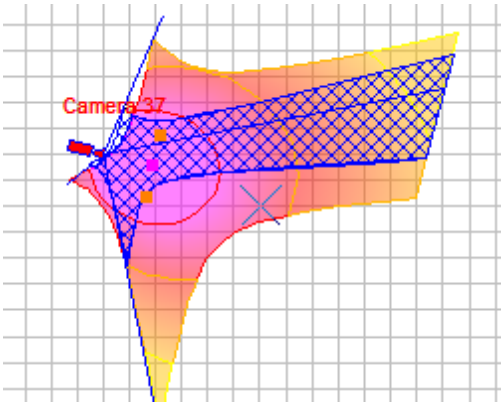
Maximum distance of drawing view area

Value in this combo box limits the distance from the camera beyond which the view area is not drawn in the Graphics window 161 and in the 3D World 342.

This tool is particularly useful for simulating camera rotation 297 around its axis and lens distortion 310.

If the value in this box is less than the maximum of the view area upper bound distance 293 and the view area lower bound distance 293, the box is colored in pink color.

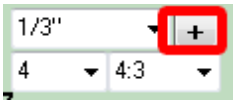




External link: *"The principles of CCTV design in VideoCAD. Part I. Camera view area"(*.pdf).*

9.3 Sensor and Lens

The **Sensor and Lens** box can be invoked by clicking the Plus button in the Camera Geometry 289 box.



In the box it is possible to specify any image sensor size 308, active area size 309, specify lens distortion 310 and adjust modeling active camera as a panoramic camera 312.

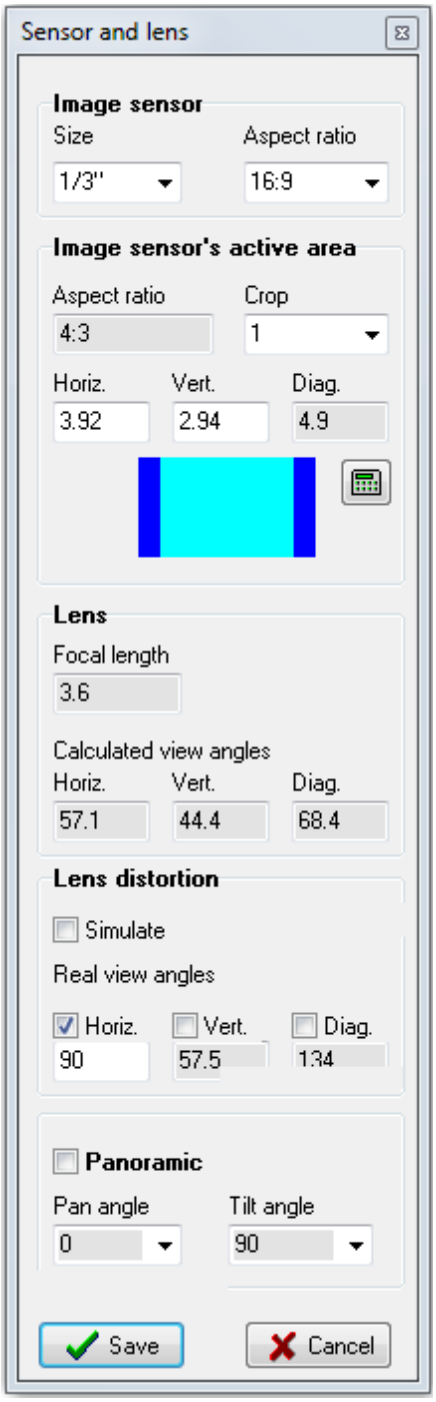


Image sensor

See before: Image Sensor and Active area of image sensor

On the **Image sensor** panel you can set the size and aspect ratio of the image sensor or size of

active area of the image sensor.
Size and **Aspect ratio** boxes duplicate the Image sensor size 293 box on the **Camera geometry** window, but allow you to enter the size and aspect ratio in different boxes.

In the **Size** box you can specify the **image sensor size** by any of the following ways:

- Choosing a standard **format (type)** from the list 1/10",1/8",1/6",1/5",1/4.5",1/4",1/3.6",1/3.2",'1/3','1/2.7','1/2.5",1/2.3",1/2",1/1.8",1/1.7",1/1.6",2/3" ,1/1.2",1",4/3",1.5";

This traditional way of setting the image sensor size can be unaccurate for modern cameras 636.

- Entering a custom format in inches, in the form of **X/Y"**. For example: **1/7.31**";

If you enter a format which does not exist in the list, the box turns yellow, and the Image sensor size will be calculated by VideoCAD.

- Entering diagonal size of the image sensor in millimeters, in the form of **dX.Y**. For example: **d6.0.**

See more: Specifying image sensor size through its diagonal and aspect ratio 639

- Entering **sensor side sizes** in millimeters horizontally and vertically separated by hash, in the form of **W#H**. For example: **4.8#3.6;**

See more: Direct specifying image sensor side sizes 639

In the **Format** box you can specify the **active area side sizes** of the image sensor in millimeters horizontally and vertically separated by asterisk, in the form of **W*H**. For example: **4.8*3.6;**

See more: Direct specifying active area side sizes of the image sensor 638

In the **Aspect ratio** box you can specify the **aspect ratio of the image sensor** in the form of **W:H.** For example: **16:9** or **4:3.**

To save changes click **Save**.
To cancel changes click **Cancel**.

See also: Specifying active area size of the image sensor/ 636

Image sensor's active area

See before: Image Sensor and Active area of image sensor

On the **Image sensor's active area** panel you can specify parameters of active area of the image sensor.

In the **Aspect ratio** box displays the **aspect ratio of the active area of the image sensor**. It is identical with the Aspect ratio of the output image 295 of the camera.

See more: Specifying the Aspect ratio of output image 641

In the **Crop** box you can set the **crop factor** - the ratio of cropping active area size of the image sensor when the active area does not touch the edges of the image sensor. In other cases Crop=1. The Crop factor can be set as a vulgar fraction (separated by slash) or a real number. For example **4:3 0.67** or **16:9 720/1080**. If the crop factor is not specified, it is taken to be unity.

See more: Specifying the crop factor 641

The **Calculator** icon invokes the Image sensor calculator 523 box for convenient calculation of image sensor's aspect ratio, active area aspect ratio and the crop factor.

The **Horiz., Vert.** and **Diag**. boxes display sizes of the *active area* of the Image sensor, which are used in modeling the camera.
These sizes are calculated based on the **size** and **aspect ratio** of the image sensor, as well as the **aspect ratio** of the output image.

In the boxes, you can directly type any sizes of the active area of the image sensor in millimeters. In this case, the aspect ratio of the active area will be defined by the ratio of its sizes. The Aspect ratio 295 box will show **Custom**.
By this method, you can specify an arbitrary aspect ratio of the image and camera angles. To set arbitrary camera angles choose the sizes of the active area of the image sensor.

Below you can see the dynamic image showing the position and relative sizes of the active area on the image sensor (aqua color) subject to the selected aspect ratios and crop factor.

Examples of images of image sensor of real cameras:

Aspect ratio of Image sensor	4:3	16:9	4:3	16:9	16:10	16:10	16:9 (1920*1080)
Aspect ratio of Active area of Image sensor	4:3	16:9	16:9	4:3	16:9	4:3	16:9 (1280*720)
Crop	1	1	1	1	1	1	720/1080=0.67
Image							

To save changes click **Save**.
To cancel changes click **Cancel**.

See also: Specifying active area size of the image sensor/ 636

Lens

On the **Lens** panel you can see:

Lens focal length - the box duplicates the similar box 294 in the Camera geometry.

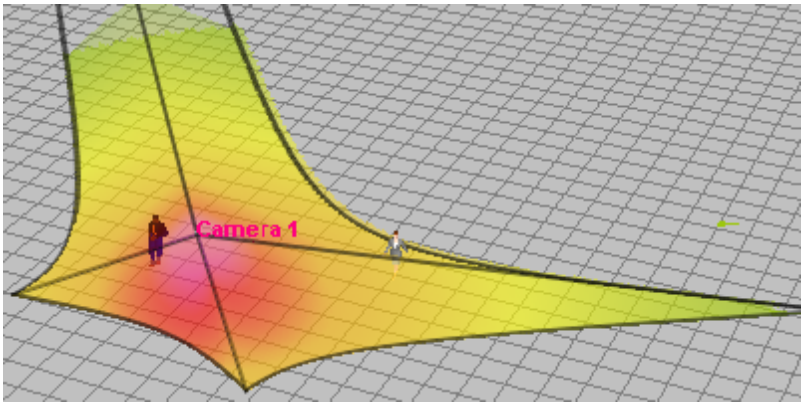
Calculated view angles are calculated from the **sizes of active area of image sensor** and the **lens focal length**.

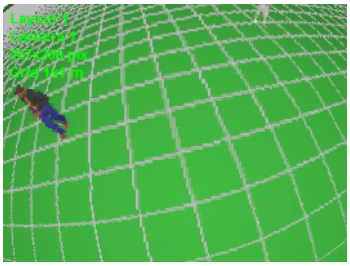
Via changing sensor sizes when the lens focal length 294 is fixed, you can set separately arbitrary horizontal and vertical **view angles.**

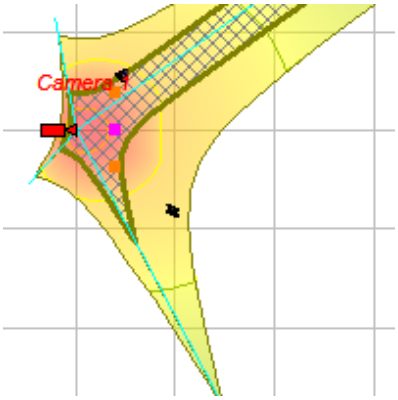
To save changes click **Save**.
To cancel changes click **Cancel**.

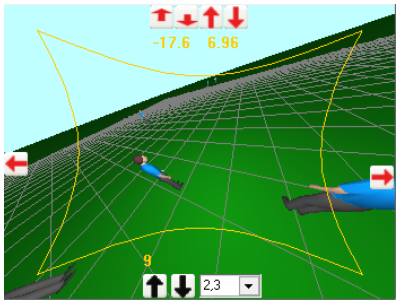
Lens distortion

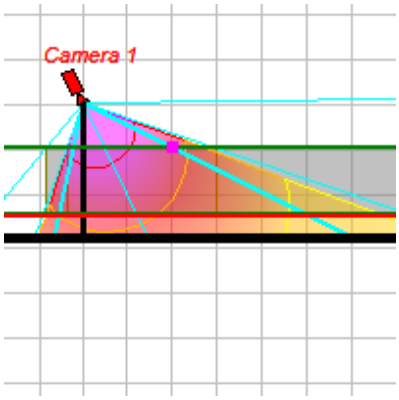
See before: About Lens distortion 654.











*As a rule, taking into account lens distortion is relevant for lenses with a focal length of less than 4mm. For long focus lenses, the distortion is usually can be neglected. In cases requiring precision, compare the **real view angles** (from the camera manufacturer's specifications or obtained by practical measuring 622) with the **calculated view angles** displayed in this box. If the angles differ by more than 1-2 degrees, the distortion of the camera lens may be noticeable. You can simulate distortion and evaluate its impact on your task.*

To specify lens distortion:

1. Set or check the correct lens focal length 294;

2. Set or check format 293 or real sensor sizes 308;

3. On the **Lens distortion** panel mark a checkbox near to a box of known value of **real view angle** (horizontal, vertical or diagonal) and enter known angle to the box. Clear checkboxes of unknown angles - VideoCAD will calculate them.

*If **real angles** calculated by VideoCAD will differ from the **real angles** from camera specification, you can correct them, by marking a checkbox near to appropriate box. You can also change lens focal length 294 a little. It is not recommended to change **sensor sizes** to correct **real angles**.*
*If you set real angle values too differed from calculated angles or set other inconsistency, then the boxed will colored in **Red** and (or) the view area will be corrupted.*

4. Mark **Simulate** to model active camera taking into account lens distortion.

Simulation of distortion for all cameras can be turned on and off in the Options box > Miscellaneous > Lens distortion > Simulate distortion 492. There, in the Options box, you can change the discretization accuracy 492 of distortion simulation.

Attention! *Changing the lens focal length or the format / size of sensor at fixed real angles causes view area corruption and requires changing the real angles. Therefore, it is advisable to enable modeling distortion after a preliminary selection of proper lens to increase precision of modeling .*

Under the influence of the lens distortion the view area becomes more complicated, it sometimes becomes infinite . To limit the distance of view area drawing use the Maximum distance of drawing view area 307.

In the 3D Video 357 *distortion is modeled with low resolution. You can obtain distorted image model with real resolution by 2 ways:*

- *Check the Real frame size* 359 *menu item then save image from the* ***3D Video*** *to a file. The file will have full size, real resolution and distortion.*
- *Use PiP* 391. *While distortion is modeled, the* ***particular view of*** *PIP has real resolution. In case of corruption on the corners of image with strong distortion - decrease the size* 393 *of the* ***particular view****.*

Changing the spatial resolution 316 *under the influence of lens distortion is considered* ***along radial rays from the center of the frame to the edges****, without distinguishing between horizontal and vertical.*

Simulation of distortion increases the demand for computer power.

To save changes click **OK**.
To cancel changes click **Cancel** or close the box.

See also:About lens distortion 654, *Modeling lens distortion* 619, *Measuring real view angles of a camera* 622

Panoramic

The panel is designed to control simulation of cameras with a view area in the form of a hemisphere (fisheye, panoramic, 360°/180° cameras).
To enable the simulation of the active camera as a panoramic camera, check the **Panoramic** box.

In the **Pan angle** and **Tilt angle** combo boxes the angles of rotation of camera main optical axis in horizontal and vertical planes are specified.

Thus, if the camera is mounted on a vertical wall, the Tilt angle should be zero, and Pan angle determines angle of the wall. If the camera is mounted on a ceiling, the Tilt angle must be set to 90 degrees, and the Pan angle does not matter. If the camera is mounted on the floor, the Tilt angle should be 90 degrees.

Pan, tilt and rotation of the camera around its own axis, made in the usual way does not affect the position of the panoramic camera. By rotation the camera in the usual way, you can view images from the panoramic camera in different directions in the 3D Video 357. In this case, the view area will be limited at 180 degrees from the main optical axis of the lens. Beyond this limit the image is cut

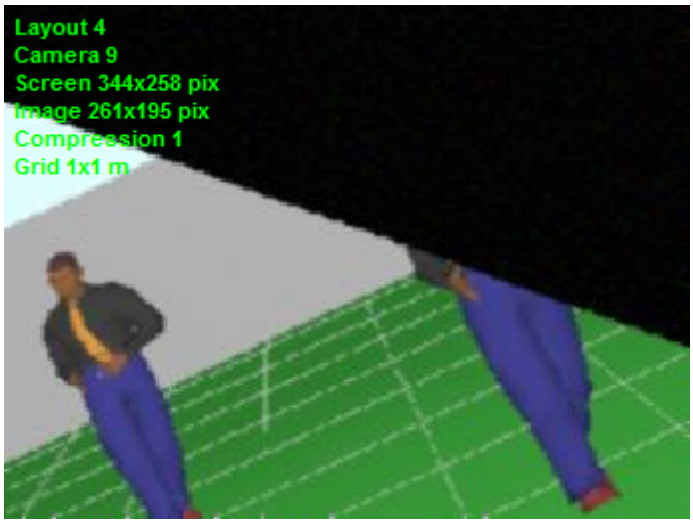
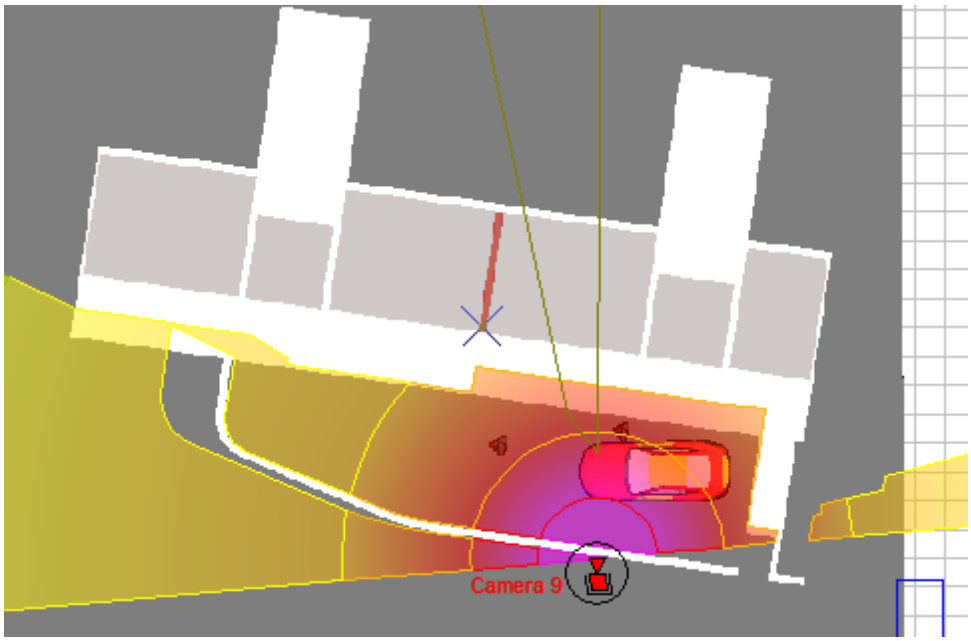


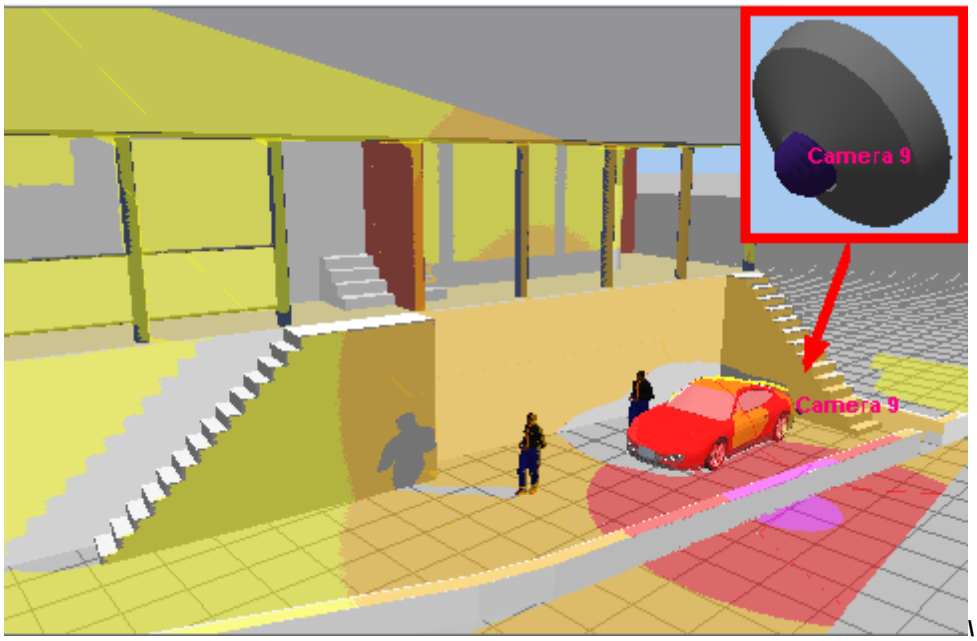
Image resolution of a *panoramic* camera is determined by the Number of pixels of sensor 332, Lens focal length 294 and Image size at image processing 381 have no affect on the image resolution of a *panoramic* camera.

You can change the **Lens focal length**, thereby changing the field of view size, but the image resolution in the 3D Video will be always maintained equal to the calculated resolution of the panoramic camera.
If the calculated resolution is worse, the resolution of the **3D Video** will be artificially reduced. If the calculated resolution is better, then the PiP 391 mode will be launched in the **3D Video**.
The **Image** line in the Titles 365 displays a virtual number of pixels for correct simulation of the resolution.
Distortion of a panoramic camera images in the **3D Video** is not modeled.
The simulated resolution is exact **only at the center of the frame**. Towards the edges of the frame the actual resolution is worse than simulated. The smaller the view angle, the more accuracy of simulating resolution on the edges of the frame.
For a more realistic model of the image, turn on modeling compression 383 and smoothing 383, or set the actual resolution of the lens 341 (for accurate simulation the lens resolution you also need to specify the correct size of the image sensor 293).

In the Graphics window 161 the horizontal projection of the view area and the distribution of spatial resolution 316 are visualized. The projection is constructed in accordance with the Within projection 179 rule.



In the 3D World 342 the camera coverage area and distribution of spatial resolution 348 are visualized.

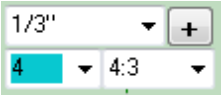


Pattern criterion 319 of spatial resolution for *panoramic* cameras must be based on spatial resolution (**Pixel per meter (Pixel per foot), Pixel for object**), but not on field of view size. Criterion **Field-of-view height**, **% of Field-of-view for object** are not suitable to *panoramic cameras*, because of *panoramic* cameras don't have a stable field of view.

To draw a camera using the special icons or in the Graphics window, you need to choose thus icon during new camera creation 216 or later on the Camera list 509 panel. Selecting the icon works regardless of the state of the **Panoramic** checkbox .

To make a camera model 419 a *panoramic* camera it is necessary:

- Assign *fisheye* to the parameter Lens>Type 438 to model the camera as *panoramic*.
- Assign *panoramic* to the parameter Type>Fixed, PTZ,Dome, Mini 431 to draw the camera using the special icons or in the Graphics window.

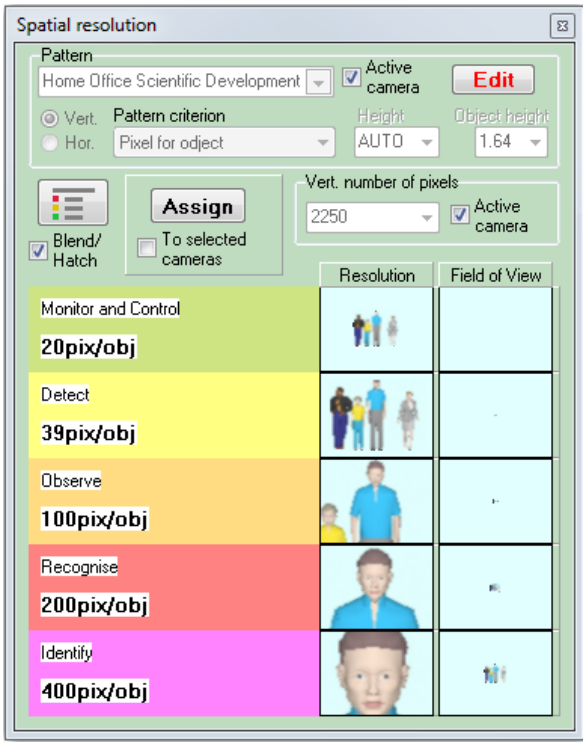
The lens focal length boxes in the Graphics window and the Camera Geometry box for panoramic cameras are colored by aqua-green. 

In reports and in the exported dxf or dwg files for panoramic cameras instead of the lens focal length value the 'fisheye' word is displayed. .

See also: Modeling panoramic cameras (Fisheye, 360°/180°) 626

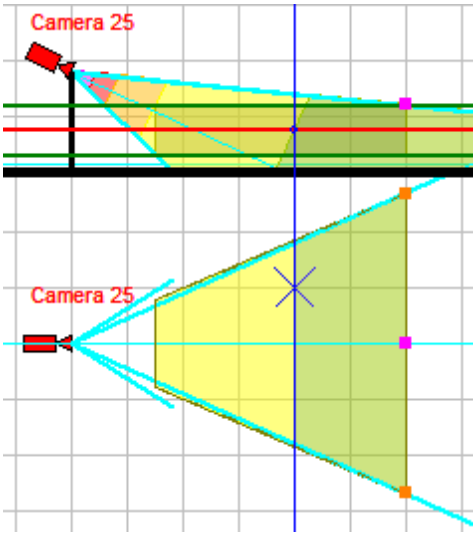
9.4 Spatial resolution

Graphics window
Tool bar
Spatial resolution



View area of cameras can be divided into **regions** based on the following **criteria**:

- vertical or horizontal spatial resolution (pixels/ meters, pixels/foot);
- vertical or horizontal field of view size (meter, foot);
- vertical or horizontal number of pixels covered by an object of the specified height(width) (meter, foot);
- the part of the frame height(width) covered by an object of the specified height(width) (meter, foot).



*These Criteria relates to the **spatial resolution** or the **field of view size**. For short, in the definitions, it is mentioned the **spatial resolution only** (the Spatial resolution box, the Spatial resolution pattern, the Spatial resolution criterion ...), except of special cases.*

In the **Graphics window**, projection of different **regions** of view area can be filled 177 by different color and (or) type of hatching.

*Changing the **spatial resolution** under the influence of the lens distortion 654 is considered **along radial rays from the center of the frame to the edges**, without distinguishing between horizontal and vertical.*

Spatial resolution pattern

- contains information about the **regions** and how they are filled and (or) hatched.
VideoCAD project can contain up to **30** spatial resolution patterns. Each pattern can include up to **10** regions. You can assign different patterns to different cameras.

Spatial resolution box

- is designed for creating and editing the patterns of spatial resolution and field of view size visualization.
In the box there are prepared spatial resolution patterns according to the following criteria:

- Home Office Scientific Development Branch;
- Home Office Guidelines for identification;
- P 78.36.008-99;
- Australian Standard AS4806: Closed Circuit Television;
- European Standard EN 50132-7;
- ISO/IEC 19794 Biometric data interchange formats.

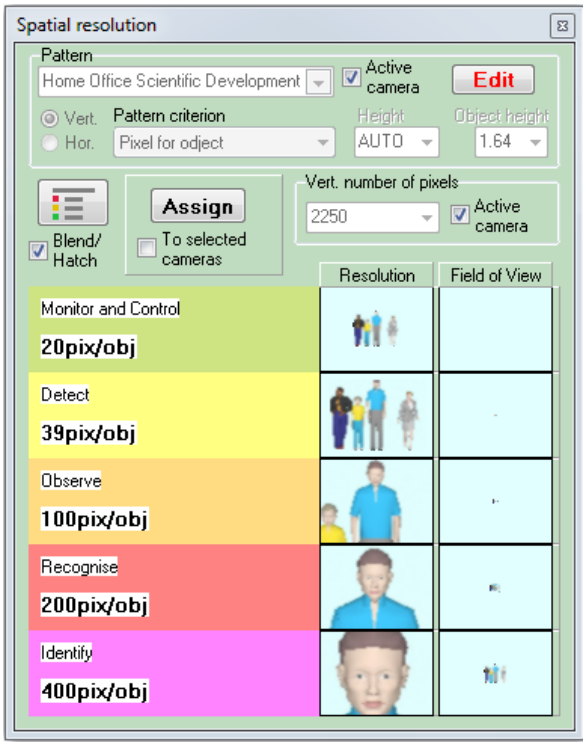
Individual patterns can be customized according to any other criteria related to the spatial resolution or the field of view size.

Also in the box there are examples of images of group of people are automatically displayed for each region of spatial resolution.

It is convenient to keep the Spatial resolution box opened during the analysis of spatial resolution in the Graphics window. Comparing color of regions on the layout with color in table in the spatial resolution box, on the images in the Resolution 323 and Field of view 323 columns you can immediately see the expected resolution and field of view size at every point of view area of each camera.

See further : *Tools in the Spatial resolution box* 318, *Work with the Spatial resolution box* 326
See also: *Spatial resolution* 177, *Fill projection* 175, *Visualization of cameras' control area projections and spatial resolution inside them* 580

9.4.1 Tools



Pattern

In this combo box the name of the chosen pattern of spatial resolution is shown.
You can choose any pattern from 30 patterns of spatial resolution. Parameters of the chosen pattern are displayed and can be edited in the Spatial resolution box.
The name of the pattern can be edited in this box, when the Edit 318 button is pressed.

As a result of right-click on the combo box a pop up menu will appear. Selecting the **Default patterns** item, you can erase all changes in the patterns and return to the patterns set by default.

The box is inaccessible when the Active camera 318 box is checked.

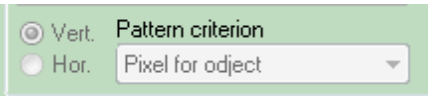
Active camera

If the checkbox is checked, a pattern assigned to the active camera is automatically displayed in the spatial resolution box. The Pattern 318 combo box will become inaccessible for editing.

Edit Edit/Save

Edit the chosen pattern. Clicking on the **Edit** button makes parameters of the chosen pattern accessible for editing. The button caption is changed to **Save** - stop editing and save the modified pattern.

Vert./Hor. switch



The switch allows to choose direction (horizontal or vertical) to which the pattern criterion 319 must be applied.

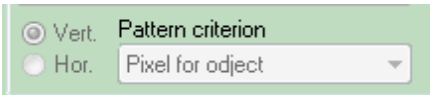
- If **Vert**. is checked then the **Pixel per meter** is the number of pixel per meter along the vertical, the **Field-of-view height** is the height of the Field-of-View, the **Pixel for object** is the number of pixel covered by the object along the vertical, the **% of Field-of-view for object** is a part (%) of the Field-of-View covered by the object along the vertical;
- If **Hor**. is checked then the **Pixel per meter** is the number of pixel per meter along the horizontal, the **Field-of-view width** is the width of the Field-of-View, the **Pixel for object** is the number of pixel covered by the object along the horizontal, the **% of Field-of-view for object** is a part (%) of the Field-of-View covered by the object along the horizontal.

The switch is accessible for editing in the *Editing* 318 *mode.*

*When calculating the **spatial resolution**, rotation* 297 *of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation* 493 *checkbox in the Options box .*

*Changing the **spatial resolution** under the influence of the lens distortion* 654 *is considered **along radial rays from the center of the frame to the edges**, without distinguishing between horizontal and vertical.*

Pattern criterion



In the box you can choose a **criterion** according to which regions in the pattern will differ.

You can choose one from 4 criteria:

- **Pixel per meter** (Pixel per foot) - vertical (horizontal 319) spatial resolution (pixels/meters, pixels/foot);.
- **Field-of-view height (width)** - vertical (horizontal) 319 field of view size (meter, foot);
- **Pixel for object** - vertical (horizontal) 319 number of pixels covered by an object of the height (width) specified in the Object height(width) 320 box (meter, foot); .
- **% of Field-of-view for object** - the part of the frame height (width 319) covered by an object of the height (width) specified in the Object height(width 320 box (meter, foot).

Direction of the criterion (vertical/height or horizontal/width) can be specified by the Vert.//Hor 319 *switch*

***Meters or feet** as a unit of height are selected automatically depending on the format of measurements* 215 *in the project.*

*For the criteria **Pixel per meter (Pixel per foot), Pixel for object** the spatial resolution depends on **the number of pixels along vertical or horizontal.***
In calculation the minimal number of pixels from parameters of camera image sensor and parameters of output image is used.
Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 *box.*

Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.
If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (or horizontal 768 pixels), what corresponds to analog camera.

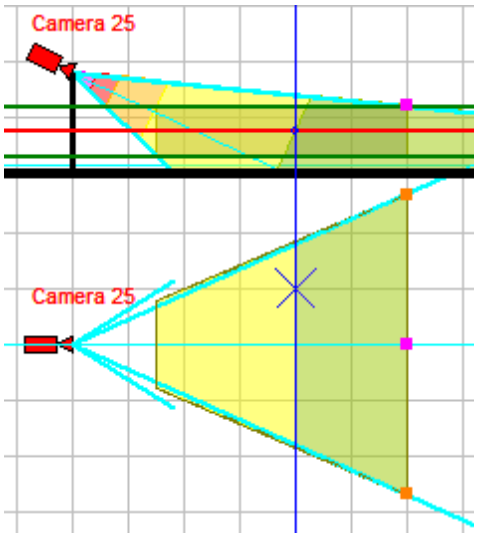
Rotation 297 of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box .

*Pattern criterion of spatial resolution for panoramic 312 cameras must be based on the spatial resolution (**Pixel per meter (Pixel per foot), Pixel for object**), but not on the field of view size. Criterion **Field-of-view height**, **% of Field-of-view for object** are not suitable to panoramic cameras, because of panoramic cameras have not a stable field of view.*

The box is accessible for editing in the *Editing 318 mode.*

Height

Height of measuring the spatial resolution in the horizontal projection (height of the horizontal red line on the picture).



If the main optical axis of the camera is not parallel to the horizon, the spatial resolution in the horizontal projection depends on the height above the ground.

- If in the **Height** box **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **Within projection** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the middle height between the view area lower bound height 300 **and the** view area upper bound height 298.
- If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **2 levels** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the view area lower bound height 300

The box is accessible for editing in the *Editing 318 mode.*

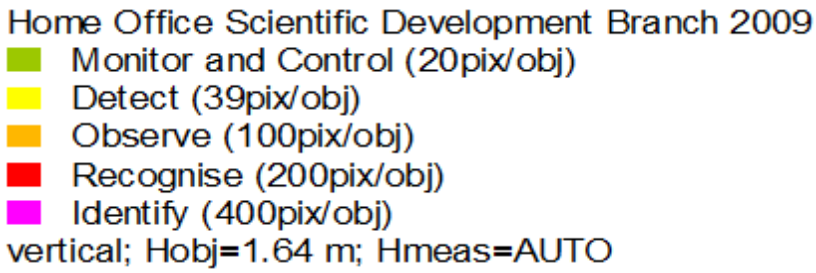
Object height (width)

Height (width 319) of the object for the criteria associated with an object: **Pixel for object** and **% of Field-of-view for object.**

The caption is changed according to the Vert./Hor. 319 switch.

The box is accessible for editing in the *Editing 318 mode.*

Draw Legend



Draw legend of the current Spatial resolution pattern on the Graphics area. After choosing this button specify place of the legend on the Graphics area of the Graphics window.
You can select font type 477 on the font type panel 281 before placing or after double clicking near to the left top corner of the legend.
By means of font type you can change size and color of the legend. You can also make the legend scalable 477 or nonscalable.
Legend is tied with his Spatial resolution pattern 316. If parameters of the pattern is changed then the legend will be changed too. You can place several legends of different patterns on the same layout.

Blend/Hatch

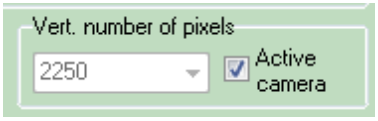
Show the regions in the Spatial resolution box hatched or filled by blend translucent colors.

This box affects displaying regions in the Spatial resolution box only. Hatch or fill regions in the Graphics window can be determined separately for each camera using the Fill projections 175 button.

Assign

Assign **chosen pattern** to the **Active camera**. If the **To selected cameras** box is checked, then the chosen pattern is assigned to **all selected cameras**.

Vert.(Horiz.) number of pixels



Attention! The purpose of this combo box differs in Starter, Lite and Professional versions!

The caption is changed according to the Vert./Hor. 319 switch.

Vertical (horizontal) number of pixels for modeling images 323 on the far bounds of regions. Images on the bounds of regions depend not only on the criterion value 319, but also on the number of pixels.

Thus, for **criteria related to the number of pixels which covers a specified height (width)** (**Pixel per meter, Pixel for object**) value of the criterion determines the **spatial resolution**, ie how detailed the scene is photographed. In this case, **Vert.(Horiz.) number of pixels** determines the size of the **field of view**.

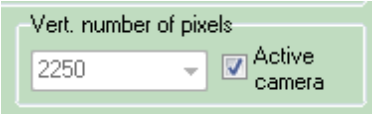
Conversely, for **criteria related to the height (width) of the field of view (Field-of-view height (width),% of Field-of-view for object**) criterion value determines the size of the **field of view**. In this case, **Vert.(Horiz.) number of pixels** determines the **spatial resolution**, ie how detailed the scene is photographed.

*In the **Professional version** this box affects only the images in the Resolution 323 and the Field of view 323 columns in the **Spatial resolution box**. This box does not affect the regions in the **Graphics window**.*
For calculation of regions in the Graphics window the minimal number of pixels from parameters of camera image sensor and parameters of output image is used.
Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box.
Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.
If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (or horizontal 768 pixels), what corresponds to analog camera.

Rotation 297 of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box .

The box is accessible for editing if the Active camera 322 box is not checked.

Active camera



When this box is checked, the number of pixels of the **Active camera** is assigned to the Vert. (Horiz.) number of pixel 321 box. The **Vert.(Horiz.) number of pixel** box becomes inaccessible for editing.

*For calculation the **minimal number of pixels** from parameters of camera image sensor and parameters of output image is used.*
Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box.
Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.
If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (or horizontal 768 pixels), what corresponds to analog camera.

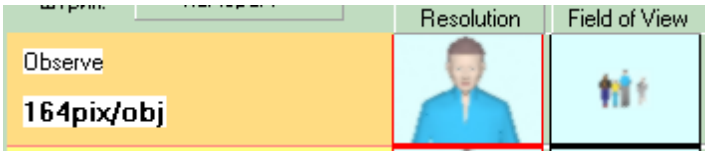
Rotation 297 of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box ..

Table of regions

In rows of this table you can see and edit 326 parameters of regions of the chosen spatial resolution pattern.

The bottom row of the table corresponds the nearest to the camera region.

On the first column of the table, on the background rectangles filled by a color assigned to the region, the Name of the region and the **Criterion value** 319 at the far bound of region are displayed.



Resolution column

The **Resolution** column contains fragments of images with people at the far bounds of each region. **These are fragments of images, not whole images**. **Field of view** of the fragments is less than the real **field of view**, but the **resolution** of people corresponds the real images exactly.

*On the images in the **Resolution** column, you can see with which resolution people at the far bound of each region will be visible.*

Field of view column

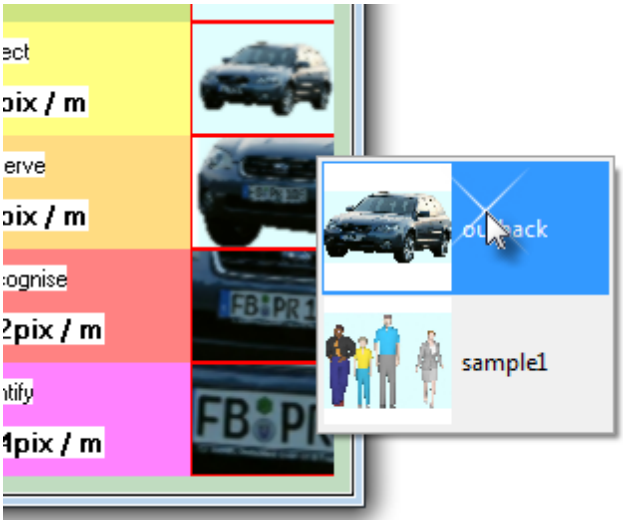
The **Field of view** column contains **whole reduced images** of people with the **field of view** at the far bounds of each region. **Resolution** of these images is less than resolution of the real image, but the **field of view** corresponds the real images exactly.

*On the images in the **Field of view** column, you can see which part of the field of view people at the far bound of each region will cover.*

Images in **Resolution** and **Field of view** columns are automatically generated according to the **criterion value** of each region and the Vert.(Horiz.) number of pixel 321 value.
The images visualize the boundary values of the criterion.

The height of "men in blue shirt" is 2 meters (about 6.5 feet).

Right click on any image in the **Table of regions**. Pop up menu will appear. With the help of this menu you can change image in the **Table of regions**.



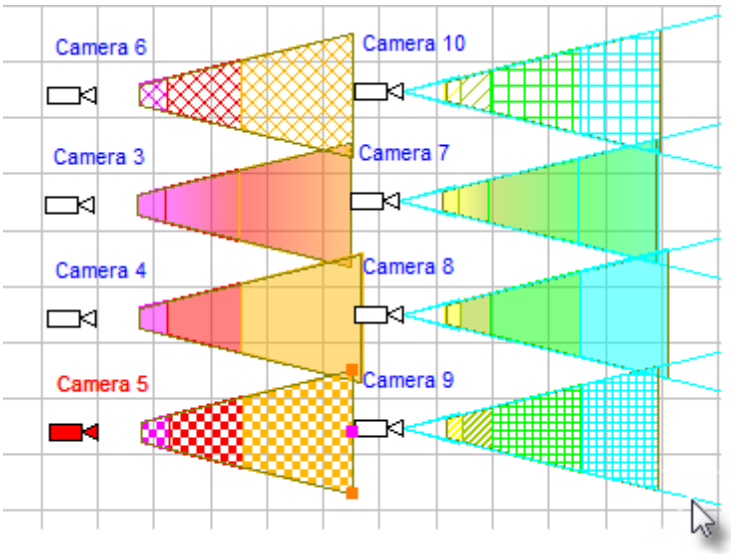
In the *Editing* 318 *mode* the **Names of regions** and the **Criterion values** become accessible for

editing. In addition the **Type of hatching** combo boxes  and **Colors of regions** buttons  appear.

In the **Type of hatching** combo boxes  you can choose type of hatching for each region.

Hatching will be visible in the **Spatial resolution box** when the Blend/Hatch 321 box is not checked. In the **Graphics window**, hatching of the chosen type will be shown for cameras, which have chosen **Hatching** in the menu of the Fill projections 175 button.

Color of region is the same for filling and for hatching.



How to add your own images to the Table of regions

Table of regions can display any images in ***. jpg** format, for example: photos of objects, etc. Adding your own images you can see how your objects will look at the far bounds of regions.

To add your own images to the Table of regions:

1. Take any ***.jpg file**, digital photo image etc.

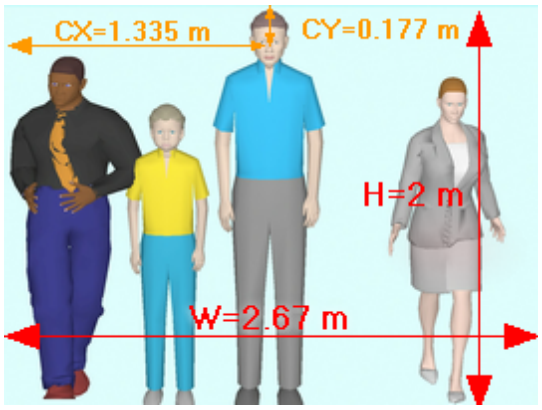
Simulated spatial resolution can not exceed the spatial resolution of the object on the used picture, so the spatial resolution of the object on the picture should be sufficient. The object should take the greatest possible part of the picture and the picture resolution should be sufficient.

2. Name your file by the following composite name: **<anyname>,<W>,<H>,<CX>,<CY>. jpg**

Thus the name is a string composed of the comma separated values:

<anyname> - any string without spaces and special characters;
<W> - image width, in meters;
<H> - image height, in meters;
<CX> - X coordinate of a spot on the image, at which the camera should be pointed (in meters);
<CY> -Y coordinate of a spot on the image, at which the camera should be pointed (in meters);

Origin of coordinates is on the top left corner of the image.



Example of file name:
sample1,2.67,2,1.335,0.177.jpg

3. Put your file in the VideoCAD installation directory, **/Resolution samples/** folder.
You can place several files to this folder.

4. Launch VideoCAD. Open the **Spatial resolution** box. Right click on any image in the **Table of regions**. Pop up menu will appear. With the help of this menu you can change image in the **Table of regions**.
If your file is missing in the menu, then you probably made a mistake in the filename. If the file is displayed not correctly, you probably typed wrong values of sizes in the filename.

See further : *Work with the Spatial resolution box* 326

9.4.2 Work with the Spatial resolution box

Editing the Spatial resolution pattern

1. Clear the Active camera 318 box.

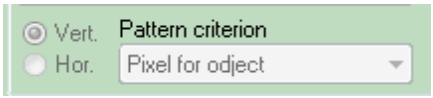
2. Choose a pattern for editing in the Pattern 318 combo box.

3. Click the Edit 318 button. 

Caption on this button will be changed to **Save**. Parameters of the chosen pattern will become accessible for editing.

4. If necessary, edit the Name of the pattern in the Pattern 318 box by the keyboard.

5. Choose direction 319 (horizontal or vertical) and criterion in the Pattern criterion 319 combo box.



6. Specify Height 320 at which the criterion values should be calculated.

- *If in the **Height** box **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **Within projection** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the middle height between the view area lower bound height 300 **and the** view area upper bound height 298.*
- *If in the Height 320 box of the **Spatial resolution box**, **AUTO** is chosen and in the View area projection bounds 173 and Shadow 178 buttons the **2 levels** is chosen, then calculation of spatial resolution in the horizontal projection is carried out at the view area lower bound height 300*

7. In case of chosen criteria is related to an object (**Pixel for object, % of Field-of-view for object**), choose the object height(width) in the Object height (width) 320 box.

8. If the **type of hatching** is needed to show, clear the Blend/Hatch 321 box.

9. Specify values of the criterion 319 at far bound of each region in the Table of regions 322.

When editing the values of criteria, you must comply with the following rules:

9.1 The bottom row of the table should correspond to the closest to the camera region, and thus must have:

- maximum spatial resolution (the maximum value of the criterion **Pixel per meter**);
- any object must cover the maximum number of pixels (the maximum value of the criterion **Pixel for object**);
- minimum size of the field of view (the minimum criterion **Field-of-view height (width)**);

- any object must cover maximum part of the field of view (the maximum value of the criterion **% of Field-of-view for object**).

9.2 The values of the criteria should be edited consistently from region to region, starting from the closest to camera region (bottom row). For example, if the criterion is Pixel per meter, then in the bottom row should be the maximum spatial resolution, and in each subsequent row criterion value must be less than the row below.
If this rule is violated then the boxes with wrong values would be red highlighted.

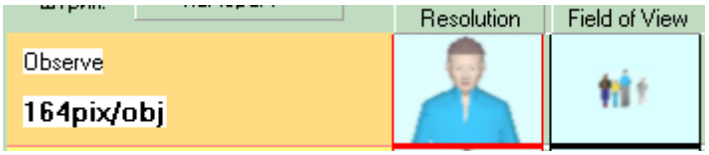
9.3 In the editing mode 318, the table unfolds and shows the **maximum number of region in the pattern (10)**. If you need a smaller number of regions, the "extra" regions must have equal values of the criterion. "Unnecessary" regions should be placed one after another at the top of the table.

10. You can edit the Name of each region in the **Name** box, choose a color that will be used for displaying the region in the Graphics window by clicking on the Color button 323  , choose hatch style in the Hatch style 323.  combo box.

*Hatching will be visible in the **Spatial resolution** box when the Blend/Hatch 321 box is not checked.*
*In the **Graphics window**, hatching of the chosen type will be shown for cameras, which have chosen **Hatching** in the menu of the Fill projections 175 button.*

11. On the images in the Resolution 323 column, you can see with which resolution people at the far bound of each region will be visible.
On the images in the Field of view 323 column, you can see which part of the **field of view** people at the far bound of each region will cover.

Sample images are correct for the cameras with vertical number of pixels specified in the Vert. (Horiz.) number of pixel 321 combo box .



12. When editing pattern will be finished, click the Edit/Save 318 button once again.

Assigning the pattern to cameras

To assign a pattern, displayed in the **Spatial resolution box** to a camera:
1. Activate 166 the camera.

2. Click on the Assign 321 button.

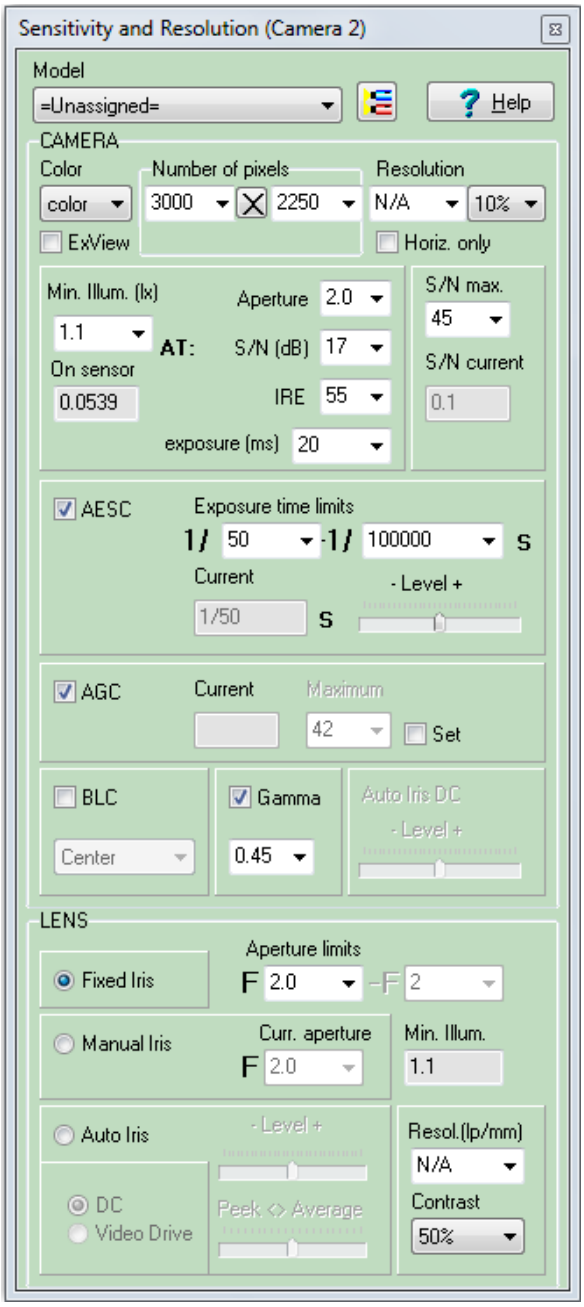
If the *To selected cameras* 321 box is checked, then the chosen pattern is assigned to **all selected cameras**.

See also: *Spatial resolution* 177, *Fill projection* 175, *Visualization of cameras' control area projections and spatial resolution inside them* 580

9.5 Sensitivity and Resolution

Graphics window
Main menu
View
Sensitivity and Resolution

In the box sensitivity and resolution parameters of the active camera present.
Here you can choose camera type: **color**, **black-white** or **day/night**.



If in the project it is required only to place cameras and choose lens focal lengths, and it is not required to model illumination and image resolution, this box can be not used.

Sensitivity parameters

Sensitivity parameters are used in image modeling taking into account camera sensitivity and scene illumination.
Sensitivity parameters are taken into account only when:

- 3D Video 357 is visible;
- Illumination modeling 372 is switched on.

Camera sensitivity is determined by set of parameters of camera and lens, therefore in the box there are 2 big panels:

- Camera 331;
- Lens 339.

For image modeling considering scene illumination, parameters in **white boxes** should be set.
Parameters in **grey boxes** are results of calculation.
Some parameters correspond to adjustments on cases of cameras and lenses.

To allow lens contamination, dirt, camera degradation and parameter variation it is necessary to set Maintenance factor of cameras 481 on the 3D modeling 481 tab of the Options box.

See also: About camera sensitivity 651.

Resolution parameters

Resolution parameters are used in modeling resolution of image from the active camera in the 3D Video 357.
Number of pixels is also taken into account when calculating person detection 498, identification 500 and license plate reading 503 areas and spatial resolution 316.

Model of active camera

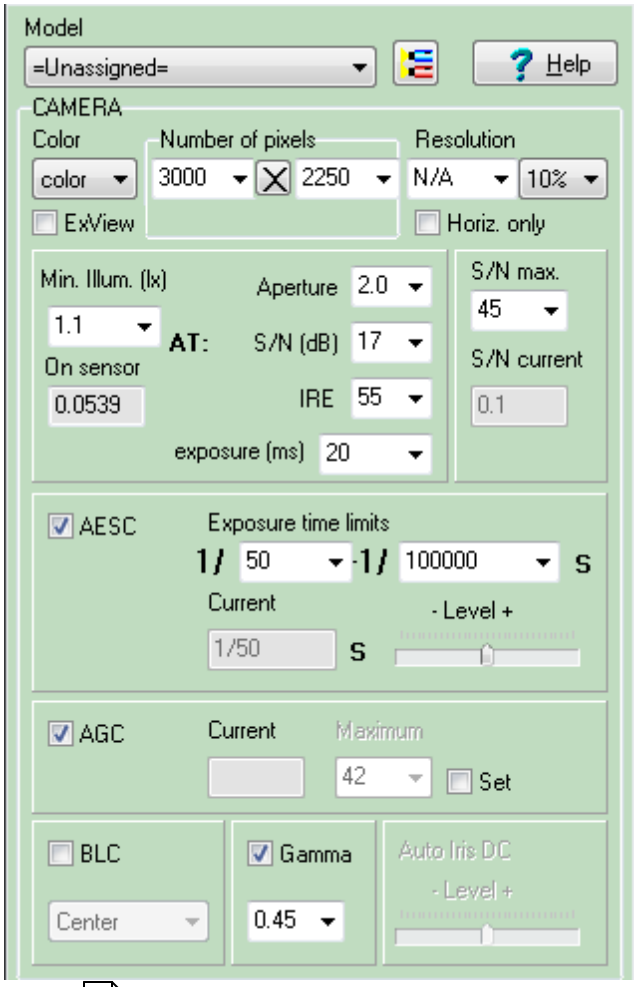
Model combo box duplicates similar combo box 185 on the **Tool bar** of the **Graphics window**. It is convenient to assign all parameters in this box at once through assignment of camera model 185 to the active camera in the **Model** combo box.
After model assignment changing some parameters is locked according to model limits. To unlock parameters it is necessary to choose **=Unassigned =** in the **Model** box.

Near the box there is **Table of camera models** button for displaying detailed Table of camera models 419.
The button duplicates similar button 185 on the Tool bar of the Graphics window.

The **Sensitivity and Resolution** box can be used for comparison of images from various camera models and lens according to known parameters.
By assigning different models to the active camera it is possible to compare images of the same scene which can be obtained using different camera and lens models.

See more: Camera 331, Lens 339
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

9.5.1 Camera



Subpanels:

Minimum scene illumination

Signal/noise ratio

Automatic gain control (AGC)

Back light compensation (BLC)

Gamma

Internal Auto iris amplifier DC (DD)

Electronic shutter (ES, AES, AESC, shutter)

AESC 336
Exposure time limits 336 (shutter speed, shutter LIM, SPD)
Current 336
- Level+ 336

Color

In the box camera color can be chosen. 4 variants are available:

B/W - black-white camera;

color - color camera;

day/night - full day/night camera, which has infra-red filter that is mechanically removed in black-white mode;
in black-white mode the day/night camera is sensitive to infrared light;
day/night camera at sufficient illumination behaves as a color camera with sensitivity approximately in 5 times less than in black-white mode;

easy day/night - camera has infra-red filter which is not removed in black-white mode;
easy day/night camera have much less advantages in sensitivity from switching to black-white mode, than full day/night cameras have;
in black-white mode easy day/night camera is non sensitive to infrared light;
At sufficient illumination easy day/night camera behaves as color camera with the sensitivity approximately in 2 times less than in black-white mode.

At illumination reduction **day/night** and **easy day/night** cameras are switched into black-white mode. At the same time their sensitivity increases up to the value set on Minimum scene illumination 334 panel.

Color parameter influences 3D model 357 color as well as **spectral sensitivity** of cameras to various light sourses 464.
For example, color camera is non sensitive to IR illumitators 469, and black-white camera has reduced sensitivity to light of discharge lamps in comparison with Incandescent lamp.

ExView

In the camera image sensor with **increased relative IR sensitivity** is used.
Image sensor type is usually specified in camera specification.

Image sensor type influences spectral efficiency factors 464 of different light sources that are used in modeling. However this influence does not exceed 15-20 %. Do not mark this box if the type of image sensor is unknown.

*Though **Sony ExView HAD ™ CCD** has increased total sensitivity, this box does not influence sensitivity to illumination produced by Halogen Incandescent lamps. Sensitivity to Halogen Incandescent lamps is unequivocally specified in the Min. illum. (lx) 334 box.*

Number of pixels

In the combo boxes you can choose horizontal and vertical **numbers of effective pixels** on the image sensor. **Analog cameras** have, as a rule, 752x582 (high resolution) or 500x582 (standard resolution) effective pixels.
Number of effective pixels of **IP cameras** can be different.

If **N/A** is chosen in the box, then number of pixels is not considered.

In the boxes **exactly the number of image sensor's pixels** is to be specified, without considering **analog-to-digital conversion** or output image size. **Analog-to-digital conversion** or output image size is set on the *Processing* 381 tab of the **Image parameter panel**. The final image is modeled considering distortions connected with different number of pixels on image sensor and in output image.

A button with a cross between combo boxes with horizontal and vertical numbers of pixels is intended for fast calculation of vertical number of pixels from the specified horizontal number of pixels and on the contrary. Calculation is carried out using the Aspect Ratio 295.

Criteria 505 of person *detection* 495, *identification* 496 and license plate *reading* 497, *spatial resolution* 316 depend on the **number of pixel**. Therefore the number of pixels influences person detection, identification and license plate reading areas, positions of *spatial resolution regions* 177 and *image examples* 322 in the **Spatial resolution box**.
For criteria calculation **minimal number of pixels** from parameters of **camera image sensor** and parameters of **output image** is used.
Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.
If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (or horizontal 768 pixels), what corresponds to analog camera.

If a camera is rotated around its axis 297 by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution** (pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.

When calculating the spatial resolution 316, rotation of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box .

The positions of the boundaries of spatial resolution 177 *and the sample images* 322 *in the* ***Spatial resolution box*** *are affected by the* ***number of pixels*** *in vertical or horizontal direction depending on the position of the Vert. / Hor* 319 *switch in settings of a* ***pattern of spatial resolution****, assigned to the camera.*

Resolution (LPH)

In the box you can specify resolution of the active camera, in **LPH - Lines per Picture Height**. At 3D modeling resolution of image will be limited up to the value set in this box.
In the box on the left, a value of the lines per picture height (LPH) is entered, and in the box on the right a drop of contrast in % according to the MTF at the entered number of lines is specified.
If the **Horiz. only** checkbox is checked then only horizontal resolution is modeled, which is typical for analog cameras. If the **Horiz. only** checkbox is not checked, the camera resolution will decrease horizontally and vertically in the same degree.

If N/A is chosen in the box, then resolution limitation is disabled.

Items sharp+1, sharp+2, sharp+3 on the contrary increase image sharpness. With the help of these items it is possible to model effect of **Aperture corrector**.

Aperture corrector is automatically switched-off at insufficient illumination.

You can also simulate the lens resolution 341. When the lens resolution simulation and camera resolution simulation are both enabled, then their effects are summarized.

You can check resolution visually using the Test chart 388.

Minimum scene illumination

Min. illum. (lx)

Minimum scene illumination (lux). The parameter is given in specification of any cameras.

However usage in calculations and models the minimum illumination values from specification of some manufacturers can lead to errors.

*In VideoCAD it is meant, that scene reflection factor is 0.75, light source - halogen incandescent lamp (color temperature 3100 +-200K) according to Standard **CEA 639 'Consumer Camcorder or Video Camera Low Light Performance'**.*

For ***day/night*** 332 and **easy day/night** cameras in this box it is necessary to enter the minimum scene illumination **in black-white** mode.

For unambiguous description of sensitivity in VideoCAD, should be pointed also:

- with what lens aperture 334 the minimum illumination is measured;
- signal/noise 334 ratio of the image at the minimum illumination;
- IRE 334 of video signal at the minimum illumination;
- exposure time 335 at what the minimum illumination is measured.

*To allow lens contamination, dirt, camera degradation and parameter variation it is necessary to set **maintenance factor of cameras** on the 3D modeling 481 tab of the **Options box**.*

For modeling increased contrast at constant signal/noise ratio use parameter Maximum AGC gain 337.

Sometimes the boosted sensitivity is achieved due to noise decreasing as a result of digital image processing. But in this case resolution essentially decreases too.
For modeling resolution decreasing, use Sharpness 383 parameter.

See also: About camera sensitivity 651, Measuring camera sensitivity 551.

AT:

Aperture

Lens aperture at which the minimum scene illumination is measured.
The parameter is given in camera specification. Typical value from F1.0 up to F2.0.

S/N (dB)

Signal/noise ratio of the image at the *minimum illumination* 334, unweighted value.

According to CEA 639, limit value of signal/noise ratio at the minimum illumination determination is 17dB (7 times in voltage).

IRE

IRE of video signal at minimum illumination, at AGC switched on by default.
In VideoCAD 100 IRE corresponds full peak-to-peak amplitude of video signal and accordingly to

maximum brightness amplitude on the image. 50IRE corresponds half of maximum brightness amplitude on the image, etc.

The parameter is given in camera's specification. Typical value is from 30 to 50.

If Set 337 box is marked (the maximum AGC gain in set), AGC mode does not correspond default AGC mode of camera. It means that **IRE** value at minimum illumination also will not correspond to the value specified in the IRE box. Therefore this box will be grey.
The more maximum AGC gain is, the larger is IRE.

Exposure (ms)

Exposure time (milliseconds) at which the minimum illumination has been measured.
Parameter is sometimes given in camera specifications. For analog cameras typically value is 20ms(PAL) or 16.5ms (NTSC). For IP cameras and analog cameras with light accumulation the exposure time may be up to 200ms or more.
VideoCAD offers a technique of measuring exposure time of cameras with an analog oscilloscope, see: Measuring exposure time of IP camera 593

*At modeling the exposure time assumed the truth of the **Reciprocity principle**, that is inversely proportional of sensitivity to the exposure time.*

See also: Modeling exposure 377

On sensor

Calculated illumination on the image sensor of the camera, corresponding the minimum illumination of scene 334 with reflection factor 0.75.

This parameter is for information only.

Signal/noise ratio

S/N max.

Maximum signal/noise ratio of the camera (dB).
In this box it is necessary to choose **weighted** value. Normally weighted value of maximum signal/noise ratio is given in cameras' specification.

At that it is not specially indicated in specification that just weighted value is given.

Typical value for cameras with 1/3 " CCD image sensors is **50dB**.

If only **unweighted** value is known, for obtaining the weighted value it is necessary to add **8dB** to unweighted one, according to http://cctv-information.co.uk

Maximum signal/noise ratio determines **dynamic range** of camera.
For accurate modeling it is possible to measure 560 **maximum scene illumination** of the real camera directly, then choose Maximum signal/noise ratio for obtaining equal maximum illumination of the camera model in VideoCAD.

S/N current

Current signal/noise ratio of the modeling image (unweighted value).
The parameter is calculated during modeling.

In the project 2 values are stored: for day 371 time and night time.

Electronic shutter (ES, AES, AESC, shutter)

AESC

Switching on/off electronic shutter. The electronic shutter controls exposure time depending on illumination.

Exposure time limits (shutter limits, shutter speed, shutter LIM, SPD)

Exposure time limits within which electronic shutter operates.

The parameter is given in camera's specification. Modern **PAL** system cameras have exposure limits 1/50s-1/100000s. For cameras of **NTSC** system the maximum exposure is 1/60s. For **IP cameras** the maximum exposure time can be larger, up to several seconds.

Current

Current exposure time.
If exposure is limited by electronic shutter 336 (electronic shutter operates), the box becomes aqua color.
If current exposure time reaches minimum exposure time 336, the box becomes yellow together with box, in which minimum exposure time is specified.

The parameter is calculated during modeling. In the project 2 values are stored: for day 371 time and night time.

*At modeling the exposure time assumed the truth of the **Reciprocity principle**, that is inversely proportional of sensitivity to the exposure time.*

- Level+

Adjuster of electronic shutter sensitivity to illumination change. Visually this adjuster changes contrast of the image, which is obtained as a result of automatic electronic shutter's work. If the contrast is too high, bright areas on the image are white level clipped.

The adjustment range of real cameras can be different.

Automatic gain control (AGC)

AGC

Switching AGC on/off. The AGC maintains constant video signal level at its insufficient level by additional gain. At that together with the useful signal the noise is gained too.

Current

Current AGC gain (dB).

The parameter is calculated during modeling. In the project 2 values are stored: for day 371 time and night time.

If AGC additionally gains the signal, the box becomes aqua color.

If Maximum AGC gain 337 is set and gain value achieves the maximum 337, the box becomes yellow, together with Maximum AGC gain box and IRE 334 box.

Maximum

In this box it is possible to specify **Maximum AGC gain (dB)** for cameras with switchable AGC gain: High AGC gain (High AGC, S-AGC, Super AGC) or LO AGC gain.
The box will be enabled and the set AGC limit will be considered in modeling, if the Set 337 box is marked.
Enter in the box maximum AGC gain if it is given in the camera's specification.

Typical value is 26-42dB.

If the camera does not have switchable AGC gain, the box must be disabled, and the maximum AGC gain is calculated in the program.

Set

Switch ON the specified **maximum AGC gain**. If this box is marked, the maximum AGC gain set in the Maximum 337 box is used in calculation.

The check mark in this box means that a special AGC mode is switched on.

If this box is marked, the AGC mode is not corresponding to default camera's AGC mode. That means that the IRE 334 value at minimum illumination also will not correspond to the value specified in the IRE box. Therefore the IRE box becomes grey.
The more maximum AGC gain is, the larger is IRE.

The signal/noise 334 ratio depends only a little on the AGC gain.

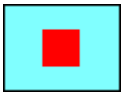
Back light compensation (BLC)

BLC

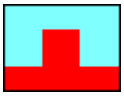
Switching on/off **back light compensation** (BLC). If this function is switched on, measurement of image brightness for the electronic shutter or Auto Iris (DC only) adjusting is made not by full image, but only by central or central and lower parts of it.
This function allows to view objects at image centre which are on different brightness background.

BLC type

In the box you can choose:



Center - analyze brightness on image center;



Multizone - analyze brightness on center and bottom of the image.

Gamma

Gamma

Switching on/off gamma correction. Gamma correction is used in the majority of cameras by default. The correction of the linear response of a camera in order to compensate for the monitor

phosphor screen non-linear response. Visually, at switched on gamma correction dark areas of an image become visible better, but contrast of bright areas decreases.

Degree of gamma correction

The parameter is given in cameras' specification. Normally gamma correction degree equals 0.45. The degree equal 1 is equivalent to absence of gamma correction.

It is supposed, that measurement of minimum illumination 334 is performed at the gamma correction degree set in this box (even if the Gamma 337 box is not marked!).

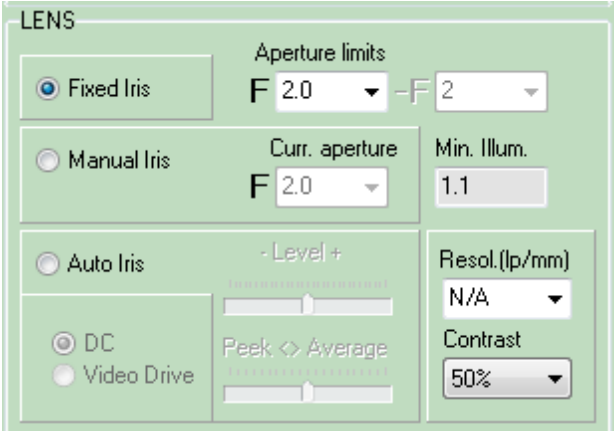
Internal Auto iris amplifier DC (DD)

Auto Iris DC -Level+

Adjuster of Auto Iris DC 339 gain. The slider corresponds to a similar adjuster on camera's case. Visually this adjuster changes image contrast which is achieved as a result of auto iris adjustment. If the contrast is too high, bright areas on the image are white level clipped.

Adjustment range of real cameras can be different.

9.5.2 Lens



Iris type

- Fixed Iris 339
- Manual Iris 339
- Auto Iris 339
  - DC 340
  - Video Drive 340
    - -Level+ 340
    - ALC 340

Boxes:

Aperture limits 340 (F-number)
Curr. aperture 341 (F-number)
Min. illum. 341

Resol. (lp/mm) 341

Iris type

Fixed Iris

Fixed Iris. Aperture value is specified in the left box of Aperture limits 340. During modeling the aperture does not vary.

Manual Iris

Manual iris. Aperture can be changed manually within specified limits, in the Curr. aperture 341 box. Aperture limits are specified in the Aperture limits 340 boxes.
During modeling the Aperture does not automatically vary.

Auto Iris

Automatic iris. During modeling the aperture automatically varies depending on scene illumination.
Aperture change limits are specified in the Aperture limits 340 boxes.
Current value of the Aperture during modeling is displayed in the Curr. aperture 341 box.
If the automatic iris is chosen, AESC 336 (electronic shutter) in camera parameters is switch off, adaptation to the illumination is performed only by changing aperture.

Auto Iris can be of two types:

Auto Iris > DC

The iris control signal, which comes from camera to the lens, is a direct-current voltage. DC signal is produced by camera depending on image sensor illumination. BLC 337 (back light compensation) can work with DC iris lens. Image contrast can be adjusted by AutoIris DC -Level+ 338 adjuster on camera's case.

Not all cameras have the circuit for controlling DC lens.

Auto Iris > Video Drive

The iris control signal, which comes from camera to the lens, is a video signal. This video signal will be transformed to iris control voltage by an internal circuit, which is in the lens. BLC 337 can not work with Video iris lens, as a rule. Image contrast can be adjusted by **-Level +** screw on lens case.

On Video Drive lens there are screws:

Auto Iris > Video Drive > -Level+

Adjuster of iris sensitivity to video signal. Visually this adjuster changes image contrast which is obtained as a result of auto iris adjustment. If the contrast is too high, bright areas on the image are white level clipped.

Adjustment range of real cameras can be different.

Auto Iris > Video Drive > ALC

Sensitivity to peaks or to average level of video signal.
If the slider is closer to **Peak**, the image contrast is adjusted by the brightest spots of the image even if they occupy insignificant square. In this case bright areas are seen well, but dark areas can be black level clipped and not be displayed.

If the slider is closer to **Average**, the image contrast is adjusted by an average level of image brightness. At that the brightest areas on the image, which occupy small square, can be white level clipped and not be displayed.
Optimum position of this adjuster depends on scene features.

Adjustment range of real lenses can be different.

Boxes:

Aperture limits (F-number)

In the left box the **maximum aperture value** (F-number), which the lens can have (fully opened aperture), is entered.
In the right box the **minimum aperture value** (fully closed aperture) is entered.

The more the F-number is, the less light passes through the lens.

These values are given in the lens specification.
For Fixed Iris 339 lenses the fixed aperture (F-number) is entered in the left box.

Curr. aperture (F-number)

Current aperture value.

For Manual Iris 339 lenses in this box it is possible to change aperture value.

For Auto Iris 339 lenses in this box the aperture value calculated during modeling is displayed.

In the project 2 values are stored: for day 371 time and night time.

This value can be automatically used at calculation and modeling of depth-of-field 457.

If the Auto Iris Control operates and closes the aperture, the box becomes aqua color.

If the Current aperture reaches limit value 340, the box becomes yellow together with box in which the limit value is set.

If in the box an aperture value, exceeding maximum aperture value 340, is entered manually, the box becomes red together with box in which the maximum aperture value is set.

Min. illum.

In the box the calculated value of minimum scene illumination at fully opened aperture is displayed.

This parameter is for information only.

Resol.(lp/mm)

Resolution of the lens in **line pairs per millimeter** (lp / mm).
Lp / mm - is the number of pairs of lines (black + white line) perpendicularly intersecting a segment on the image sensor of length of 1 millimeter.
Note the difference with the unit of *camera resolution, LPH*. Resolution of cameras is measured in the amount of black and white lines, but the lens resolution is measured in line pairs , that is, at the same actual resolution, the lp / mm value is in 2 times less than LPH.

Effect of lens resolution on the final resolution of the camera depends on the ratio of lens resolution in lp / mm to the number of pixels on the image sensor per 1mm (pixel density on the sensor) . Thus, the smaller the *size of the image sensor* 293 is and the more *pixels* 332 on it - the higher lens resolution must be in order that the lens does not spoil the resolution of the camera .

At the top box you can specify the number of line pairs per millimeter (lp / mm), and in the box below (% contrast) you should enter contrast drop in % according to MTF (Modulation Transfer Function) at the specified value of lp / mm.

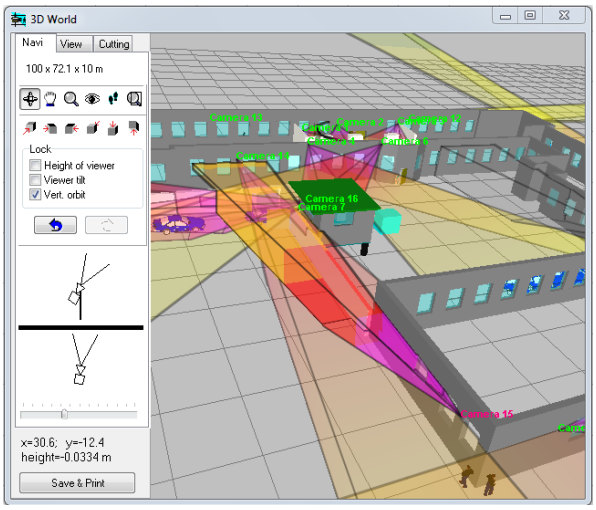
In the 3D Video 357 window image resolution will be limited by values in these boxed. If N/A is chosen, then the lens resolution limitation is disabled.

You can also simulate the camera resolution 333. When the lens resolution simulation and camera resolution simulation are both enabled, then their effects are summarized.

You can check resolution visually using the Test chart 388.

9.6 3D World

Graphics window
Main menu
View
3D World



The **3D World** window allows you to see the work project with cameras and view areas in three-dimensional representation. For detailed examination of the object the 3D World has special 3D tools 343 .

Placing and editing of objects is carried out in the horizontal projection 162 of the the Graphics window 161. In the **3D World** you can see the result of these actions.

You can change size of the **3D World** by dragging its borders by mouse.

Camera height above the zero ground in the 3D World are the sum of the installation height of the camera 296 and the base height 298 of the camera. Heights of constructions 193 and 3D models 202 are the sum of the height of the objects above the ground 171 specified in the Graphics window and the base height of the layout 277 to which the object belongs. These and other tools allow you to work with complex multi-level projects, use three-dimensional models of multi-storey buildings.

Like the 3D Models 397 window, the **3D World** consists of display area and panels with tools, divided into tabs:

Navigation 343
View 346
Cutting 352

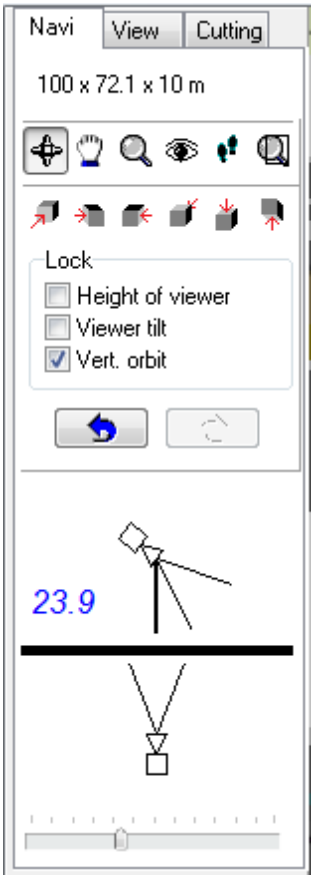
Below the tabs is a line with coordinates of a point in the 3D space over which the cursor is located . Below there is the Save and Print 354 button, intended for export, save and print the contents of the **3D World** window.

See also: *3D Video* 357, *3D Models* 397

9.6.1 Navigation

On the Navigation tab there are tools for navigation, using them you can view the current layout 513 in 3D.

Using the 3D interface, you can consider in detail the features of placing cameras, "visit" in the premises of the 3D model-building, "walk" on the floors, etc.



Functions of mouse buttons

- On the left mouse button the **Orbit** is assigned - moving the mouse cursor with the left button pressed rotates the 3D model in the space (or rotates the virtual viewer around the 3D model);

Function of the left button can be changed 344.
You can lock the rotation in vertical planes , leaving only the horizontal rotation , by checking the Lock>Vert. orbit 344 checkbox .

- On the middle mouse button the **Move** is assigned - moving 3D model in the field of view plane;

- On the rotation of the mouse wheel the **Zoom** tool is assigned - wheel rotation zooms in or out the point in the 3D space, where the mouse cursor is.

*Pressed **Ctrl** reduces step of zooming;*
Step and direction of zooming by turning the mouse wheel can be changed widely using Navigation>Scale factor 490 in the Options box .

- On the right mouse button the Look around **Look around** is assigned - rotates the sight direction standing the virtual viewer stationary.

Layout size

Sizes of the whole layout on the screen in the format **X:Y:Height**.

3D navigation buttons

By these buttons you can change function of the left mouse button.

Orbit - moving the mouse cursor with the left button pressed rotates the 3D model in the space (or rotates the virtual viewer around the 3D model).
This is default function of the left mouse button.
You can lock the rotation in vertical planes , leaving only the horizontal rotation , by checking the Lock>Vert. orbit 344 checkbox

Move - moving 3D model in the field of view plane.
This is default function of the left middle mouse button. The middle mouse button works like in the Graphics window 162.

Zoom - moving the mouse cursor along vertical zooms in or out the point in the 3D space at the center of the display area. By double clicking in the display area you can specify a new center point.
Wheel rotation zooms in or out the point in the 3D space, where the mouse cursor is. The Zoom tool works like in the Graphics window.

*Pressed **Ctrl** reduces step of zooming;*
Step and direction of zooming by turning the mouse wheel can be changed widely using Navigation>Scale factor 490 in the Options box .

Look around - rotates the sight direction standing the virtual viewer stationary.
This is default function of the right mouse button.

Walk - controls movement of the virtual viewer in virtual horizontal plane. Pressing the left mouse button fixes the starting point, moving the cursor from the starting point with left mouse button pressed sets the direction and speed of movement.

Zoom frame . Pressing the left mouse button specifies the first point of the zoom frame, moving the cursor with left mouse button pressed and releasing the left mouse button generates the ZOOM frame. After releasing the mouse button the virtual viewer will approach to content of the frame.

This tool works like the function of the right mouse button 162 in the Graphics window.

Fixed views buttons

Allow to quick look at the model from any of 6 sides: **Front view**, **Left view**, **Right view**, **Back view**, **Top view**, **Bottom view**.

Lock panel

On the panel there are checkboxes, which can fix some of parameters that can be useful when navigating in the 3D space.

Height of viewer - fix the height above the ground of the virtual viewer;
Viewer tilt - fix tilt of the sight direction of the virtual viewer;

Vert. orbit - disable *rotation in vertical planes by the* Orbit 344  *, leaving only the horizontal rotation*.

Step backward and Step forward buttons

Allows to move on the chain of previous views backward and forward.

Sight direction of the virtual viewer

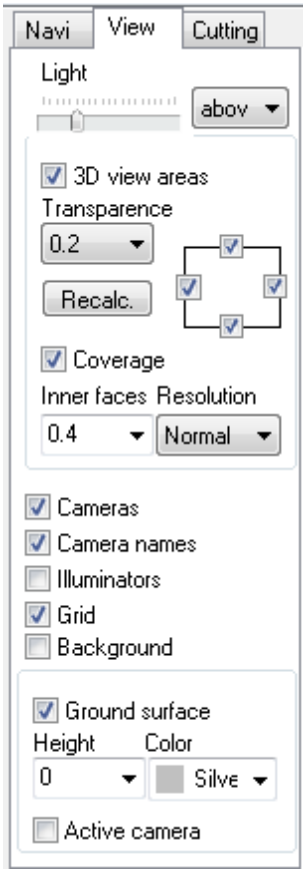
Sight direction of the virtual viewer in vertical and horizontal planes and its view angle are represented as a camera. The blue digits display the height of the virtual viewer above the ground.

View angle of virtual viewer slider

The slider allows to change **view angles of the virtual viewer**. Vertical angle value is displayed on the caption of the window.

9.6.2 View

On the View tab there are tools to controls visibility of elements in the 3D space.



Light

The Light slider allows you to change the light level on the layout, and a combo box located next to - the direction of light. These tools allow you to highlight dark or light areas located at different angles to the viewer.

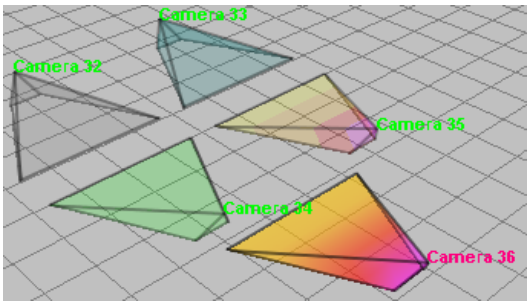
3D view area

The **3D view area** checkbox allows to hide 3D view areas of all cameras at once.

You can switch ON/OFF 3D view areas of separate cameras using the *3D View area* 183 *button on the Toolbar of Graphics window.*

Four checkboxes located on the sides of the rectangle are used to hide individual faces of view areas, for a more detailed studying their borders.

Color of faces is determined by the same rules as the color of view area filling 175 in the Graphics window:

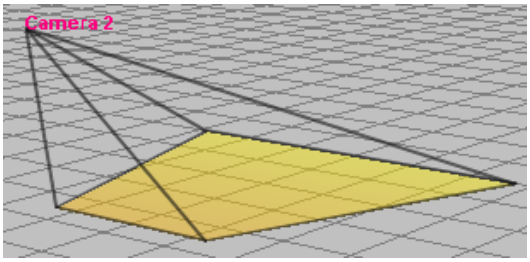


- If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera faces are filled by Gray color**.** (Camera 32)

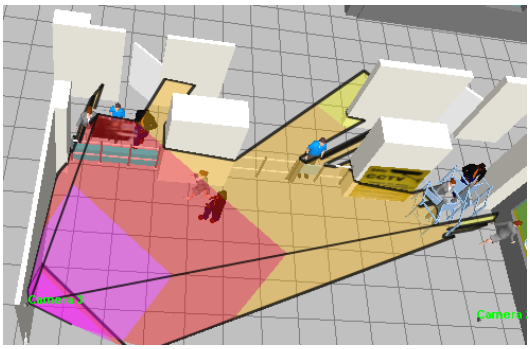
Default line type for cameras is Line 21.

- If another line type was assigned to the camera, then for this camera faces are filled by a color determined by **color** of the line type (Camera 33,34).
- If the Spatial resolution 177 is enabled, then colors of filling faces is determined by Spatial resolution parameters (Camera 35,36).

If **Off** is chosen in the Fill projections 175 and Shadows 178, then filling view area faces in the 3D World is not shown.



Faces of 3D view areas are built taking into account shadows from surrounding objects. Automatic calculation of shadows can't be disabled, but it is performed only for the active camera 166. For other cameras shadows are displayed from memory, in the form when this camera was active. If surrounding objects of a camera were changed, or a new camera was pasted 191, to update the shadows activate 166 this camera.



To recalculate 3D view areas of all cameras on the current layout use the Recalc 348. button.

To make a construction 193 considered as an obstacle in the calculation of shadows of the 3D view areas in the **3D World** :

- **Line type** of the construction must have the checkbox Shadow 475 marked ;
- The construction must belong to a **layer** with the field Shadows 277 marked;

To make a 3D model 202 is considered as an obstacle in calculation of shadows of the view areas in the **3D World** :

- **Line type** of the instance of the 3D model must must have the checkbox Shadow 475 marked;

- **3D model** must belong to a **layer** with the field Shadows 277 marked;
- The instance of the 3D model , must have checkbox Shadow 283 on the Current construction parameter panel 282 marked or the Shadow 402 checkbox on the View tab, 3D Models 397 window must be marked .

Calculation of shadows in the 3D World works independently on the calculation of shadows 178 in the Graphics window and in complicated environment it works more roughly but much faster.

*Accounting for 3D models as obstacles in the 3D World does not depend on the state of the checkbox Calculate shadows from 3D models 491 in the **Options box**. Using this checkbox it is convenient to disable calculation of shadows from 3D models only in the Graphics window, where this calculation requires a lot of resources, but leave the calculation of shadows from 3D models in the 3D World.*

3D models of view areas can be exported 354 to *.dxf file. The *.dxf files can be imported by many 3D design software, for example SketchUP 611.

Recalc.

Faces of 3D view areas are built taking into account shadows from surrounding objects. Automatic calculation of shadows can't be disabled, but it is performed only for the active camera 166. For other cameras shadows are displayed from memory, in the form when this camera was active.

Click this button launches procedure of recalculating 3D view areas of all cameras on the current layout in the **3D World**. During the procedure all cameras are activated 166 sequentially.

Transparence

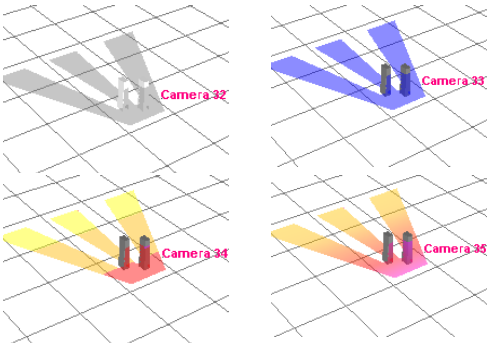
Using the **Transparence** combo box you can change transparence of 3D view area faces 346 and active camera coverage 348. 3D view area of the active camera has lower transparency (highlighted by color strength).

See also: Transparence in the Graphics window 483.

Coverage

The **Coverage** checkbox allows to switch ON/OFF displaying active camera coverage on surrounding objects. The coverage is calculating and displaying for the active camera 166 only.

Color of the coverage is determined by the same rules as the color of view area filling 175 in the Graphics window and color of 3D view area faces 346:



- If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then for this camera the coverage is filled by Gray color**.** (Camera 32)

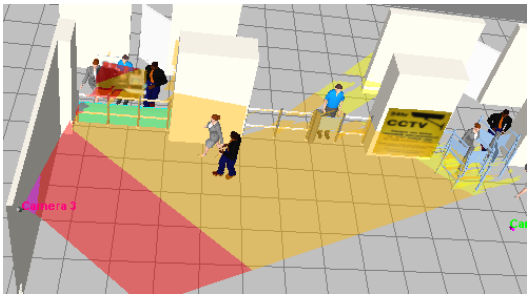
Default line type for cameras is Line 21.

- If another line type was assigned to the camera, then for this camera the coverage is filled by a color determined by **color** of the

line type (Camera 33).

- If the Spatial resolution 177 is enabled, then colors of filling coverage is determined by Spatial resolution parameters (Camera 34,35).

Objects can be considered as obstacles or not, according to the same rules as in calculating shadows.



To make a construction 193 considered as an obstacle in the calculation of the coverage in the **3D World** :

- **Line type** of the construction must have the checkbox Shadow 475 marked ;
- The construction must belong to a **layer** with the field Shadows 277 marked;

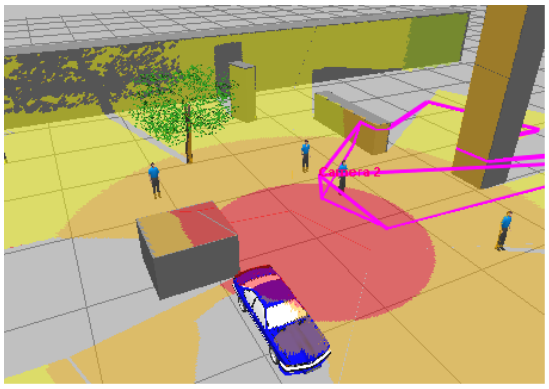
To make a 3D model 202 is considered as an obstacle in calculation of the coverage in the **3D World** :

- **Line type** of the instance of the 3D model must must have the checkbox Shadow 475 marked;
- **3D model** must belong to a **layer** with the field Shadows 277 marked;
- The instance of the 3D model , must have checkbox Shadow 283 on the Current construction parameter panel 282 marked or the Shadow 402 checkbox on the View tab, 3D Models 397 window must be marked .

*Accounting for 3D models as obstacles in the 3D World does not depend on the state of the checkbox Calculate shadows from 3D models 491 in the **Options box**.*

Calculation of coverage in the 3D World works independently on the calculation of shadows 178 in the Graphics window and in complicated environment it works more roughly but much faster.

You can adjust transparence 348 of the coverage, resolution 350 of coverage calculation and adjust deleting inner faces 350 formed in the view area by obstacles.



If the Dome 179 mode is chosen for the active camera then the coverage displays the territory controlled by the camera in 360 degrees, without view area borders, but only taking into account the shadowing.

When the **Dome** item is chosen, actually the **control area** of an **ideal dome (PTZ)** camera wish spherical 360-degree FOV is displayed.

The **Dome** mode is also useful for choosing the best installation place for fixed cameras to make required areas reachable for the cameras.

In the **Dome** mode all shaded areas from the specified camera position become visible.

In the **Dome** mode the Spatial resolution 177 is

calculated without taking into account pan and tilt angles of camera. It is assumed that the camera can pan and tilt freely, and spatial resolution is calculated at the center of the field of view.

*Coverage calculations in the **Dome** mode requires a lot of computing resources. To increase speed of image refresh, reduce the Resolution 350 of calculating the coverage.*

3D models of the coverage can be exported 355 to *.dxf file. The *.dxf files can be imported by many 3D design software, for example SketchUP 611.

Resolution

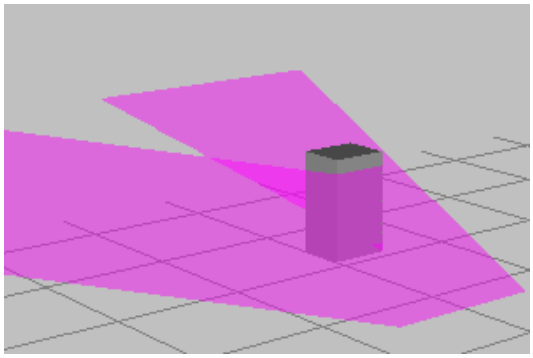
In the box, you can select the resolution of the camera coverage 348 calculation. The higher the resolution is, the more accurate the calculation, but the more time is needed to redraw image in the 3D World.

*Coverage calculations in the Dome 349 mode requires a lot of computing resources. To increase speed of image refresh, reduce the **Resolution** of calculating the coverage.*

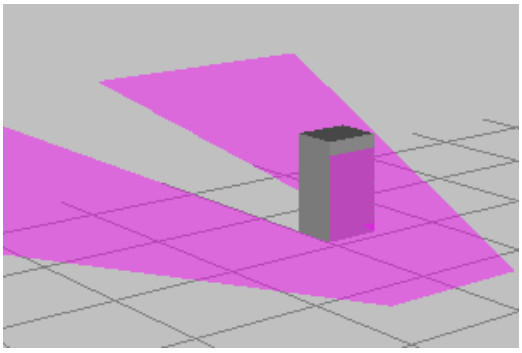
When you export 355 the coverage to DXF file, it is recommended to set the minimum required resolution to make DXF file of low size and its processing takes less time.

Inner faces

Shading from obstacles forms new internal faces (see Fig.) The inner faces in most cases spoil the view of the camera coverage.



Coverage with inner faces



Coverage without inner faces

By changing the parameter in the combo box, you can adjust the removal of inner faces with minimum loss of coverage. The smaller the value in the box, the more fully the inner faces is removed, but the more parts of real coverage can be removed together with them. The more the parameter is, the less carefully the inner faces is removed. If you choose **leave**, then the inner faces will not be deleted.

Cameras, Illuminators, Camera names, Grid, Background, Textura

These checkboxes allow to show/hide Cameras, Illuminators 206, Camera names, Grid, Background in the **3D World**.

Font of camera names can be changed in the Options box 477.

The **Texture** checkbox allows you to disable texture of 3D models 202 with textures. Disabling texture increases the speed of redrawing complex 3D models and hides an excessive amount of detail, allowing you to concentrate on the 3D model geometry.

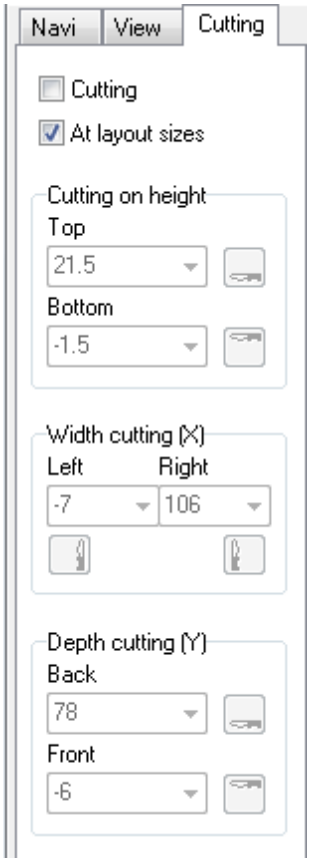
Ground panel

On the panel you can switch ON/OF displaying ground surface. You can set color, height relative to the **zero ground**.
If the **Active camera** checkbox is checked, then height of the ground is kept equal to the base height 298 of the active camera.

9.6.3 Cutting

The tab is intended to manage six clipping planes. Using the cutting you can left visible only the desired area in arbitrarily complex 3D model. Clipping is useful when designing CCTV indoor a large building, using 3D model of the building.

You can also hide individual objects (Hide 267 tool) and separate layers 277.



Cutting

Switch ON/OFF using cutting.

At layout size

If the checkbox is checked, then cutting plane positions are calculated automatically by limiting objects on the layout. The Cutting on Height 352, Width cutting (X) and Depth cutting (Y) panels 353 become inaccessible.

To form stable work area it is recommended to place limiting objects (for example - points 194) on the corners of the layout.

Cutting on Height panel

In the **Top** and **Bottom** combo boxes you can set heights of upper and lower cutting planes. The heights are set relative to the zero ground.

The boxes are accessible when the At layout size 352 check box in not checked.

You can set the position of horizontal cutting plane directly on the 3D image. To do this, click the button with a knife or . The mouse cursor changes to a knife. After that, specify the position of the clipping plane by clicking directly on the 3D image.
Click on any object, but not on the free space.

To set the clipping plane on the limit of the layout (disable one of clipping planes), click the button with a knife or , and then click on the **free space** on the layout where clipped objects were.

Width cutting (X) and Depth cutting (Y) panels

Positions and directions of X and Y axis correspond to view of the layout in the Graphics window and view in the 3D World after clicking on the Top view 344 button.

In the **Left** and **Right**, **Front** and **Back** combo boxes you can set distances of the clipping planes from the **front left corner point** on the layout.

The boxes are accessible when the At layout size 352 check box in not checked.

You can set the position of cutting plane directly on the 3D image. To do this, click the button with a knife , , or , . The mouse cursor changes to a knife. After that, specify the position of the clipping plane by clicking directly on the 3D image.
Click on any object, but not on the free space.

To set the clipping plane on the limit of the layout (disable one of clipping planes), click the button with a knife , , or , , and then click on the **free space** on the layout where clipped objects were.

9.6.4 Save and Print

Click on the button opens a menu. With the help of the menu you can save and print image on the 3D World, as well as export 3D view areas and coverage to DXF files.

Multiply resolution

You can get images with resolution (size in pixels) larger than the size of the **3D World** window and even larger than the size of screen in Windows. The item opens a submenu where you can select a multiplication factor of image resolution when saving and printing relative to image resolution in the **3D World**.

Save as

The item opens a submenu where you can select format of output file with image from the **3D World**.

You can increase 354 size in pixel of the output file.

Copy to clipboard

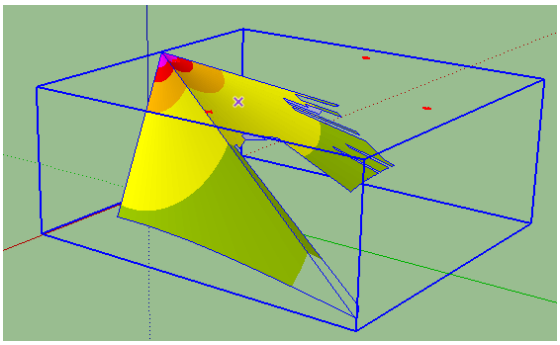
Copy image from the 3D World to **Windows clipboard**. After that the image can be pasted to other program, for example MS Word.

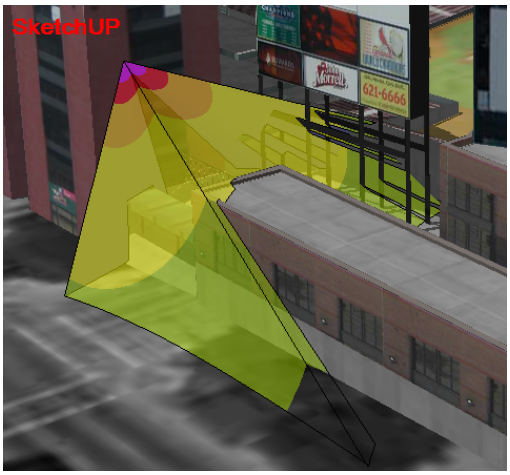
You can increase 354 size in pixel of the output file.

Export 3D view areas to dxf

Export displayed in the 3D World view areas 346 to AutoCAD DXF file. View areas are exported with shadows, lens distortion 654, spatial resolution 316, in the same form as displayed.
View areas are exported as AutoCAD blocks. To attributes of the block the most important parameters of the camera are recorded: Name, Model, Lens focal length, Height of installation, Base height, Heights of view area lower and upper bounds, View angles, Number of pixels, Spatial resolution pattern.
Obtained DXF file can be imported into the most of general 3D design software, for example SketchUP 611.

This feature allows the convenient scheme of work with combination of 3D BIM Software (SketchUP) + VideoCAD.
1. Export layout as a 3D model-territory through SketchUP and loading it into VideoCAD.
2. Adding cameras with 3D view areas in VideoCAD.
3. Export 3D view areas in DXF format, loading them into 3D BIM Software and combining with the original layout in 3D.





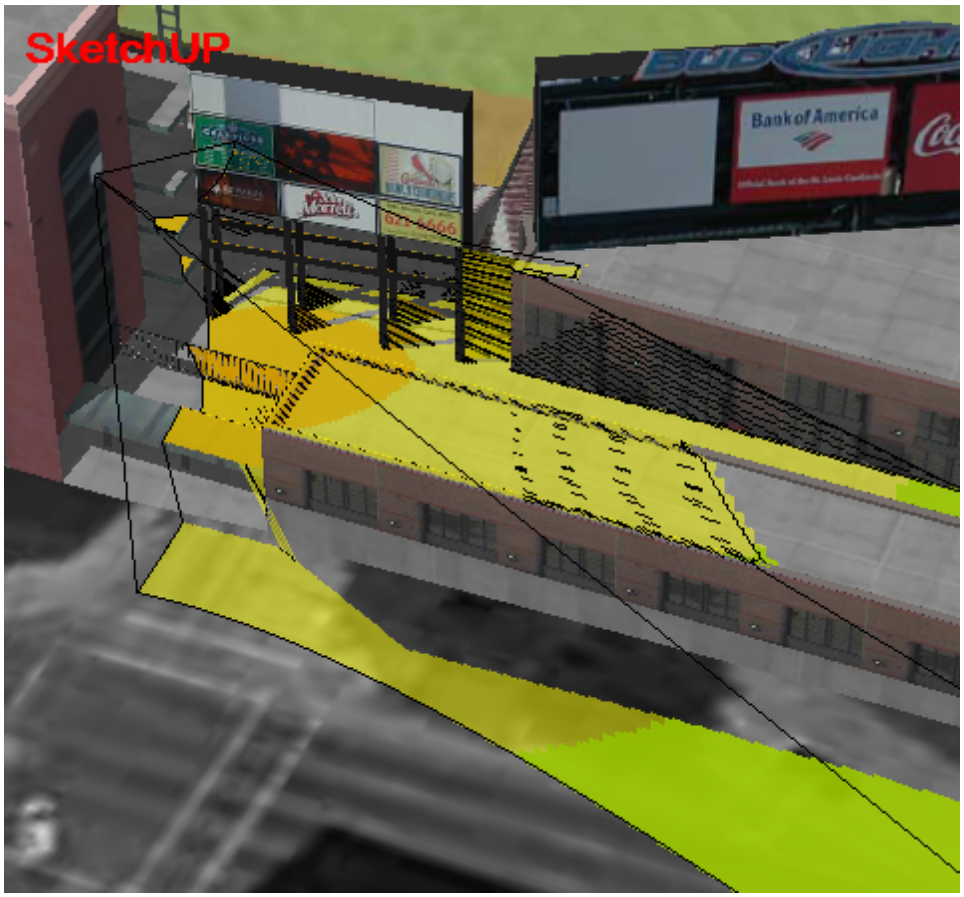
See also: *Export coverage to dxf* 355, *Export 3D view areas to general 3D design software* 611

Export coverage to dxf

Export displayed in the 3D World active camera coverage 348 with 3D view area to AutoCAD DXF file. The coverage is exported with shadows, lens distortion 654, spatial resolution 316, in the same form as displayed.
Obtained DXF file can be imported into the most of general 3D design software, for example SketchUP 611.

This feature allows the convenient scheme of work with combination of 3D BIM Software (SketchUP) + VideoCAD.
1. Export layout as a 3D model-territory through SketchUP and loading it into VideoCAD.
2. Adding cameras with 3D view areas in VideoCAD.
3. Export 3D view areas in DXF format, loading them into 3D BIM Software and combining with the original layout in 3D.

The Coverage is exported in the form of 3D polygon mesh. Mesh resolution, and hence the number of polygons is determined by the Resolution 350 of calculating coverage. If the resolution is set to Normal or High, it will produce a large number of polygons, the exported file will be huge and it takes a lot of processing time.



See also: *Export 3D view areas to dxf* 354, *Export 3D view areas to general 3D design software* 611

Printer setup

Open standard printer setup dialog.

Print

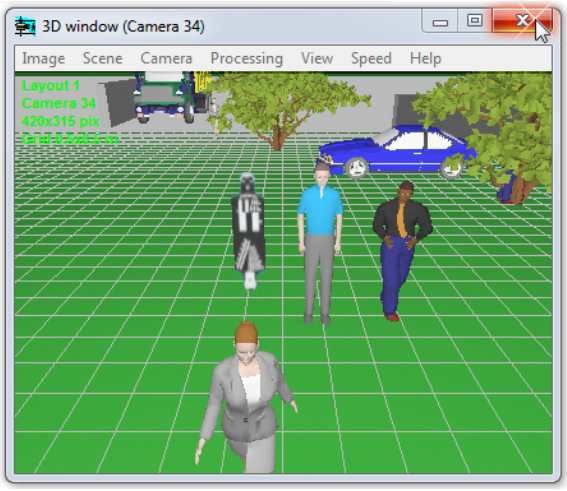
Print image from the 3D World on the current printer.

You can increase 354 *resolution of the printed file.*

See also: *Drawing>Print* 226

9.7 3D Video

Graphics window
Main menu
View
3D Video



The 3D Video window is designed for 3D modeling images from the active camera.

3D Video can display:

- **Ground surface**. The ground color is set on the tab 3D modeling 480 in the Options Box. In multi-level 3D projects the height of the ground equals to the base height 298 of active camera.
- **Grid**. The presence, step and location of the grid are determined by the similar grid parameters 188 in the graphics window.
- **Background** 222. The Background is not visible by default. You can make the background visible on the View 385 tab of the Image parameter panel 370 or in the Main menu of 3D Video.
- **3D constructions**; represent stretched throughout the height 2D constructions 193 in the graphics window.
- **3D models**. These are prepared 3D models of people, cars and other objects. See more: 3D model 202
- **3D images**. Usual raster images can be placed in the 3D space. See more: 3D image 205
- **Illuminators**. Illuminators 206 Cameras are represented as 3D models 390.
- **Cameras**. Cameras are represented as 3D models 389.
- **Virtual post** on which the active camera is installed. Allows to see the active camera installation place projection on the ground. The post is nor displayed by default. You can make the post visible in the View 385 tab of the Image parameter panel 370
- **Test object** 507. Is visible in the graphical editing state 210 of the active camera as the parallelepiped with numbers on sides.
- **The fragment of the test chart EIA1956** for the visual estimation of the current horizontal and vertical resolution.
- **Titles** 386. At the left top corner the main image parameters are displayed.

Visibility of these objects can be switched on/off separately for each camera on the View 385 tab on Image parameter panel 370. Visibility of some objects can be switched in the Main menu 359 of the 3D Video.

Location and editing these objects are carried out in the **horizontal projection** of the graphics

area 162. In the **3D Video** the result of these actions can be observed.

3D Video allows to:

- model different situations of the **person detection** and **identification** and **license plate reading** and any digital symbols in different sections of the view area, taking into account video quality parameters 505;
- adjust **person detection, identification** and **license plate reading criteria** 500 according to the personal demands;
- disclose the view area distortions, arising from obstacles;
- compare camera models, choose model with optimal parameters for the current task;
- choose type, power and places of luminaries;
- model resolution of megapixel cameras 391 which exceeds screen resolution;
- save 360 obtained images in the static files or animated 386 *.gif files;
- see at the design stage that, for what the video surveillance system is made - **images from video cameras.**
- In the 3D Video it is possible to model static and animated 386 images rather precisely considering parameters of the scene (illumination, illuminators, visibility range), cameras (sensitivity, resolution, color, exposure time, rolling shutter, interlace distortions, frame rate), lenses (focal length, F-number, resolution, distortion) and DVR (resolution, compression, brightness, contrast, sharpness). The parameters can be adjusted on the Image parameter panel 370 and in the Sensitivity and Resolution 329 box.

By default illumination and resolution modeling is disabled, only view area is modeled.

If image in the 3D Video is distorted, redrawing the image is too long or there are other artifacts, see Errors in rendering 3D images 395.

See also: 3D Video main menu 359, Image parameter panel 370, 3D model 202, 3D image 205, Illuminator 206, Illuminator calculation 461, Sensitivity and Resolution 329, Errors in rendering 3D images 395, 3D World 342, 3D Models 397
External link: "The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(.pdf)*
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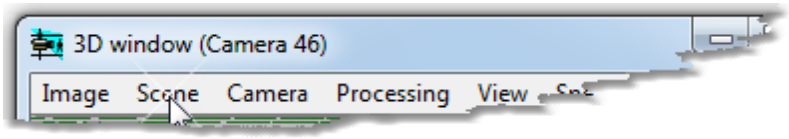
9.7.1 Main menu



In the Main menu there are commands of image saving and printing and a part of image parameter adjustments, which duplicate adjustments on the Image parameter panel 370 for faster access. All image parameters are presented on the Image parameter panel. The panel can be called by right or double clicking on the image in the 3D Video.

The menu is divided into groups according to the order of image processing from the camera:

- **Image -** saving and printing current image in the 3D Video;
- **Scene** - parameters of the scene;
- **Camera** - parameters of the camera;
- **Processing** - processing the obtained image, by the camera and other CCTV equipment;
- **View** - visibility of auxiliary objects on the image model;
- **Speed** - fast switching between redrawing speed and exactness of modeling 3D images.

Image > Real frame size

If this item is checked , the frame from the 3D Video will be saved or printed with its real size in pixels , regardless of the size of the 3D Video window .

The frame size is specified in the Sensitivity and Resolution 332 box and in the Image parameter panel > Processing 381 tab.

This tool as well as the PiP 391 tool, allows modeling megapixel images .

When modeling distortion 310 is enabled and the Real frame size is checked, the obtained images will have real resolution of distortion (distortion without this tool is modeled only at a lower resolution) . Another way to get the real resolution with lens distortion - see PiP 391.

Generation of frames with size more than the 3D Video window size or generation of frames with distortion requires additional time and computer resources.
Depending on the capabilities of your video card and computer may be some problems with large size images , especially when modeling large images with distortion 310 . If errors occur , try to disable distortion or decrease the frame size

The Real frame size 359 item doesn't affect to animated images 360.

Image > Save as *.bmp (*.jpg, *.gif, *.tif, *.png)

Save the static image in the 3D Video in any format from the following: ***.bmp, *.jpg, *.gif, *.tif, *.png.**

These items are inaccessible , when the image is animated, the Animate 386 box is checked and Number of frames 386 is more than one.

See also: Real frame size 359.

Image > Save as animated *.gif

Save the **animated** image in the 3D Video in the **animated *.gif** format**.**
This item is inaccessible , when the image is not animated, the Animate 386 box is not checked or Number of frames 386 equals one.

The Real frame size 359 item doesn't affect to animated images.

Image > Copy to Clipboard

Copy the image to **Windows clipboard**.
After that the image can be pasted into other program.

Image > Printer setup

Choosing this item opens a standard dialog box of current printer setup in Windows.

Image > Print

Print image in the 3D Video.

See also: Real frame size 359, Drawing>Print 226

Scene > According to camera parameters

Different cameras can be in various conditions and consequently for different cameras scene parameters can be different.
If this item is checked, scene parameters are set according to scene parameters of active camera. As a result of activation of other camera, scene parameters will be changed according to scene parameters of this camera. Manual changing scene parameters is disabled.

If this item is not checked, scene parameters could be specified manually. The set parameters will not be changed during activation of different cameras.

See also: *Image parameter panel* 370 > *Scene* 371, *Save* 374

Scene > Day/night

During the day, scene of the same camera can be essentially changed. In daytime there is predominance of the natural illumination, and at night artificial one. In daytime the sky is much brighter than the ground, and at night it is darker (because of the predominance of artificial illumination). Therefore for each camera 2 sets of scene parameters are specified: for day and night time.
If this item is checked, scene parameters of day time is used, otherwise scene parameters of night time is used.

The effect of this item is applied to all cameras at once. Actually it is a switch of time in the project. The same switch is available in the Monitor window 409.

See also: *Image parameter panel* 370 > *Scene* 371

Scene > Lamp position

The item opens a submenu, in which the **Lamp position** relative to the active camera can be chosen.

Background light source produces background scene illumination. Except the background light source on a scene it is possible to place illuminators 206.

See also: *Image parameter panel* 370 > *Scene* 371

Scene > Model illuminantion

If this item is checked, during 3D image generation, scene illumination parameters 371, illuminators 206 and camera sensitivity 329 are considered.

Image generation time can considerably increase.

If the item is not checked, illumination is not considered, only camera view area is modeled.

Illumination modeling can be switched on separately for each camera, for day time or night time.

See also: *Image parameter panel* 370 > *Scene* 371

Scene > Illuminators

If this item is checked, during 3D image generation, switched on illuminators 206, placed on the scene, are considered.
If the item is not checked, the illuminators are not considered.

The item is accessible only if illumination modeling 361 is switched on.

Illuminators can be switched on separately for each camera, for a day time or night time.

See also: *Image parameter panel* 370 > *Scene* 371, *Illuminator* 206

Scene > Meteorological Visibility

The item opens submenu, which can help to model meteor, limiting visibility range (rain, snow, fog, sandy storms, etc.).

Meteorological Visibility is the greatest distance at which it is just possible to see with the unaided eye:

- in the daytime, a prominent dark object against the sky at the horizon;
- at night, a known, preferably unfocused, moderately intense light source.

This parameter is reported in a weather forecast, and can be also visually determined.

Rough values of Meteorological Visibility for various weather conditions according to data of meteorologists:

- Rain, weak snowfall, smoke - 900-1000 m
- Medium snowfall, weak fog - 500 m
- Medium fog, strong snowfall - 100-500 m
- Thick fog - less 100 m.

Pay attention to the following moments:

Meteorological Visibility does not coincide with the maximal person detection range. Meteorological Visibility is calculated in respect of black big size object against background of fog or sky. Maximal person detection range, limited by visibility, is 1.5-2 times less at the average depending on contrast between background and person's clothes.

At surveillance in the night time and at illumination from the camera the maximal detection range is considerably reduced due to light reflection from fog (rain or snow).

At modeling the threshold of eye contrast sensitivity 0.03 is accepted.

Quality of visibility range modeling has a great dependence from video card's opportunities and its adjustments. Modern 3D-accelerator allows getting excellent quality of modeling. At the same time without the accelerator, accurate modeling fog is insufficient.

See also: Errors in rendering 3D images 395

Scene > Show panel

Show the Scene 371 tab on the **Image parameter panel**. On the tab all scene parameters are presented. In the main menu there is only a part of the parameters.

See more: Image parameter panel 370 > *Scene* 371

Camera > Model

Show the **Table of camera models**. In the table it is possible to set parameters to models and

assign any model to the active camera.

See more: Table of camera models 419

Camera > Depth-of-field

The Item opens submenu, which makes possible switch on **unitary** or **permanent** depth-of-field 454 modeling. Initial data (**lens focal length**, **aperture** and **focus distance**) are set in Depth-of-field box 457. Clicking the **Parameters** item it is possible to display this box.

More detail about Depth-of-field see General information about Depth of field in CCTV 454.

Modeling Depth-of-field takes much time (depending on complexity of scene, video card's and computer's opportunities (from several seconds to one minute), therefore it is not recommended to mark needlessly the item **Model permanently**, otherwise the program will work very slowly.

Quality of modeling considerably depends on video card's opportunities and its adjustments. If depth of field modeling does not work or works incorrectly, try to change adjustments of video card hardware acceleration.
If in your video card there is no hardware support of this function, Depth of field should be modeled at completely switched off hardware acceleration (the slider is moved to the left). However in this case quality of other parameters of image is worsened.

See also: Errors in rendering 3D images 395

Camera > Exposure

The Item opens submenu, which makes possible switch on **unitary** or **permanent** exposure time 377 modeling.
This item duplicates corresponding panel 377 on the Camera tab on the Image parameter panel.

Modeling Exposure time takes much time (depending on complexity of scene, video card's and computer's opportunities (from several seconds to several minutes), therefore it is not recommended to mark needlessly the item **Model perm.**, otherwise the program will work very slowly.

Quality of modeling considerably depends on video card's opportunities and its adjustments. If modeling exposure does not work or works incorrectly, try to change adjustments of video card hardware acceleration.
If in your video card there is no hardware support of this function, exposure should be modeled at completely switched off hardware acceleration (the slider is moved to the left). However in this case quality of other parameters of image is worsened.

See also: Errors in rendering 3D images 395

Camera > Show panel

Show the Camera 375 tab on the **Image parameter panel**. On the tab the active camera parameters are presented. In the main menu there is only a part of the parameters.

See more: Image parameter panel 370 *>Camera* 375

Camera > Sensitivity and Resolution

Show the Sensitivity and Resolution 329 box in which there are parameters of sensitivity and resolution of the active camera.

Sensitivity parameters take part in modeling only if 3D Video 357 is opened and illumination modeling 372 is switched on.

See more. *Sensitivity and Resolution* 329

Processing > According to camera parameters

Images from different cameras can be processing by various means and consequently for different cameras the processing parameters can be different.
If this item is checked, processing parameters are set according to processing parameters of the active camera. As a result of activation of other camera, processing parameters will be changed according to processing parameters of this camera. Manual changing processing parameters will be disabled.

If this item is not checked, processing parameters could be specified manually. The set parameters will not be changed during activation of different cameras.

See also: *Image parameter panel* 370 > *Processing* 381

Processing > One field

If this item is checked, the vertical resolution of the image sensor 332 is reduced in half.
Vertical resolution decreases, if video signal from a camera with interlace scan is captured by fields (half frames), instead of full frames. For example, 768x288 pixels.

Processing > Brightness

The item opens a submenu, in which the **image brightness** can be chosen.

Processing > Contrast

The item opens a submenu, in which the **image contrast** can be chosen.

Processing > Compression

The item opens a submenu, in which the **image compression level** can be chosen.

Compression levels may differ from the compression levels in the settings of different DVR or IP cameras. To determine a correspondence use the visual image comparison.

Obtained image compress by the JPEG algorithm for approximating the image in the 3D Video to the real image from video cameras to exactly estimation the possibilities of detection, identification and reading

Using in your DVR algorithms different from JPEG is not generally an obstacle for compression modeling with the help of JPEG algorithm. Although other algorithm artifacts differ from JPEG artifacts, the general amount of information correspondence that can be determined by the careful visual image comparison is enough for modeling.

Processing > Show panel

Show the Processing 381 tab on the **Image parameter panel**. On the tab the image processing parameters are presented. In the main menu there is only a part of the parameters.

See more: *Image parameter panel* 370 > *Processing* 381

View > According to camera parameters

You can set visibility of additional elements separately for different cameras.
If this item is checked, visibility of additional elements are set according to parameters of active camera. As a result of activation of other camera, visibility of additional elements will be changed according to parameters of this camera. Manual changing visibility of additional elements will be disabled.

If this item is not checked, the visibility could be specified manually. The set visibility will not be changed during activation of different cameras.

See also: Image parameter panel 370 > *View* 385

View > Title

Place the following information in the left upper corner of the image:

- **Name** of the layout 513 on which the active camera is placed.
- Active camera **name**.
- Current **image sizes** in pixels.
- Current image resolution in pixels (**Image**) and 3D Video size (**Screen**) separately, when the image resolution differs from the 3D Video size;

*For panoramic 312 cameras the **Image** line displays a virtual number of pixels for correct simulation of resolution of panoramic camera.* The simulated resolution is exact **only at the center of the frame**. Towards the edges of the frame the actual resolution is worse than simulated. The smaller the view angle, the more accuracy of simulating resolution on the edges of the frame.

- **Resolution** in LPH (lines per pixture height, equals to TV-lines for analog cameras) in case of it can be calculated.
- **Brightness** and **Contast** if these parameters are differed from default.
- Image **compression**, if it is used.
- The **grid** 188 **step**, if the grid is displayed.
- Calculated unweighted **signal/noise ratio** of the image, if illumination modeling 361 is switched on.
- Calculated **IRE** of the image, if illumination modeling 361 is switched on.
- Frame rate (fps), when image in the 3D Video is animated 385.
- Exposure time (milliseconds) when exposure 377 is modeled.

View > PTZH frame

PTZH frame (Pan-Tilt-Zoom-Height) allows operating camera similarly to PTZ one and additionally change **camera's installation height**.

After clicking this item the camera's field of view extends, and the objects being off view area, for increasing the convenience of camera's adjustment, become visible. Real field of view is limited by **orange frame**.

Above the frame the buttons, which changes view area upper bound distance 301 and view area upper bound height 298., are located. Current distance and height values are digitally shown under the buttons.

*It is recommended to set **view area upper bound height**, which is equal to maximal height of observed objects, and do not change it further. Further adjust camera's inclination by changing only the **view area upper bound distance.***

On the right and to the left of the frame there are camera rotation buttons .

Under the frame there are buttons, which change the height of camera installation 296. Current value of **height** is digitally shown above the buttons. Near by them the lens focal length 294 **combo box** is located. Value in the box can be selected from the list or entered from the keyboard.

Using these tools it is possible to rotate the camera in both planes, change **lens focal length** and **height of installation.**

To change the position **on one step** click corresponding button. For **continuous moving** bring the cursor to the button, then press it and do not release the left mouse button. For precise position adjustment do the same, but with pressed **Ctrl.**

In the PTZH frame mode you can pan and tilt the camera by moving the image like moving drawing in the Graphics window. Press left mouse button, move cursor with the button pressed then release the mouse button. Camera tilt angle is changed through changing **view area upper bound distance**. But when **Ctrl** is pressed, the tilt angle is changed through changing **view area upper bound height.** You can pan camera using **arrow keys**.

Frame PTZH disables image processing, titles 386 and animation 386.

Together with Monitor window 407 *this tool offers a new method 546 of 3D CCTV design.*

If a model 419 is assigned to the camera, and the model has fixed 438 focal length lens, then you can not change the focal length.

If a model is assigned to the camera, and the model has a lens with limited 438 variable focal length, then you can change focal length within the limits only. When approach to the limit values, the box will become crimson.

You can change focal length in wide range of 0.5-1000mm of cameras, which have not assigned model or the assigned model have not specified limits of the lens focal length.

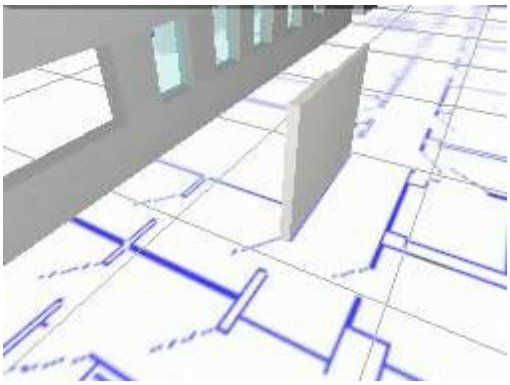
*Changing the **lens focal length** and therefore the calculated values of view angles of camera with enabled modeling lens distortion 310 will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles 310, taking into account the changed values of calculated view angles.*

*The PTZH frame simulates lens distortion 310 in simplified way. Only border of the **field of view** is drawn without modeling optical distortion of the image.*

View > Background

Show or hide a background in the 3D image.

In case of vector background you can adjust background resolution 481 in the 3D Video.



See more: Background 222, Background resolution 481

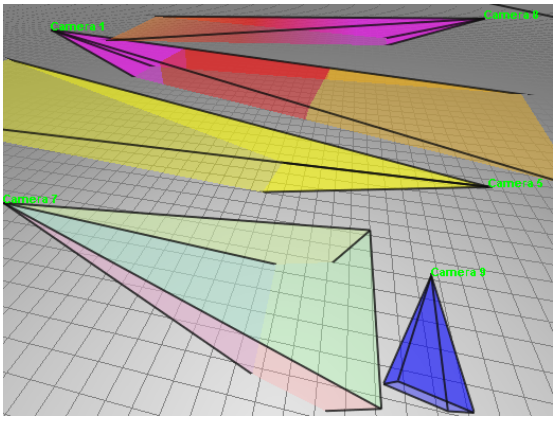
View > Ground surface

Show or hide ground surface. Ground color can be set on the 3D modeling 490 tab on the Options box.

In multi-level 3D projects the height of the ground surface equals to the base height 298 of the active camera.

View > 3D view areas

Enable in the 3D Video visualization of view areas of cameras with 3D view area 183 enabled. View areas are shown in the form of pyramids.



If the line type of camera 171 coincides with default line type for camera icons, specified in the Options box 483, then sides of the view area are filled by different colors by default (Camera 7 on the figure).

If another line type was assigned to the camera, then filling view area of this camera is performed by a color (3D>Color) of this line type assigned to the camera. (Camera 5,9).

If the Spatial resolution 177 is enabled, then colors of filling projections is determined by Spatial resolution parameters (Camera 1,8).

View of 3D view area of the active camera can be adjusted by buttons on the Toolbar View area edges 172, Fill projections 175, Spatial resolution 177.

Transparency of the 3D view areas can be changed with transparency of view area projections in the Graphics window, in the Transparency box in the Camera icon tab in the Options box.

The 3D view areas can be limited by the maximum distance from the camera by using the Camera geometry> Maximum distance of drawing view area 307.

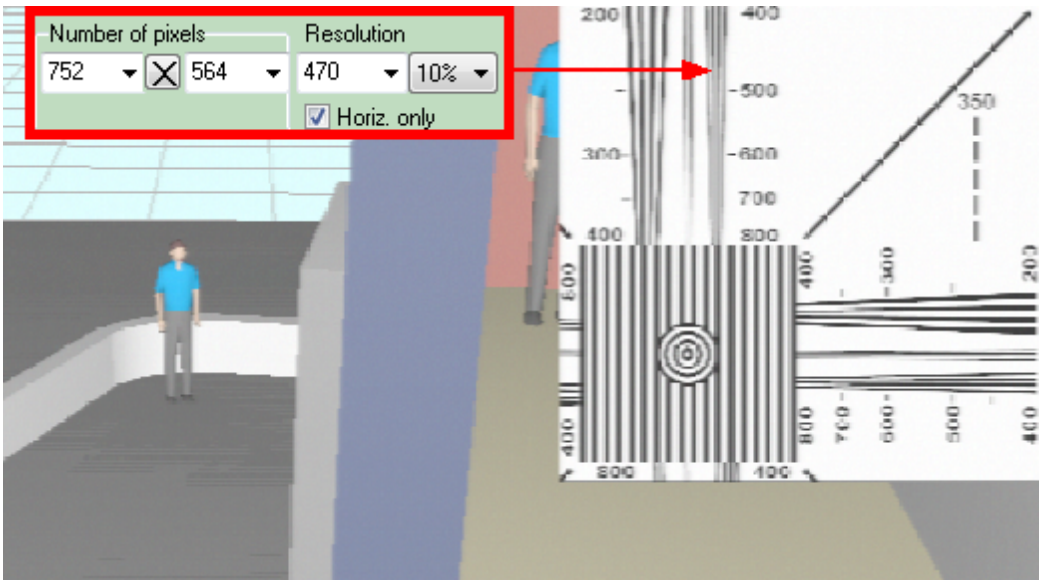
To display the 3D view areas in VideoCAD Professional there is a special window - 3D World 342, it offers much more powerful tools for view area visualization.

View > Test chart

Place at the right top corner the image fragment of the standard test chart EIA1956 for the visual estimation of the current horizontal and vertical resolution.
The Test chart shows resolution in lines per picture height (**LPH**) regardless of the Aspect Ratio 295.

Result of measuring resolution by this fragment of **EIA1956** test chart equals to the modern **ISO 12223**. Use of **EIA1956** is caused that it is more compact.

Maximum resolution what can be measured by the middle field without multiplication is 1600 LPH. With the help of combo box under the Test chart 388 checkbox on the **View** tab of the **Image parameter panel**, you can increase the size of the chart in 2 or 4 times or reduce the size in 2,4,8,16,32,64 times, and thus expand the range of measured resolution to 50-102400 LPH.



You can simulate the image resolution using the tools Camera>Resolution (LPH) 333, Lens>Resol.(lp/mm) 341, Processing>Sharpness 383, Depth of Field 454.

You can get images with the number of pixels exceeds the screen size using the tools Real frame size 359 and PiP 391.

You can measure contrast drop using the **TV - lines** tool from the CCTVCAD Lab Toolkit 558 package.

See also: 3D Video window 357, , *Real frame size* 359

View > Show panel

Show the View 385 tab on the **Image parameter panel**. On the tab you can show or hide all additional elements on the 3D image. In the main menu there is only a part of the elements.

See more: Image parameter panel 370 > *View* 385

Speed > Disable image processing

This item duplicates the same box 482 on the **3D modeling** tab on the **Options** box.

If this box is marked then the image processing will not be modeled.
Modeling gamma, noise, brightness, contrast, resolution, sharpness, compression, titles, animation, exposure time and depth of field will be disabled.

Redraw speed will increase, errors with outdated video cards may be removed.

Speed > Redraw 3D image only by clicking

This item duplicates the same box 482 on the 3D modeling tab on the Options box.

Modeling complex 3D scenes, especially taking into account illumination, require high computer performance.
If the image in the 3D Video is redrawn too slowly and that hinder operation in the Graphics window, mark this box. After that the image in the 3D Video will be redrawn automatically only at activation of cameras. To force redrawing click on the image.

Help

Open the Help system topic with the information about **3D Video**.

9.7.2 Image parameter panel

3D Video
Image parameter panel

The panel can be called by right clicking or double clicking on the image in 3D window 357 3D Video 357 or from the Main menu 359 of 3D Video.
On the panel it is possible to see and change 3D image parameters and thus to obtain accurate model of a real image from a real camera.

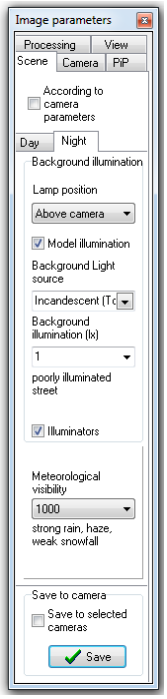
The panel is divided into tabs according to the order of image processing from the camera:

- Scene 371 - parameters of the scene;
- Camera 375 - parameters of the camera;
- Processing 381 - processing the obtained image, by the camera and other CCTV equipment;
- View 385 - visibility of auxiliary objects on the image model.
- PiP 391 (Picture in Picture) - modeling megapixel resolutions with the PiP technology.

9.7.2.1 Scene

On the tab parameters of the scene in front of the active camera are presented. Scene parameters include illumination and visibility range. For day and night time separate scene parameter sets are specified.

Some elements on this panel are duplicated in the Main menu 359 of the 3D Video.



According to camera parameters

Different cameras can be in various conditions and consequently for different cameras scene parameters can be different.

If this box is checked, scene parameters are set according to scene parameters of active camera. As a result of activation of other camera, scene parameters will be changed according to scene parameters of this camera. Manual changing scene parameters is disabled.

If this box is not checked, scene parameters could be specified manually. The set parameters will not be changed during activation of different cameras.

The box is duplicated 360 in the Main menu of the 3D Video.

See also: Save, Save to selected cameras 374

Day and Night tabs

During the day, scene of the same camera can be essentially changed. In daytime there is predominance of the natural illumination, and at night artificial one. In daytime the sky is much brighter than the ground, and at night it is darker (because of the predominance of artificial illumination).
Therefore for each camera 2 sets of scene parameters are specified: for day and night time.
If the Day tab is opened, scene parameters of day time is used. If the Night tab is opened, scene parameters of night time is used.

The effect of this tabs is applied to all cameras at once. Actually it is a switch of time in the project. The same switch is available in the Monitor window 409 and in the Main menu 359 of the 3D Video.

Background illumination panel

On the panel there are parameters of the Background light source. Background light source produces background illumination on the scene.

For simple modeling illumination it is enough to specify parameters of the background light for each camera. The Illumination produced by background light can be measure by the luxmeter during the site pre-design investigation.

In addition to the background light on the scene you can place Illuminators 206.

Lamp position

The item opens a submenu, in which the **Lamp position** relative to the active camera can be chosen.
Background light source produces background illumination on the scene.
In addition to the background light on the scene you can place Illuminators 206.

Model illumination

If this box is checked, during 3D image generation, scene illumination parameters 371, illuminators 206 and camera sensitivity 329 are considered.

Image generation time can considerably increase.

If the item is not checked, illumination is not considered, only camera view area is modeled.

Illumination modeling can be switched on separately for each camera, for day time or night time.

External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

Background light source

Using this combo box you can choose type of the Background light source.

The combo box is accessible only if illumination modeling 361 is switched on.

Camera sensor spectral sensitivity to different types of light sources essentially differs from human eye (and luxmeter) spectral sensitivity. For example, luminescent and Incandescent lamps produce equal scene illumination according to luxmeter reading. But the image from a black-white camera directed on this scene will not be equal at scene illumination produced by different lamps. The difference in the equivalent illumination can reach four or more times. Color cameras are practically insensitive to IR illuminators, and black-white cameras have sensitivity depending on maximum wavelength of the IR illuminators.

VideoCAD considers this difference through in advance determined and experimentally verified 567 spectral efficiency factors of different light sources for different types of cameras.

Choosing type of the light source, you automatically switch on an appropriate set of the spectral efficiency factors.

See also: Illuminator calculation 461, Measuring spectral efficiency of light source 567.

Background illumination (lx)

In the box it is possible to choose from the list or enter from keyboard scene illumination, created by background light.
Illumination is measured, according to the standard luxmeter reading, in luxes.
If background light source is an infra-red (IR) LED 469, the background illumination is measured in Watts/square meter (watt/m2). The IR illumination cannot be measured by an luxmeter. More in detail see Infra-red illuminators.
Background illumination does not decrease with distance, the scene is illuminated evenly.
Light source type is selected in the Background light source 373 combo box, the light direction is selected in the Lamp position 372 combo box.

The box is accessible and considered in 3D image modeling only if the illumination modeling 372 is switched on.

Illuminators

If this box is checked, during 3D image generation, switched on illuminators 206, placed on the scene, are considered.
If the box is not checked, the illuminators are not considered.

The box is accessible and considered in 3D image modeling only if the illumination modeling 372 is switched on.

Meteorological visibility

Using this combo box you can model meteor, limiting visibility range (rain, snow, fog, sandy storms, etc.).

Meteorological Visibility is the greatest distance at which it is just possible to see with the unaided eye:
- in the daytime, a prominent dark object against the sky at the horizon;
- at night, a known, preferably unfocused, moderately intense light source.

This parameter is reported in a weather forecast, and can be also visually determined.

Rough values of Meteorological Visibility for various weather conditions according to data of meteorologists:

- Rain, weak snowfall, smoke - 900-1000 m
- Medium snowfall, weak fog - 500 m
- Medium fog, strong snowfall - 100-500 m
- Thick fog - less 100 m.

Pay attention to the following moments:

Meteorological Visibility does not coincide with the maximal person detection range. Meteorological Visibility is calculated in respect of black big size object against background of fog or sky. Maximal person detection range, limited by visibility, is 1.5-2 times less at the average depending on contrast between background and person's clothes.

At surveillance in the night time and at illumination from the camera the maximal detection range is considerably reduced due to light reflection from fog (rain or snow).

At modeling the threshold of eye contrast sensitivity 0.03 is accepted.

Quality of visibility range modeling has a great dependence from video card's opportunities and its adjustments. Modern 3D-accelerator allows getting excellent quality of modeling. At the same time without the accelerator, accurate modeling fog is insufficient.

See also: Errors in rendering 3D images 395

Save to camera

Clicking **Save** button, the scene parameters, specified on the Scene tab, will be saved in parameters of the active camera.
Later on, if the According to camera parameters 371 box is marked, the saved scene parameters will be loaded at each activation of this camera.
At modeling monitors 407 the scene parameters saved in cameras is always used.

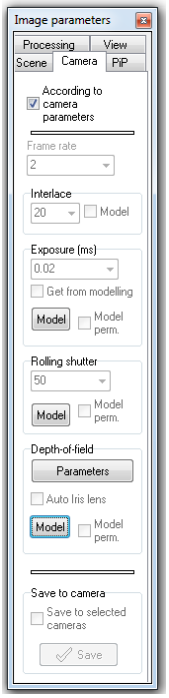
If at clicking **Save** button the **Save to selected cameras** box is marked, scene parameter set on the Scene tab will be saved in all selected cameras.

9.7.2.2 Camera

This tab contains the tools for 3D modeling camera parameters associated with the modeling movement (frame rate, interlacing, exposure time, rolling shutter) and the depth of field.
Tools on this tab can be applied simultaneously to one image, but in this case time of image generation might increase in the tens or hundreds of times.

Camera sensitivity and resolution parameters, lens parameters are available in the Sensitivity and resolution 329 box.

See more: about modeling moving 3D models 203, *Rotakin* 205
See more: about the depth of field 454



According to camera parameters

Different cameras can have different parameters.

If this box is checked, parameters on this tab are set according to parameters of the active camera. As a result of activation of other camera, parameters will be changed according to parameters of this camera. Manual changing parameters is disabled.

If this box is not checked, parameters on this tab could be specified manually. The set parameters will not be changed during activation of different cameras.

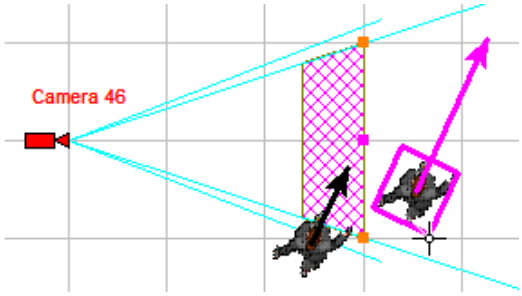
See also: Save, Save to selected cameras 380

Frame rate

In this box you can specify the Frame rate of the Active camera in frames per second.
The Frame rate is taken into account when modeling animated images 386 with moving 3D models

202 and Rotakin 205.

If a 3D model has non zero speed 203, then the **velocity vector** is displayed.



If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the active camera (black arrow).**

If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model passes per second (crimson arrow)**.

*The length of the **velocity vector** of a **3D model in the normal state** is inversely proportional to the **frame rate** of the active camera. Thus we can see how many times the moving 3D model gets into the frame of the active camera.*

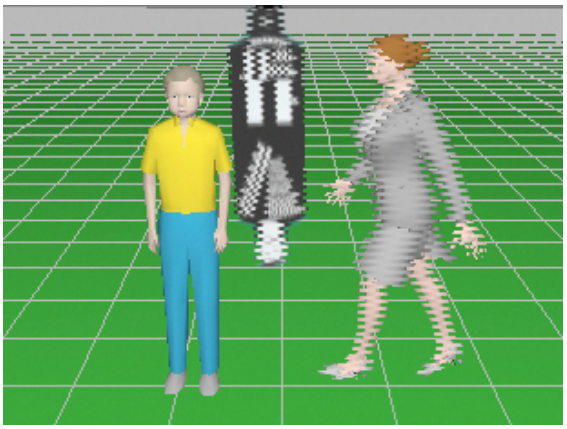
*If a model 419 is assigned to the active camera, and the model has set maximal frame rate 434, then value in this box can not exceed the **maximal frame rate**.*
When approach to the maximal value, the box will become crimson.
*You can change frame rate in wide range of cameras, which have not assigned model or the assigned model have not specified **maximal frame rate**.*

See also: Selecting frame rate on the basis of known target's positions and velocities 575.
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Interlace

*The panel is intended for modeling distortion of moving 3D models 203 and rotating Rotakin 205 object arising from interlacing of **analog cameras** (comb effect).*

Due to the interlaced scanning, the full frame is composed of two interlaced fields. The exposition of the fields is performed consistently at different times, but the full frame is displayed on a digital monitor at once, which causes a horizontal shift of lines of moving objects.
Analog monitors have interlaced scan, and the full frame is displayed on an analog monitor field by field sequentially, therefore on analog monitors the interlace effect is absent.



In the **Time interval between fields** box you can specify a period between two fields in the full frame.

In the PAL system this interval equals 20 millisecond (1/50 s), In the NTSC system this interval equals 16.5 millisecond (1/60 s).

If the **Model** box is checked the the Interlace will be modeled.

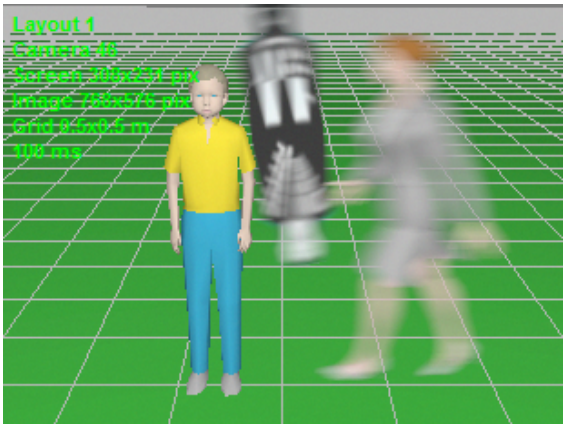
Modeling Interlace increases image generation time in several times.

See also: Simulating distortions of moving objects arising from Exposure time, Interlace scan and Rolling shutter 585, *One field* 382
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Exposure (ms)

The panel is intended for modeling blur of moving 3D models 203 and rotating Rotakin 205 object arising from the exposure time (Motion blur).

The greater the exposure time and the greater the velocity of an object on the screen, the more the blur appear.



In the **Exposure time** box you can specify the exposure time of the active camera (shutter time, shutter speed) in millisecond.

Exposure time of standard analog cameras can not exceed the period between fields. (20ms (1/50s) for PAL, 16.5ms (1/60s) for NTSC). Automatic electronic shutter reduces actual exposure time in dependence of scene illumination, camera sensitivity and the aperture ratio of the lens. In low light conditions exposure time is maximal.
Exposure time of IP cameras and analog cameras with light accumulation can be up to 200-500ms and more. By increasing the exposure time increasing the rated sensitivity of these cameras is achieved, but this leads to blurring of moving objects, for that it does not always pay attention.

If the **Get from modeling** box is checked, then the expected exposure time is calculated during modeling sensitivity.

Different cameras can have different regularities of variation of exposure depending on the light, so the possible error in calculating the expected time during modeling sensitivity. Before the practical use of this feature, you must check it with the camera in use and make the necessary corrections.

The **Model** button launch the modeling exposure time once.

If the **Model perm.** box is checked, then the exposure time will be modeled permanently.

VideoCAD offers a technique of measuring exposure time of cameras with an analog oscilloscope, see: Measuring exposure time of IP camera 593

Modeling Exposure time takes much time (depending on complexity of scene, video card's and computer's opportunities (from several seconds to several minutes), therefore it is not recommended to mark needlessly the item **Model perm.**, otherwise the program will work very slowly.

Realism of modeling exposure can be adjusted by the Model Depth of Field and Shutter 482 *slider in the Options box.*
Quality of modeling considerably depends on video card's opportunities and its adjustments. If

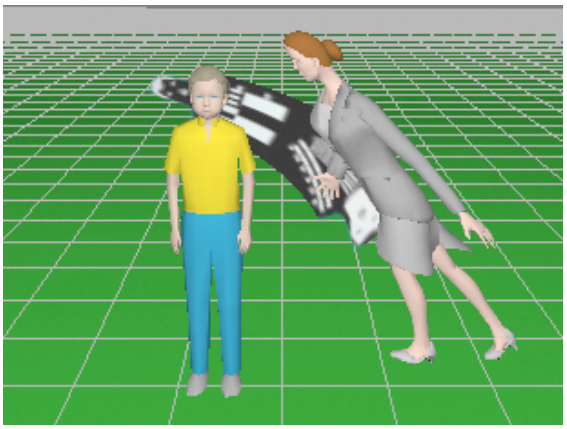
modeling exposure does not work or works incorrectly, try to change adjustments of video card hardware acceleration.
If in your video card there is no hardware support of this function, exposure should be modeled at completely switched off hardware acceleration (the slider is moved to the left). However in this case quality of other parameters of image is worsened.

See also: Errors in rendering 3D images 395

See also: Simulating distortions of moving objects arising from Exposure time, Interlace scan and Rolling shutter 585
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Rolling Shutter

The panel is intended for modeling distortion of moving 3D models 203 *and rotating Rotakin* 205 *object arising from the rolling shutter effect.*



*As a result of Rolling Shutter work, exposure of different rows of the image sensor begins and ends sequentially at different times, which causes a horizontal shift of moving objects. This effect occurs with many **IP cameras** with **CMOS** image sensor and usually doesn't occur with cameras with CCD image sensor.*

In the **Row time** box you can specify the time period **(in microsecond)** between the beginning of exposure of adjacent rows. Unfortunately this parameter is not given in the cameras' specification. To elucidate the value of the parameter you should contact the manufacturer or measured this time in practice.

*VideoCAD offers a technique of measuring **row time** of rolling shutter with an analog oscilloscope, see: Measuring rolling shutter row time of IP camera* 596

The Row time may vary slightly under different settings of the same camera.

The **Up** checkbox switches direction of scanning strings by the Rolling shutter. Top-down or Down-top.

The **Model** button launch modeling Rolling Shutter once.

If the **Model perm.** box is checked, then the Rolling Shutter will be modeled permanently.

*Modeling Rolling Shutter takes much time (depending on complexity of scene, video card's and computer's opportunities (from several seconds to several minutes), therefore it is not recommended to mark needlessly the item **Model perm.**, otherwise the program will work very slowly.*

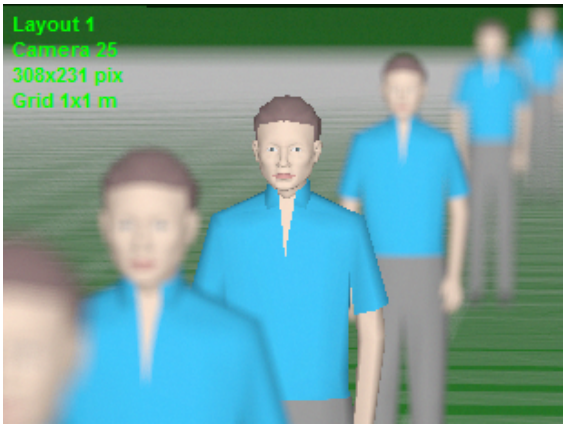
Realism of modeling can be adjusted by the Model Depth of Field and Shutter 482 *slider in the Options box.*
Quality of modeling considerably depends on video card's opportunities and its adjustments. If modeling Rolling Shutter does not work or works incorrectly, try to change adjustments of video card hardware acceleration.
If in your video card there is no hardware support of this function, Rolling Shutter should be modeled at completely switched off hardware acceleration (the slider is moved to the left).

However in this case quality of other parameters of image is worsened.

See also: Errors in rendering 3D images 395
See also: Simulating distortions of moving objects arising from Exposure time, Interlace scan and Rolling shutter 585
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Depth of Field

On the panel you can invoke modeling depth-of-field 454 and change depth-of-field parameters.



Parameters

Show Depth-of-field 457 box. In this box it is possible to change lens parameters (**lens focal length**, **aperture** and **focus distance).**

Auto Iris lens

If the box is checked, at depth of field calculation the aperture value 341, computed during 3D modeling illumination, will be used. If the box is not checked, the aperture value, specified in the box Aperture 457 (F number) in the Depth-of-field 457 box, is used.

Model

Run depth-of-field 454 modeling once. Initial data (**lens focal length**, **aperture** and **focus distance**) are set in Depth-of-field box 457. Clicking the item **Parameters** it is possible to display this box.

If the **Model perm.** box is checked, then the Depth of Field will be modeled permanently.

*Modeling Depth of Field takes much time (depending on complexity of scene, video card's and computer's opportunities (from several seconds to several minutes), therefore it is not recommended to mark needlessly the item **Model perm.**, otherwise the program will work very slowly.*

Realism of modeling can be adjusted by the Model Depth of Field and Shutter 482 slider in the Options box.
Quality of modeling considerably depends on video card's opportunities and its adjustments. If modeling Depth of Field does not work or works incorrectly, try to change adjustments of video card hardware acceleration.
If in your video card there is no hardware support of this function, Depth of Field should be

modeled at completely switched off hardware acceleration (the slider is moved to the left). However in this case quality of other parameters of image is worsened.

See also: Errors in rendering 3D images 395

Save to camera

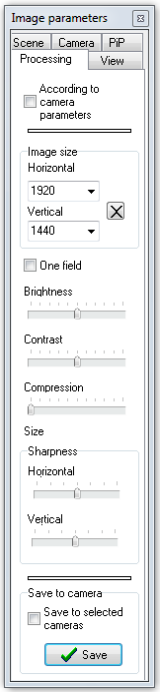
Clicking **Save** button, the parameters, specified on the Camera tab, will be saved in parameters of the active camera.
Later on, if the According to camera parameters 375 box is marked, the saved parameters will be loaded at each activation of this camera.
At modeling monitors 407 the parameters saved in cameras is always used.

If at clicking **Save** button the **Save to selected cameras** box is marked, parameter set on the Camera tab will be saved in all selected cameras.

9.7.2.3 Processing

In CCTV systems the obtained image undergoes additional processing inside camera or other equipment. On the tab it is possible to set image processing parameters.

Some elements on this panel are duplicated in the Main menu 359 of 3D Video.



According to camera parameters

Images from different cameras can be processing by various means and consequently for different cameras the processing parameters can be different.
If this box is checked, processing parameters are set according to processing parameters of the active camera. As a result activation of other camera, processing parameters will be changed according to processing parameters of this camera. Manual changing processing parameters will be disabled.

If this box is not checked, processing parameters could be specified manually. The set parameters will not be changed during activation of different cameras.

*The **According to camera parameters** checkbox on the **Processing** tab is marked automatically when closing the **Image parameter panel** to avoid confusion with the resolution of active and inactive cameras.*

See also: Save to camera 384

Image size

Video signal received from an analog camera, comes to DVR or multiplexer input, where it is processed by **analog-to-digital convertor**.
Analog-to-digital conversion does not coincide with number of pixels of camera image sensor.

As a result, the output image size, as a rule, does not coincide with number of pixels of the image sensor. Because of such mismatch, there are distortions.

In **IP cameras** the number of pixels on the output image also differs from number of pixels of the image sensor.
In the combo boxes it is possible to set the horizontal and vertical number of pixels of output image.

A button with a cross between combo boxes with horizontal and vertical numbers of pixels is intended for fast calculation of vertical number of pixels from the specified horizontal number of pixels and on the contrary. Calculation is carried out using the Aspect Ratio 295.

You can save frames with size in pixel exciting Windows screen size. See Real frame size 359.

Criteria 505 of person *detection* 495, *identification* 496 and license plate *reading* 497, *spatial resolution* 316 depend on **vertical number of pixel**. Therefore Vertical number of pixels influences person detection, identification and license plate reading areas, positions of *spatial resolution regions* 177 and *image examples* 322 in the **Spatial resolution box**.

For criteria calculation minimal number of pixels from parameters of camera image sensor and parameters of output image is used.
Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box.

If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (or horizontal 768 pixels)*, what corresponds to analog camera.*

If a camera is rotated around its axis 297 by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution** (pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.

When calculating the spatial resolution 316, rotation of the camera around its axis by default does not affect the position of the vertical and horizontal in the frame. Horizontal and vertical positions are tied to the camera and not to the scene. You can change this rule, using the Spatial resolution and rotation 493 checkbox in the Options box .

*The positions of the boundaries of spatial resolution 177 and the sample images 322 in the **Spatial resolution box** are affected by the **number of pixels** in vertical or horizontal direction depending on the position of the Vert. / Hor 319 switch in settings of a **pattern of spatial resolution**, assigned to the camera.*

If the According to camera parameters 385 box is marked on the View tab of the Image parameters panel, Image size 385 the in the 3D Video becomes equal to the image size specified in these boxes.

One field

If this box is checked, the vertical resolution of the image sensor 332 is reduced in half. Vertical resolution decreases, if video signal from a camera with interlace scan is captured by fields (half frames), instead of full frames. For example, 768x288 pixels.

For progressive scan cameras this box should not be marked.

See also: Interlace 376

Brightness

Using this slider the **image brightness** can be chosen.

Contrast

Using this slider the **image contrast** can be chosen.

Compression

Using this combo box an **image compression level** can be chosen.

Compression levels may differ from the compression levels in the settings of different DVR or IP cameras. To determine a correspondence use the visual image comparison.

Obtained image compress by the JPEG algorithm for approximating the image in the 3D Video to the real image from video cameras to exactly estimation the possibilities of detection, identification and reading

Using in your DVR algorithms different from JPEG is not generally an obstacle for compression modeling with the help of JPEG algorithm. Although other algorithm artifacts differ from JPEG artifacts, the general amount of information correspondence that can be determined by the careful visual image comparison is enough for modeling.

Sharpness

Using the sliders it is possible to set additional sharpness or smoothing of the image.
Move the sliders right to increase sharpness, move the sliders left to increase smoothing.
Additional sharping is applied to approximate the image in the 3D Video to real images from cameras for evaluation of their possibilities.

Principal causes of sharpness variation:

- **Sharpness increasing** results from effect of aperture correctors in cameras and in other CCTV equipment.
- **Horizontal smoothing** appears as the result of losses of the videosignal high-frequency component on long lines of communication or other components of the CCTV system. The horizontal smoothing also will be necessarily present at the color videosignal capture by chips without comb filters of chrominance (for example, Bt878) or black-and-white signal by the same chips without disconnection of noth filters with the horizontal discretization more than 500 pixels. Horizontal smoothing is in the case of recording on VHS videorecorder.

- **Vertical smoothing** appears when working some algorithms of deinterlacing (the process of removing interlacing effects from the image).
- **Total smoothing** can appear as the result of lens adjustments errors (especially with Auto iris lenses), optic pollution or as the result of working some algorithms of smoothing. Effect of some digital processing systems in low light conditions can lead to smoothing.

You can evaluate the resolution visually using the Test chart 388.

Save to camera

Clicking **Save** button, the processing parameters, specified on the Processing tab, will be saved in parameters of the active camera.
Later on, if the According to camera parameters 371 box is marked, the saved processing parameters will be loaded at each activation of this camera.
At modeling monitors 407 the parameters saved in cameras is always used.

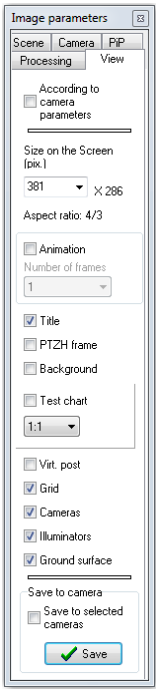
If at clicking **Save** button the **Save to selected cameras** box is marked, processing parameter set on the Processing tab will be saved in all selected cameras.

9.7.2.4 View

On the tab the image size in the 3D Video and visibility of additional elements on the 3D image are specified.

Some elements on this panel are duplicated in the Main menu 359 of 3D Video.

See also: 3D Video 357



According to camera parameters

You can set visibility of additional elements separately for each camera.
If this box is checked, visibility of additional elements are set according to parameters of active camera. As a result of activation of other camera, visibility of additional elements will be changed according to parameters of this camera. Manual changing visibility of additional elements will be disabled.

If this box is not checked, the visibility could be specified manually. The set visibility will not be changed during activation of different cameras.

The box is duplicated 365 in the Main menu of the 3D Video.

See also: Save to camera 390

Size on the screen

In the box horizontal image size in the 3D Video is specified. Near this box, the calculated vertical image size and the Aspect Ratio 295 is *shown*.

If the According to camera parameters 385 box is marked, **Size on the screen (pix)** is taken from camera parameters. But only if for this camera the Image size 381 on the Processing 381 tab

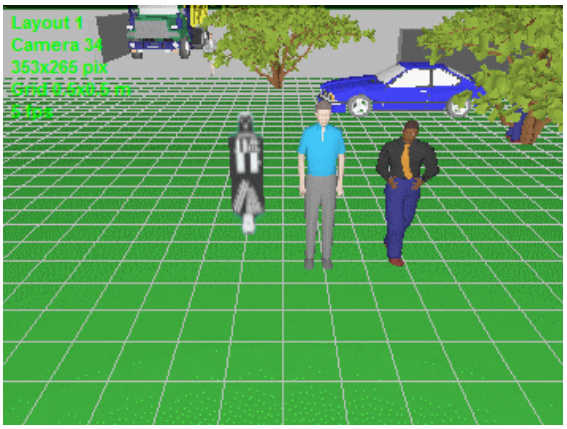
is not specified. If the **Image size** is specified, the **Size on the screen (pix)** becomes equal to the specified **Image size**.

*The **Image size** in the 3D Video can not exceed **screen resolution**. How to model high resolution images, see Real image size 359 and the PiP 391 tab.*

See also: According to camera parameters 385

Animation

When the **Animation** box is checked and the value in the **Number of frames** combo box is more than one, in the **3D Video** instead of a static 3D image an animated image will be generated.



Time of animated image generation increases in proportion to the **number of frames**.

The frame rate can be specified in the corresponding box 375 on the **Camera** tab.

On the animated image the 3D models 203 with non-zero speed will move, the Rotakin 205 will rotate.

Animated images can be saved 360 in the **animated gif** files , and also can be displayed on the Monitor 409 and saved 412 in **html** file.

To make visible movement on an animated image, in the view area 3D models 203 with non-zero speed and (or) object Rotakin 205 must present.

See also: Creating animated model of monitor 577
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Title

Place the following information in the left upper corner of the image:

- **Name** of the layout 513 on which the active camera is placed.
- Active camera **name**.
- Current **image sizes** in pixels.
- Current image resolution in pixels (**Image**) and 3D Video size (**Screen**) separately, when the image resolution differs from the 3D Video size;

*For panoramic 312 cameras the **Image** line displays a virtual number of pixels for correct simulation of resolution of panoramic camera.*

- **Resolution** in LPH (lines per pixture height, equals to TV-lines for analog cameras) in case of it can be calculated.
- **Brightness** and **Contast** if these parameters are differed from default.
- Image **compression**, if it is used.
- The **grid** 188 **step**, if the grid is displayed.
- Calculated unweighted **signal/noise ratio** of the image, if illumination modeling 361 is switched

on.
- Calculated **IRE** of the image, if illumination modeling 361 is switched on.
- **Frame rate** (fps), when image in the 3D Video is animated 385.
- **Exposure time** (milliseconds) when exposure 377 is modeled.

PTZH frame

PTZH frame (Pan-Tilt-Zoom-Height) allows operating camera similarly to PTZ one and additionally change **camera's installation height**.

After clicking this item the camera's field of view extends, and the objects being off view area, for increasing the convenience of camera's adjustment, become visible. Real field of view is limited by **orange frame**.

Above the frame the buttons, which changes view area upper bound distance 301 and view area upper bound height 298., are located. Current distance and height values are digitally shown under the buttons.

*It is recommended to set **view area upper bound height**, which is equal to maximal height of observed objects, and do not change it further. Further adjust camera's inclination by changing only the **view area upper bound distance.***

On the right and to the left of the frame there are camera rotation buttons .

Under the frame there are buttons, which change the height of camera installation 296. Current value of **height** is digitally shown above the buttons. Near by them the lens focal length 294 **combo box** is located. Value in the box can be selected from the list or entered from the keyboard.

Using these tools it is possible to rotate the camera in both planes, change **lens focal length** and **height of installation.**

To change the position **on one step** click corresponding button. For **continuous moving** bring the cursor to the button, then press it and do not release the left mouse button. For precise position adjustment do the same, but with pressed **Ctrl.**

In the PTZH frame mode you can pan and tilt the camera by moving the image like moving drawing in the Graphics window. Press left mouse button, move cursor with the button pressed then release the mouse button. Camera tilt angle is changed through changing **view area upper bound distance**. But when **Ctrl** is pressed, the tilt angle is changed through changing **view area upper bound height.**
You can also pan camera using **the arrow keys**.

Frame PTZH disables image processing, titles 386 and animation 386.

Together with Monitor window 407 *this tool offers a new method* 546 *of 3D CCTV design.*

If a model 419 *is assigned to the camera, and the model has fixed* 438 *focal length lens, then you can not change the focal length.*

If a model is assigned to the camera, and the model has a lens with limited 438 *variable focal length, then you can change focal length within the limits only. When approach to the limit values, the box will become crimson.*

You can change focal length in wide range of 0.5-1000mm of cameras, which have not assigned model or the assigned model have not specified limits of the lens focal length.

Changing the ***lens focal length*** *and therefore the calculated values of view angles of camera with enabled modeling lens distortion* 310 *will lead to detuning parameters of distortion and warping view area form. To correct the mismatch you should set new values of the actual view angles* 310*, taking into account the changed values of calculated view angles.*

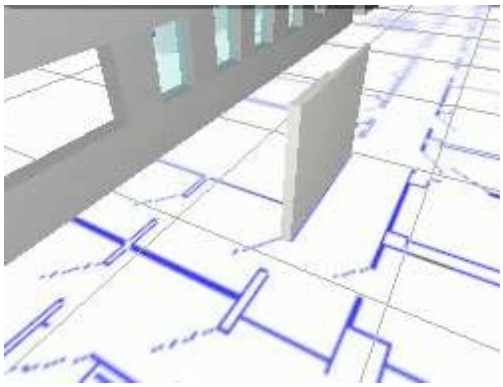
The PTZH frame simulates lens distortion 310 *in simplified way. Only border of the* ***field of view*** *is drawn without modeling optical distortion of the image.*

See also: CCTV design using Monitor window and PTZH frame 546

Background

Show or hide a background in the 3D image.

In case of vector background you can adjust background resolution 481 *in the 3D Video.*



See more: Background 222*, Background resolution* 481

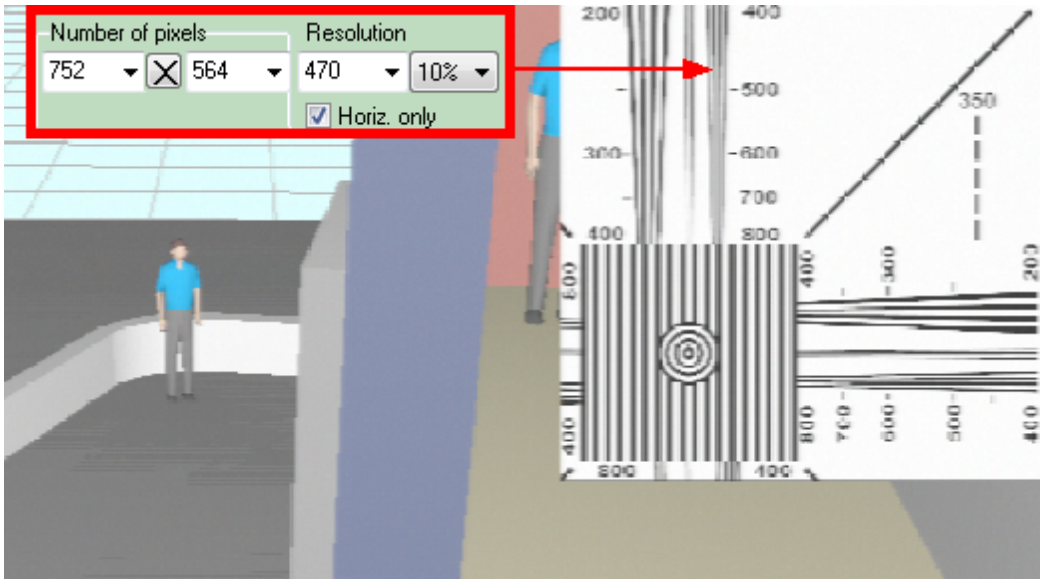
Test chart

Place at the right top corner the image fragment of the standard test chart EIA1956 for the visual estimation of the current horizontal and vertical resolution.

The Test chart shows resolution in lines per picture height (**LPH**) regardless of the Aspect Ratio 295.

Result of measuring resolution by this fragment of **EIA1956** test chart equals to the modern **ISO 12223**. Use of **EIA1956** is caused that it is more compact.

Maximum resolution what can be measured by the middle field without multiplication is 1600 LPH.
With the help of combo box under the Test chart 388 checkbox on the **View** tab of the **Image parameter panel**, you can increase the size of the chart in 2 or 4 times or reduce the size in 2,4,8,16,32,64 times, and thus expand the range of measured resolution to 50-102400 LPH.



You can simulate the image resolution using the tools Camera>Resolution (LPH)[333], Lens>Resol.(lp/mm)[341], Processing>Sharpness[383], Depth of Field[454].

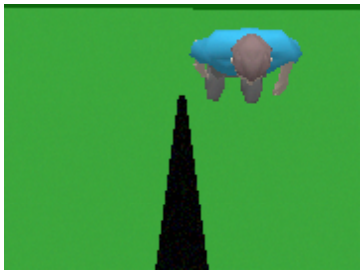
You can get images with the number of pixels exceeds the screen size using the tools Real frame size[359] and PiP[391].

You can measure contrast drop using the **TV - lines** tool from the CCTVCAD Lab Toolkit[558] package.

See also: 3D Video window[357], *Real frame size*[359]

Virtual post

Show or hide the virtual post on which the camera is installed. The post allows to see projection of the place, where the active camera is installed on the ground.. The post is not visible by default.

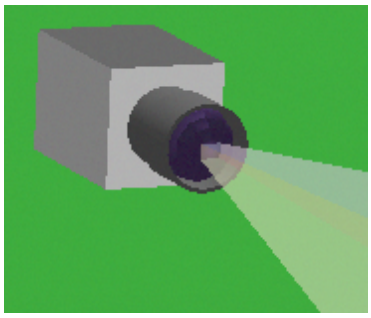


Grid

Show/Hide the Grid[188].

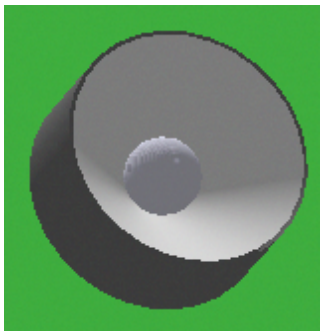
Cameras

Show/Hide 3D models of cameras.



Illuminators

Show/Hide 3D models of Illuminators 206.



Ground surface

Show/Hide 3D the ground surface. Ground color can be set on the 3D modeling 490 tab in Options box.

In multi-level 3D projects the height of the ground surface equals to the base height 298 of the active camera.

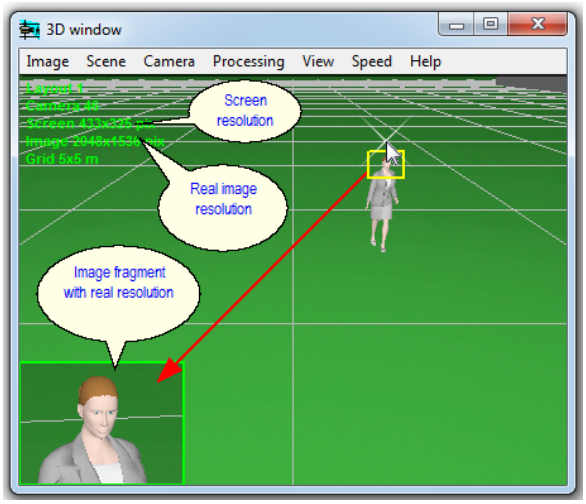
Save to camera

Clicking **Save** button, the view parameters, specified on the View tab, will be saved in parameters of the active camera.
Later on, if the According to camera parameters 371 box is marked, the saved parameters will be loaded at each activation of this camera.
At modeling monitors 407 the parameters saved in cameras is always used.

If at clicking **Save** button the **Save to selected cameras** box is marked, parameter set on the View tab will be saved in all selected cameras.

9.7.2.5 PiP

This tab is designed for modeling images with **megapixel** resolution which exceeds 3D Video size.



*PiP technology allows to model resolutions up to **tens of megapixels**, as well as **save screen working space** and **reduce generation time** of megapixel 3D images.*

*In the **3D Video** 2 pictures are displayed simultaneously . One of them is a **general view** - shows the **whole field of view**, but with lower resolution. Another picture - a **particular view** - shows the **target region** of the field of view, but with the original higher resolution.*

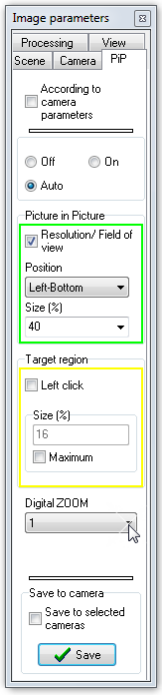
*The **target region** is outlined by a yellow frame.*

*You can quickly choose the **target region** on the **general view** clicking by the **middle mouse button (or wheel)**. If there is no middle button, you can enable control by the left mouse button 393.*

With the help of PiP, the lens distortion can be modeled with real resolution of image. Without PiP the lens distortion 654 in the 3D Video is modeled with low resolution only. To get image with real resolution while modeling distortion, turn PiP ON. When modeling distortion, the target region of PIP will have real resolution. In case of warping at the image corners while modeling significant distortion, reduce the size 393 of the target region .

Another way of modeling megapixel images and distortion with real resolution - use the Real frame size 359 item.

See also: Modeling megapixel images 573



According to camera parameters

Scenes of different cameras can demand different positions of the target region and different positions of the little picture in the big picture. Therefore the PiP parameters can be specified for each camera separately.
If this box is checked, PiP parameters on this tab are set according to PIP parameters of the active camera. As a result activation of other camera, PIP parameters will be changed according to PIP parameters of this camera. Manual changing PiP parameters will be disabled.

If this box is not checked, PiP parameters could be specified manually. The set parameters will not be changed during activation of different cameras.

See also: *Save to camera* 393

Off

Turn OFF the PiP mode unconditionally.

On

Turn ON the PiP mode unconditionally.

Auto

If this switch is chosen, the PiP mode will be turned ON automatically when resolution of image in the 3D Video exceeds size of the 3D Video in any dimension (in width or in height).

Picture in picture

Resolution/Field of view

If this box is checked, then particular view 391 is displayed in the **little picture** outlined by a green frame, which located inside the **big picture**. The **big picture** displays the general view 391.
If this box is not checked, in the **little picture** the **general view** is displayed, but in the **big picture** the **particular view** is displayed.

Position

In this combo box you can choose position of the **little picture** inside the **big picture** on unimportant area of image. 6 positions are possible.

Size (%)

In this combo box you can choose size of the **little picture** as a % part of the **big picture**.

Target region

Left click

You can quickly choose the **target region** on the general view 391 clicking by the **middle mouse button (or wheel**) by default. If there is no middle button, you can enable control by the left mouse button, checking this box.

Size (%)

If the Maximum 393 box is not checked, then the **Size (%)** box displays the current size of the target region in % of the whole field of view. The Size is calculated automatically.

If the **Maximum** box is checked, then in the **Size (%)** box you can set the **maximum size of the target region** in % of the whole field of view.
In case, for exact imaging resolution, it would be required larger target region, then the size of the target region will still not exceed the value in the **Size (%)** box, but the resolution of a **particular view** will be reduced.

This mode can be useful for comparing resolution of cameras without changing the size of the target region.

Maximum

See Size (%) 393 above. In the most cases the **Maximum** box should not be checked.

Digital ZOOM

In this box you can choose additional digital ZOOM of the particular view 391 without increasing real resolution. This tool gives the the same effect as Digital ZOOM in cameras.

Save to camera

Clicking **Save** button, the view parameters, specified on the PiP tab, will be saved in parameters of the active camera.
Later on, if the According to camera parameters 392 box is marked, the saved parameters will be loaded at each activation of this camera.

At modeling monitors 407 the parameters saved in cameras is always used.

If at clicking **Save** button the **Save to selected cameras** box is marked, parameter set on the PiP tab will be saved to all selected cameras.

See also: Modeling megapixel images 573

9.8 Errors in rendering 3D images

The quality of 3D images in the 3D Video 357, 3D World 342 and 3D Models 397 windows and the speed of its refreshing depends much on your graphics card capabilities. To get maximum realism set the maximum quality of **Open GL** images.

On some outdated graphic cards visible pixelization, errors and the lack of image are possible. This is not a program fault. Some new graphic cards need an additional setting to get the maximum realistic quality.
The speed of image updating also depends on the quantity of the displayed 3D models.

If errors are visible on the image in the 3D Video/3D World or the computer buzzes at the 3D Video /3D World displaying, first of all **update the graphics card driver** to the latest version accessible on the manufacturer website. *The drivers which are used in Windows by default as a rule do not support hardware acceleration.*

Then try to change **Hardware acceleration** in the Display Properties box.

Then try to reduce **Model space** on the **3D modeling** 480 tab in the **Options** box. Try to disable image processing 482.

If failures or distortions remain, - a more high-end graphics card is necessary for 3D modeling.
*For the best quality it is necessary to use a graphics card with **OpenGL** hardware support.*

Redraw speed of the image depends also on number and complexity of displayed 3D models and the size of opened 3D Video.

The speed is considerably decreased when modeling illumination 372, depth of field 379 exposure 377, rolling shutter 378, animation 386, distortion 310, gradient 177. The speed is decreased in a less degree when modeling interlace 376, using PiP 391.
Compression 383 modeling and other additional image processing reduces speed to some extend.

It is recommended to enable resource-intensive operations only when needed and disable them during normal operation.
You can quickly enable and disable all image processing with the help of the 3D Video>Main menu>Speed>Disable image processing 369.
Using the 3D Video>Main menu>Speed>Redraw 3D image only by clicking 369 you can avoid unnecessary redrawing the 3D view.

If the image is redrawn too slowly and that hinder operation in the Graphics window, try to adjust VideoCAD for the most comfortable working on your equipment and your projects:

Mark the Redraw 3D image only by clicking 482 box on the 3D modeling 480 tab in the Options box 474. After that the image in 3D Video will be redrawn automatically only at activation of cameras. To force redrawing click on the image.

Try to disable image processing 482. After that the image processing will not be modeled, but redraw speed will increase.

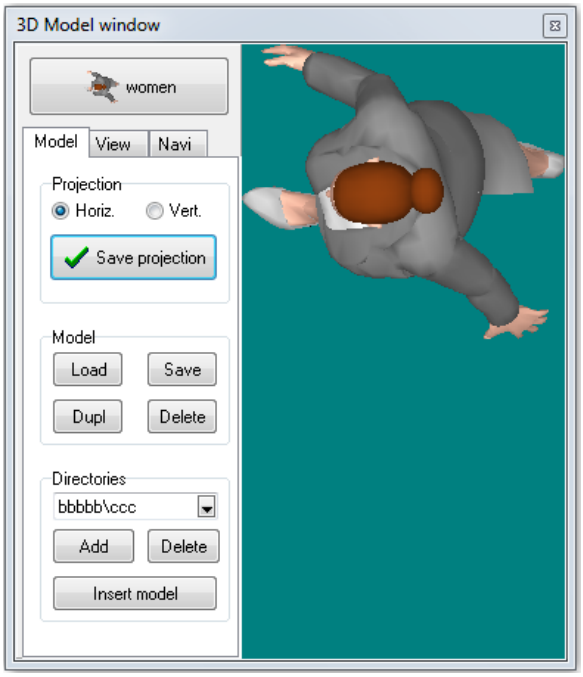
You can increase redraw speed or modeling accuracy using Speed <> Accuracy 481 slider on the 3D modeling 480 tab in the Options box 474.

If with the 3D Video opened, errors occur, try to switch redrawing in the 3D Video to the common thread by clearing the checkbox Draw 3D Video in separated thread 481. This would worsen the ease of program operation, but may increase stability.

See also: *Options box>3D modeling>Redrawing 3D Video* 481, *Program speed and system requirements* 650

9.9 3D Models

Graphics window
Main menu
View
3D Models



The **3D Models** window is intended to manage 3D models 202 in the program library.

The **3D Models** window can be opened in several ways:

- Via the Main menu > 3D models> 3D Models window 261;
- By clicking the button on the Current construction parameter panel 283 during placement or editing 3D models. In the 3D Models window the placed or edited 3D model will be loaded.
- Adding a new model via Main menu >3D Models> Add 3D model 262. The 3D Models window will appeared automatically after opening a 3D model file, the new 3D model will be loaded into the 3D Models window.

Like the 3D World 342, tThe **3D Models** window consists of display area and panels with tools.
On the top of panels there is a button of choosing 3D models. Clicking on the button opens a menu where you can select a 3D model from 3D model available in the library of 3D models. Below there are 3 tabs:

Model 399
View 401
Navi (navigation) 404

For general 3D models of variety of objects, people , vehicles etc. tools on the Model 399 tab are enough. The other tabs are intended to work with 3D models-territories. For example 3D model of the building , terrain, etc. You can place inside these 3D models: cameras, constructions and other 3D models.

In VideoCAD Lite there is only one tab - Model 399. In VideoCAD Professional there are more tabs **View** and **Navigation**.
Changes in the **3D Models** window will be applied to all instances of the 3D model already placed in the project. If you need several variants of the same 3D model with different properties, create a copy 400 of the 3D model.

You can resize the **3D Models** window by dragging its borders by mouse. Via resizing the window, you can change **resolution of the 3D model's projection** for displaying in the Graphics window 162.
The 3D model's projection is updated at the moment of clicking the Save projection 399 button.

See also: *3D Video* 357, *3D World* 397

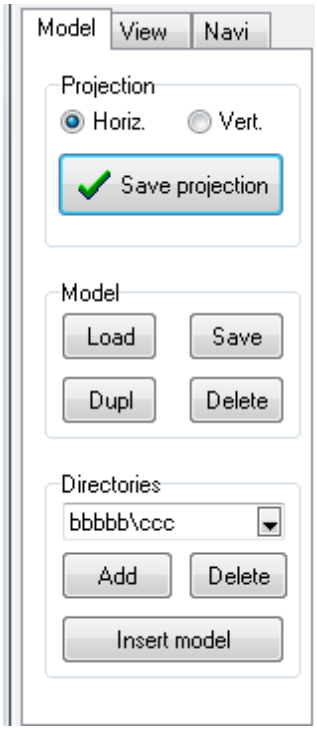
9.9.1 Model

On the Model tab you can:

- Load new 3D models from *.vcm files.

*3D model files in ***.vcm** format can be obtained from **SketchUP** or **3ds max** with the help of special plugins. See more: Import of 3D models from SketchUp and Autodesk 3dsMax* 599.

- Delete 3D models from the library;
- Build **projections** of 3D models to display in the Graphics window 161 and in menus 202;
- Save 3D models to *.vcm files;
- Duplicate 3D models;
- Distribute 3D models by hierarchy directories for convenient access from menus.



Projection panel

The panel is intended to create **projections** of the 3D model to display in the Graphics window 162 and the menu 202. Without the created projections, in the menus and Graphics window instead of the 3D models gray rectangles will be displayed.
These projections can be repeatedly re-created for new or already placed 3D models.

The order of creation projection:

1. By the **Horiz. <> Vert.** switch, choose which projection should be created. Firstly you should create the **horizontal projection**. The **vertical projection** is used rarely only to display 3D model in Vertical projection of the Graphics area 162.

2. Then adjust resolution of the projection visually, via changing window size by mouse.

For 3D-models of objects in order to improve performance you should chose minimally sufficient resolution.
3D-models-territories require high resolution, for its increase special tools on the View 401 *tab are offered.*

3. After adjusting resolution, click the **Save projection** button. As a result in menus and in the Graphics area 162 the 3D model will be displayed in the form of created projection.

Model panel

Load - Add new 3D model to the program library. In the appeared dialog choose a file in ***.vcm** format and click **Open**.

*3D model files in ***.vcm** format can be obtained from **SketchUP** or **3ds max** with the help of special plugins. See more: Import of 3D models from SketchUp and Autodesk 3dsMax* 599.

If VideoCAD library already has a 3D model with the same name or ID, you will be prompted to add the model under a different name or ID.
Then you will see the _3D Models window 397, in which you can create the projection 399 of the 3D model to display it in the Graphics window 161 and menus 202. To do this click the **Save projection button** and close the **3D Models** window. After this, icons of the 3D model will appear in menus and the 3D model can be placed in the graphics area.

If your 3D model has **textures**, in the same directory where the ***.vcm** file is opened from, a folder with textures must be. The folder should be named **<model name> _textures**. VideoCAD plugin for SketchUP automatically creates the folder with the textures in the directory of saving exported model.

Save - save to ***.vcm** file the current 3D model. If your 3D model has **textures**, in the directory of saving ***.vcm** file, a folder with textures named **<model name> _textures** will be created.

Dupl - make a copy of the current 3D model. Copies can be useful, for example, while working with multi-storey buildings. You can create multiple copies of the 3D model of the building for each floor. For each copy make a projection at different levels 399 and put them on different layers 276.

Delete - delete the current 3D model from the library. When you delete placed 3D model, all instances of this 3D model will be also deleted from the project.

Directories panel

The panel is intended for distribution 3D models by hierarchy directories for convenient access from menus.

List of directories - The list with full paths starting from the root directory. In the list you can choose a directory for deleting or to put in it the current 3D model.

Add - Add new directory. The name of the directory should be entered with all directories of higher levels. For example:
"cars" - new directory **cars** in the root directory of menus.
"cars\trucks" - new directory **trucks** in directory **cars**. If the **cars** directory does not exist, it will be created.

Empty directories are not visible in menus, only directories with 3D models are visible in menus.

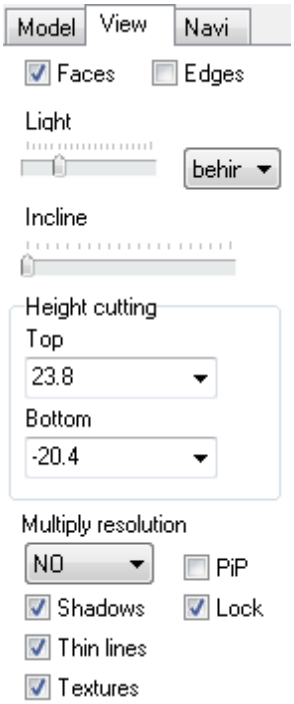
Delete - Delete the directory, chosen in the List of directories. Only empty directory can be deleted.

Insert model - Put the current 3D model to the directory, displayed in the **List of directories**.

9.9.2 View

On the **View** tab, you can change view and resolution of **projection** of 3D model for displaying in the Graphics area 162 of the Graphics window. Changes may be necessary when working with 3D models- territories.

To change the projection make the necessary settings on this tab and click Save projection 399. Projection can be changed many times, the changes will affect on all already placed instances of the 3D model. If you need multiple instances with different properties, create a copy 400 of the 3D model.



Faces and Edges

Checkboxes **Faces** and **Edges** allows to switch view of the 3D model in the form of faces or edges (lines). If both checkboxes are not checked the 3D model is displayed as points.

Light

The Light slider allows you to change the light level on the layout, and a combo box located next to - the direction of light. These tools allow you to highlight dark or light areas located at different angles to the viewer.

Incline

The **Incline** slider allows to incline projection of the 3D model a little to make vertical details (for example: walls) more discernible on horizontal projection.

Height cutting

The **Height cutting** comboboxes allow to cut in the 3D model a horizontal layer limited from top and bottom, draw it as a projection to display in the Graphics window 162. The tool is useful to highlight the storeys in the form of projections of the 3D model while working with multi-storey buildings.

Multiply resolution

The **Multiply resolution** combo box allows to increase resolution of the projection of the 3D model in several times, relative to the size of the **3D Models** window. Increasing the resolution

may be necessary when working with 3D models-territories.

PiP (picture in picture)

The **PiP** checkbox allows to further increase the resolution of a separate area on the projection.

To select the area:
1. Check this checkbox;
2. Specify by black frame the area on the projection (left mouse button click in the corner of the area, move the mouse while holding the button and release the button at the other corner);
3. Click Save projection 399.

After that, the area on the projection of the 3D model will be displayed with higher resolution in the Graphics area. The smaller the fraction of the total size of the projection the area occupies, the more the relative increase of the resolution.

*The **PiP** checkbox is inaccessible while the Enable navigation 404 on the Navigation 404 tab is checked.*

Shadows

The **Shadows** checkbox allows to consider the 3D model as an obstacles in the calculation of shadows 178 in the 3D World 342 and in the Graphics window 161 regardless of the state of checkboxes Calculate shadows from 3D models 491 in the Options box and Shadow 283 on the Current construction parameter panel.
A 3D model with the **Shadows** option checked behaves like a construction 193 that is an obstacle if its **line type** has checked Shadow 475 option and it belongs to a **layer** with the Shadows 277 option checked.

This checkbox should not have a mark for conventional 3D models - not a territory. Do not mark it unnecessarily.

See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

Lock

The Lock checkbox makes instances of the 3D model insensitive to selection 189 by mouse click. This option is required to work with projections of 3D models- territories in the Graphics window.

*Opportunity of selection by the **selection window** remains.*

To make 3D models will not cover cameras, check the Main Menu in the Graphics window View>Camera over constructions 242.

Thin lines

Mark of this checkbox increases the thickness of the thin dark lines on a light background to one pixel when displaying projection of the 3D model in the **Graphics window**. In most cases it improves legibility of the projection when it is scaled.

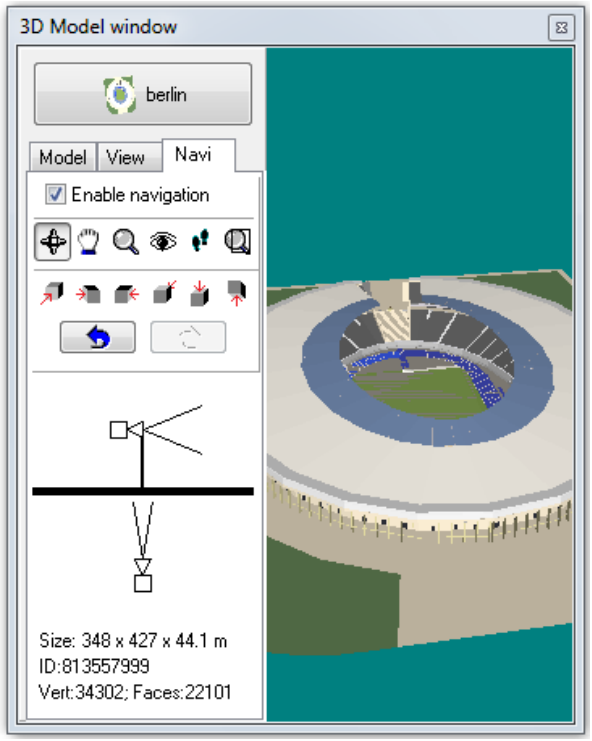
Textures

The **Textures** checkbox allows you to hide textures of 3D models with textures. Hiding textures increases the speed of redrawing complex 3D models and hides an excessive amount of detail, allowing you to concentrate on the geometry of 3D models.

9.9.3 Navigation

On the **Navi** tab, you can examine in detail the 3D model using the tools of navigation in 3D space. This can be useful when working with 3D models-territories.

Navigation interface is a simplified version of the interface of the 3D World 343.



Enable navigation

If the checkbox is not checked, the selected projection 399 of 3D model is displayed, ready to save. If the checkbox is checked, the 3D navigation interface is active.
Using the 3D interface, you can examine in detail features of the 3D model, "visit" in the premises of the 3D model-building, "walk" on the floors etc.

Functions of mouse buttons

- On the left mouse button the **Orbit** is assigned - moving the mouse cursor with the left button pressed rotates the 3D model in the space (or rotates the virtual viewer around the 3D model);

Function of the left button can be changed 405.

- On the middle mouse button the **Move** is assigned - moving 3D model in the field of view plane;

- On the rotation of the mouse wheel the **Zoom** tool is assigned - wheel rotation zooms in or out the point in the 3D space, where the mouse cursor is.

*Pressed **Ctrl** reduces step of zooming;*
Step and direction of zooming by turning the mouse wheel can be changed widely using Navigation>Scale factor 490 *in the Options box .*

- On the right mouse button the Look around **Look around** is assigned - rotates the sight

direction standing the virtual viewer stationary.

3D navigation buttons

By these buttons you can change function of the left mouse button.

Orbit - moving the mouse cursor with the left button pressed rotates the 3D model in the space (or rotates the virtual viewer around the 3D model).
This is default function of the left mouse button.

Move - moving 3D model in the field of view plane.
*This is default function of the left middle mouse button. The middle mouse button works like in the Graphics window*162.

Zoom - moving the mouse cursor along vertical zooms in or out the point in the 3D space at the center of the display area. By double clicking in the display area you can specify a new center point.
Wheel rotation zooms in or out the point in the 3D space, where the mouse cursor is. The Zoom tool works like in the Graphics window.

*Pressed **Ctrl** reduces step of zooming;*
*Step and direction of zooming by turning the mouse wheel can be changed widely using Navigation>Scale factor*490 *in the Options box .*

Look around - rotates the sight direction standing the virtual viewer stationary.
This is default function of the right mouse button.

Walk - controls movement of the virtual viewer in virtual horizontal plane. Pressing the left mouse button fixes the starting point, moving the cursor from the starting point with left mouse button pressed sets the direction and speed of movement.

Zoom frame . Pressing the left mouse button specifies the first point of the zoom frame, moving the cursor with left mouse button pressed and releasing the left mouse button generates the ZOOM frame. After releasing the mouse button the virtual viewer will approach to content of the frame.

*This tool works like the function of the right mouse button*162 *in the Graphics window.*

Fixed views buttons

Allow to quick look at the model from any of 6 sides: **Front view**, **Left view**, **Right view**, **Back view**, **Top view**, **Bottom view**.

Step backward and Step forward buttons

Allows to move on the chain of previous views backward and forward.

Sight direction of the virtual viewer

Sight direction of the virtual viewer in vertical and horizontal planes and its view angle are represented as a camera.

Parameters of the model

On the bottom of the tab important parameters of the 3D model are displayed:

Size: - Sizes of the 3D model in the format **X:Y:Height**.
Sizes of instances of the 3D model along each coordinate axis can be set independently on the Current construction parameter panel 283.

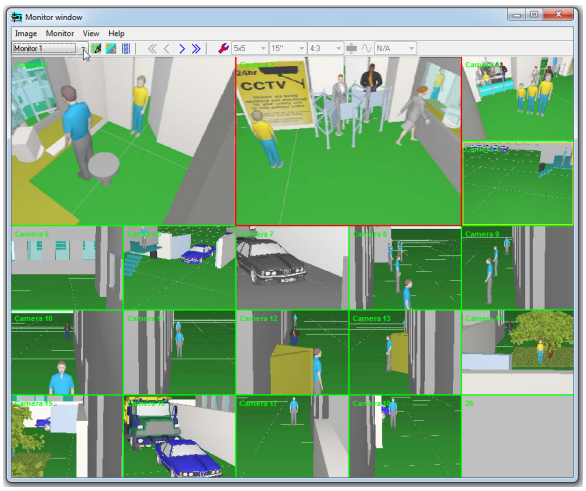
ID of the 3D Model. VideoCAD recognizes 3D models not by names, but by integer IDs. All 3D Models in the library must have different IDs.

Number of vertices (**Vert**) and faces (**Faces**) in the 3D model. The more vertices and faces are, the more complicated the 3D model, the more computational power is required for calculating shadows 178 from this 3D model in the Graphics window. For 3D models-territories with shadow calculation it is recommended to use 3D models with little number of vertices to increase drawing speed.

Shadow calculation in the 3D World 342 *less dependent on the complexity of 3D models, than the calculation in the Graphics window.*

9.10 Monitor window

Graphics window
Main menu
View
Monitor window



Monitor window is intended to model monitors of video surveillance system. However the field of application of this tool is much wider.

Together with 3D Video 357 the Monitor window allows to project video surveillance system, working directly with images. Thus all necessary changes on the drawing are carried out automatically.

Monitor window logically finishes the information transfer process in video surveillance system "from a real object to an operator" and thus, allows to model the video surveillance system as a hole.

In Monitor window there can be up to 10 monitors. On each monitor up to 100 images from cameras could be displayed simultaneously or with the dividing into screens.

Monitor window can display static and animated 386 images. Animated images in different cells can have different frame rate 375.

Using Monitor window in order to achieve the best result it is possible to compare various variants of cameras' placement.

Monitor window is useful at designing an operator's workplace. It is possible to estimate the detail of images from cameras in split screen, an option to display images from different cameras in various sizes, choose optimal quantity and sizes of monitors as well as optimal distance of watching these monitors, taking into account features of projected video surveillance system.

Together with PTZH frame 365 this tool offers a new method 546 of 3D CCTV design.

See also: Work with Monitors 417, Monitor window Tool bar 408, Monitor window Main menu 412, Monitor window Pop-up menu 415.
External link: "The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(.pdf)*
.

9.10.1 Tool bar

Monitor 1 Monitor list 408

Update 408

Day/Night 409

Animation 409

Previous screen 409, Next screen 409

Previous cell 409, Next cell 409

Edit 410

5x5 Monitor dimension 410

15" Monitor diagonal 410

4:3 Screen Acpect Ratio 410

Stretch another aspect ratio images 410

Analog monitor 410

1280*1024 Monitor resolution 411

Monitor 1 Monitor list

In the combo box there is a name of displayed monitor. It is possible to choose other monitor. In VideoCAD there are 10 monitors, in which the set of cameras and the parameters are adjusted independently.
*To rename the displayed monitor use item **Main menu** Monitor>Rename 413.*

Update

Update all images on the displayed monitor.

Monitor window itself does not generate 3D images, but uses the ready images which are created in 3D Video 357 and are stored in the memory that allows to work simultaneously with a big quantity of 3D images without decreasing program's speed.

As a result of clicking this button, for some time **3D Video** will appear, in which the images from all cameras will be modeled according to saved parameters of the cameras.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and resolution 329 box.

To update the image in one cell click it by the right mouse button and choose in the pop-up menu Update 415.

Day/Night

Switch Day/Night 371 time in the project and update all images on the displayed monitor.
As a result of clicking this button, the Day/Night 371 time on the Scene 371 tab on the Camera parameters panel 370 will be switched, then for some time **3D Video** will appear, in which the images from all cameras will be modeled according to saved parameters of the cameras.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and resolution 329 box.

Animation

Turn On/Off animation on the monitor..
When the Animation is turned On, animated images will be generated and loaded on the Monitor.

The 3D Video 357 will appear when necessary, in which animated images from cameras with enabled animation 386 will be generated.

In order to make image from a camera animated:
- Image parameter panel>View>Animation 386 box must be checked;
- Number of frames 386 must be more than one;
- these settings must be saved in camera parameters 390.

To make visible movement on an animated image, in the view area 3D models 203 with non-zero speed and (or) object Rotakin 205 must present.

See also: Creating animated model of monitor 577.
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Previous screen, Next screen

Each monitor consists of 100 cells, but it is also possible to display a smaller quantity of cells simultaneously. The quantity of simultaneously displayed cells is chosen in the Monitor dimension 410 combo box.

Clicking the buttons **Previous screen** and **Next screen** shift the displayed cells on the **quantity of simultaneously displayed cells.**

*For example, if the monitor's dimension is 2x2, 4 cells are simultaneously displayed. If cells 5,6,7,8 are displayed, as a result of clicking the **Previous screen** button - cells 1,2,3,4 will be displayed, and by clicking the **Next screen** button - cells 9,10,11,12 will be displayed.*

Thus, each monitor can have several screens.

Previous cell, Next cell

Each monitor consists of 100 cells, but it is also possible to display a smaller quantity of cells simultaneously. The quantity of simultaneously displayed cells is chosen in the Monitor dimension 410 combo box.

Clicking the buttons **Previous cell** and **Next cell** shift displayed cells on one cell.

*For example, if monitor's dimension is 2x2, 4 cells are simultaneously displayed. If cells 5,6,7,8 are displayed, as a result of clicking the **Previous cell** button - cells 4,5,6,7 will be displayed, and by clicking the **Next cell** button - cells 6,7,8,9 will be displayed.*

Edit

If this button is pressed, the **monitor editing tools** become available:

Monitor dimension 410
Monitor diagonal 410
Screen Acpect Ratio 410
Stretch another aspect ratio images 410
Analog monitor 410
Monitor resolution 411
Monitor>Clear 413
Monitor>Rename 413
Clear cell 415
Opportunity of cameras connection to the monitor 417
Opportunity of moving and copying cells 418

If this button is not pressed, monitor's editing is locked for protection against accidental change of the monitor.

5x5 Monitor dimension

In the combo box it is possible to choose quantity of simultaneously displayed cells on the current monitor.
2x2 corresponds to 4 cells, 3x3 - to 9 cells, etc.

One image can occupy 1, 4, 9 or 16 side-by-side located cells.

Changing value in the box is possible only in Edit mode 410 of the monitor.

15'' Monitor diagonal

In the combo box it is possible to choose **physical size of the screen** of the current monitor. The size is set by diagonal, in inches. Value **N/A** corresponds to the size which is not set. If the physical size is set, possibility to change the sizes of **Monitor window** by the mouse is locked.

*To get precise sizes of the Monitor window you can adjust Monitor size factor 492 in the **Options box.***

To change value in the box is possible only in Edit mode 410 of the monitor.

4:3 Screen aspect ratio

You can choose in the combo box screen aspect ratio. 4/3 - standard monitor, 16/9 - wide-screen monitor.

Stretch another aspect ratio images

If the button is pressed then images from cameras with differing aspect ratio will be stretched.

Analog monitor

This tool allows to model analog monitors, the resolution of which is below the computers' one. If this button is pressed, the resolution of the monitor is limited to value **768x576** pixels.

To change button's state is possible only in Edit mode 410 of the monitor.

1280*1024 Monitor resolution

In this box you can set resolution of the monitor. Resolution in the Monitor window will be limited by value in this box.

Changing value in the box is possible only in Edit mode 410 of the monitor.

9.10.2 Main menu

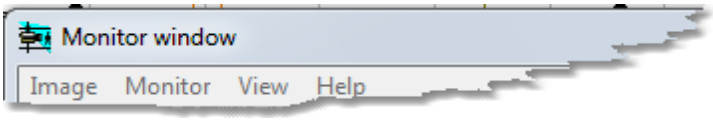


Image
- Save as *.bmp 412
- Save as *.jpg ,*.gif, *.tif, *.png 412
- Export to *.html 412
- Printer setup 412
- Print 412

Monitor
- Update 412
- Edit 413
- Clear 413
- Rename 413

View
- Day/Night 413
  - Animation 413
  - Full screen 414

Help 414

Image > Save as *.bmp

Save the image in the **Monitor window** in ***.bmp** format. The image is saved exactly as on the screen, but the obtained file will be big.

Image > Save as *.jpg, gif, *.tif, *.png

Save the image in the **Monitor window** in ***.jpg, *.gif, *.tif, *.png** formats**.** The image is saved compressed, at that a small loss of quality appears, but the file size turns to be small.

Image > Export to *.html

*Export the image in the monitor window to ***. html** file. This file can be viewed in any Internet browser.*

The main html file and separate image files are generated. Images are saved with resolutions according to parameters of each camera. The images are stretched by a browser when viewing. All files are saved in one directory.

Image files can be static (.png), and animated 413 (animated *.gif).*

See also: PDF Report 216

Image > Printer setup

Choosing this item opens a standard dialog box of current printer setup in Windows.

Image > Print

Print the image in the Monitor window.

Monitor > Update

Update all images on the displayed monitor.

Monitor window itself does not generate 3D images, but uses the ready images which are created in 3D Video 357 and are stored in the memory that allows to work simultaneously with a big quantity of 3D images without decreasing program's speed.

As a result of clicking this button, for some time **3D Video** will appear, in which the images from

all cameras will be modeled according to saved parameters of the cameras.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and resolution 329 box.

To update the image in one cell click it by the right mouse button and choose in the pop-up menu Update 415.

Monitor > Edit

If this item is checked, the **monitor editing tools** become available:

Monitor dimension 410
Monitor diagonal 410
Screen Aspect Ratio 410
Stretch another aspect ratio images 410
Analog monitor 410
Monitor resolution 411
Monitor>Clear 413
Monitor>Rename 413
Clear cell 415
Opportunity of cameras connection to the monitor 417
Opportunity of moving and copying cells 418

If this item is not checked, monitor's editing is locked for protection against accidental change of the monitor.

Monitor > Clear

Clear all cells of the displayed monitor, delete images and disconnect cameras.

Item is accessible only in Edit mode 410 of the monitor

Monitor > Rename

Rename the displayed monitor. As a result of clicking this item a dialog box will appear, in which it is possible to enter the new name of the monitor.

Item is accessible only in Edit mode 410 of the monitor

View > Day/Night

Switch Day/Night 371 time in the project and update all images on the displayed monitor.
As a result of clicking this item, the Day/Night 371 time on the Scene 371 tab on the Camera parameters panel 370 will be switched, then for some time **3D Video** will appear, in which the images from all cameras will be modeled according to saved parameters of the cameras.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and resolution 329 box.

View > Animation

Turn On/Off animation on the monitor..
When the Animation is turned On, animated images will be generated and loaded on the Monitor.

The 3D Video 357 will appear when necessary, in which animated images from cameras with enabled animation 386 will be generated.

In order to make image from a camera animated:

- Image parameter panel>View>Animation 386 box must be checked;
- Number of frames 386 must be more than one;
- these settings must be saved in camera parameters 390.

To make visible movement on an animated image, in the view area 3D models 203 with non-zero speed and (or) object Rotakin 205 must present.

See also: Creating animated model of monitor 577.

View > Full screen

Show the image from the displayed monitor **at full screen**.
In this mode it is possible to switch monitors sequentially using the keys **Page Up** and **Page Down**, to shift cells by cursor moving keys **Arrow left** and **Arrow right**, to change monitor's dimensions by cursor moving keys **Arrow up** and **Arrow down**.

To return to the monitor's showing in the window press any other key.

Help

Show Help section with description of **Monitor window.**

9.10.3 Pop-up menu

***The Pop-up menu** appears as a result of clicking the right mouse button on any cell in **Monitor** w **indow**. Operations in the pop-up menu are carried out **above the camera**, **the image from which is present at the cell.** Therefore, in case of an empty cell items of the menu are inaccessible. Exception is the Clear cell 415 item, which action concerns to the cell. Clicking this item deletes the image from the cell.*

Show in 3D Video 415
Update 415
Activate 415
Find on layouts 415
Clear cell 415

Show in 3D Video

Show the image in this cell in 3D Video 357. The same result will be obtained, by double click the cell.

It is convenient in **3D Video** check the item of **Main menu**>View> PTZH frame 365 and visually adjust cameras' positions. It is also possible to model parameters of the image and conditions of surveillance. Thus, it is possible to project video surveillance system, working only with images. All necessary changes on the layout will be automatically carried out.
After changing the camera's parameters click the Update 415 item.

Update

Update the image from the camera connected to this cell.

Monitor window does not generate 3D images itself, and uses ready images which are created in 3D Video 357 and are stored in the memory that allows to work simultaneously with a big quantity of 3D images without program's speed decreasing.

As a result of clicking this item, for some time **3D Video** will appear. In this window the image from the camera will be modeled. The image will be modeled according to saved parameters of the cameras.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and resolution 329 box.

*To update the images on the monitor use the Update 408 button on the **Tool bar.***

Activate

Activate 164 the camera, connected to this cell.

Find on layouts

Find on layouts and select the camera, connected to this cell.

Clear cell

Delete the image from this cell and disconnect the camera from it.

Item is accessible only in *Edit mode* 410 of the monitor

9.10.4 Work with Monitors

Opening Monitor window

For opening the **Monitor window** click the Monitor window 187 button on **Graphics window** tool bar. At first opening in Monitor window the first monitor with the name **Monitor 1** and parameters by default will be shown.

If the monitor is already adjusted and cameras are connected to it, at first opening **Monitor window** after starting the program for some time 3D Video 357 will appear, in which images from these cameras will be modeled.

*Generation of 3D images can take a lot of time. To interrupt generation press **ESC**.*

Preliminary monitor's adjustment

For monitor's adjustment, first of all switch on **edit mode** by clicking the Edit 410 button.

For renaming the monitor click the item in the **Main menu of Monitor window** Monitor > Rename 413.

Select **quantity of cameras, which will be displayed** the Monitor dimension 410 combo box.

If necessary, select **physical size** of monitor's screen in the Monitor diagonal 410 combo box. *Having set the size it will be impossible to change the size of Monitor Window by the mouse.*

If it is an **analog monitor**, click the Analog monitor 410 button. The button should look pressed.

In the Monitor resolution 411 box you can specify the resolution of monitor.

Connecting cameras

Connection of cameras is available only in **Edit mode** (Edit 410 button is pressed).

Select 189 necessary cameras on the layout in **Graphics window**, and then click a cell on the monitor, beginning from which these cameras should be displayed on the monitor.

For some time 3D Video 357 will appear, in which images from these cameras will be modeled. After that the images will appear in cells of the monitor, beginning from a cell selected by click.

Thus it is possible to connect any quantity of the selected cameras simultaneously.

*If at the moment of clicking on the monitor **Ctrl** is pressed, new cameras will fill only free cells on the monitor. Cells already filled will not change.*

The image from each camera is modeled according to saved parameters of the camera.

Camera parameters can be saved on the Camera parameters panel 370 and in the Sensitivity and

resolution 329 *box.*

Placement of images

Images can be changed in positions, copied, deleted, merged in 4,9,16 side-by-side located cells to get big images from some cameras

For placement of images the Edit 410 *mode should be switched on.*

To **interchange images' positions** in two cells, first click the first cell, then the second one.

For **copying the image** from one cell in another, first click the cell, from which it is necessary to copy the image, and then on the cell, where it is necessary to copy the image. At the same time **Ctrl** should be pressed.

To delete the image from the cell, click it by the right mouse button and choose in pop-up menu Clear cell 415.

To delete all images from the monitor choose item in the **Main menu**>Monitor>Clear 413.

To increase images' size by **merging the cells,** place the images from one camera in 4, 9 or 16 side-by-side located cells. These cells are merged automatically.

Updating images

Monitor window does not generate 3D images itself, and uses the ready images which are created in 3D Video 357 *and which are stored in the memory. That allows to work simultaneously with a big quantity of 3D images without decreasing the program's speed.*

That is why after changing the parameters of a camera it is necessary to **update** camera's image on the screen. To update the image in a cell click it by the right mouse button and choose in the pop-up menu Update 415. Then **3D Video** will appear**,** in which the image will be modeled according to saved parameters of the camera.

Camera parameters can be saved on the Camera parameters panel 370 *and in the Sensitivity and resolution* 329 *box.*

To update all images click the Update 408 button on the Tool bar.

Creation of animated monitor

Monitors can display animated 386 images. Monitor with animated images can be exported to *.html file.

See: Animation 413*, Export to html* 412*, Creating animated model of monitor* 577*.*
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

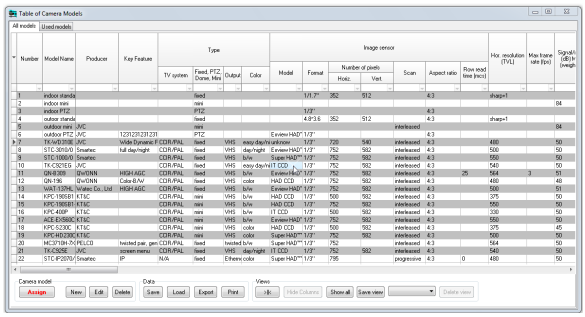
Work with monitor

In order not to change monitor's adjustment by accident, switch off **Edit mode** by clicking the Edit 410 button. The button should look not pressed.

Application of monitors at designing can be various. For acquaintance with all options of the work with monitors, see: Tool bar 408, Menu bar 412 and Pop-up menu 415.

9.11 Table of camera models

Graphics window
Tool bar
Table of camera models



The table displays parameters **of camera models**. Rows in the table correspond to models and columns in the table correspond to model parameters.

To get help for any parameter, select a cell and press F1 or use the Help of parameter (F1) 429 ***item in the pop-up menu.***

Models can be assigned 425 to cameras in the project. As a result of model assignment to a camera, model parameters 430 would be assigned to the camera.

In the table there is a variety of parameters 430, which is sufficient for description almost all security cameras existing at the moment of VideoCAD creation. Some parameters are used in camera modeling in VideoCAD, the rest of parameters exist only for comparison and for information. Parameters values can be taken from camera specifications.

Many cameras have different parameters in different modes, for example, at different resolutions, different combinations of settings. If you need to simulate different modes of these cameras, you should create several models for single camera.

At adding 425 new model it is not necessary to specify all parameters, it is possible to set only important for a current task parameters. Unused columns in the table can be hidden 427. It is possible to create variety of table views 426 with different sets of columns and switch between them.

Search 424, filtering 423, sorting 423 of camera models by parameters are possible. These functions make the table suitable for optimal choice of camera models for specific tasks.

It is possible to print 426 or export 426 the table or its separate fragments into formats *.txt, *.csv, *.htm, *.rtf, *.xls.

It is possible to paste 428 fragments from **Excel** and copy 428 fragments to **Excel** using standard copying and pasting.
At that the copying cell number and types of data in the copying cells should coincide.

In the table **the sums of some parameters** are automatically calculated and displayed in the bottom row.

The table of camera models has 2 tabs:

All models

On the tab all camera models, which are available in the database of models, are presented. It is possible to add 425 new models, edit 425 and delete 426 existing ones, as well as to assign 425 models to cameras in the project.

*The assigned model will be copied to the **Used models** tab automatically.*

The database file of models on this tab is located in the VideoCAD installation directory and is not included in the project. It is possible to save 426 the database of models to file and load 426 from file.

Sensitivity parameters of camera models, which are being in the table by default, ***are tested*** 551 ***in laboratory of CCTVCAD Software****. These models can be used in illumination modeling.*

Used models

On the tab there are camera models, which have been already assigned to cameras in the project.

It is possible to edit 425 models and assign 425 models to cameras in the project. Adding and deleting models from this tab is carried out automatically.

The assigned model from the ***All models*** *tab is automatically copied to the* ***Used models*** *tab. If the model is not used in the project any more, it is deleted from this tab.*

The database of models on the **Used models** tab is a part of the project. As a result of opening the project on other computer on the tab there will be the same models. You can copy 426 model from this tab to the **All models** tab.

See more: Table Interface 422, *Tool bar* 425, *Pop-up menu* 428, *Parameters of camera model* 430.

9.11.1 Interface

Interface of the **Table of camera models** includes:

Table Interface 422;
Tool bar 425;
Pop-up menu 428.

9.11.1.1 Table Interface

Selecting model (row)

To select **model (row)** bring the cursor to the left end of the row. The cursor should become **a right arrow**  . Then click on this place. The selected row will be highlighted and marked by the sign  .
To select adjacent models use **up arrow** and **down arrow** keys.
By pressing the **down arrow** key on the bottom row, new model will be created.

Selecting column

To select a column bring the cursor to the border between header and data of the column. The cursor should become **down arrow**  . Click on this border.
To select several columns hold **Ctrl.** To select range of columns hold **Shift** or move the cursor, holding the left mouse button.

Selecting fragment

Bring the cursor to a corner cell of a fragment, press the left mouse button and then move the cursor, holding the left mouse button pressed. After selecting the fragment release the left mouse button.

Selecting and editing cell

To select a cell, click on it. To edit, click on the selected cell once again. In most cells it is possible to choose parameter value from the list.
It is possible to move around the cells using keys with arrows. For editing press Enter.

Some cells admit choice from the list of values only.

Changing column width

Bring the cursor to border of a column on the header. The cursor will become **a double arrow**  . Press the left mouse button and move the cursor. After getting the necessary width release the mouse button.

Changing row height

Bring the cursor to border of a row on the left edge of the table. The cursor will become **a double arrow**  . Press the left mouse button and move the cursor. After getting the necessary height release the mouse button.

You can change height only for all rows simultaneously.

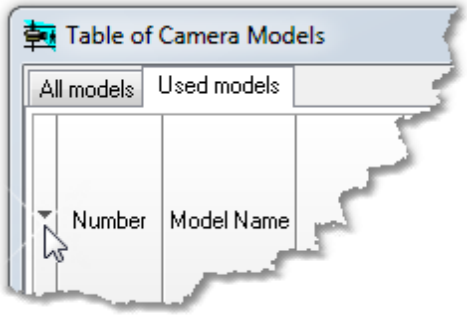
Moving columns

To move a column, place the cursor on the column header. Press the left mouse button and move the cursor. After moving column, release mouse button.

Visibility of columns

You can adjust visibility of columns, save and restore table structures as **Views**.

To show/hide any particular column:



- Click on the black triangle on the top-left corner of the table;
- In the appeared menu choose Visible columns;
- In the appeared list of all columns check or clear name of necessary columns.

See also: *Table tool bar>Views* 426

Table Views

You can adjust visibility of columns, save and restore table structures as **Views**.

See also: *Table tool bar>Views* 426

Sorting by column data

To sort by the parameter value in the column, just click on the column header. Reclick changes sort order to the reverse one.

*To disable sorting, sort by the **Number** column.*

Filtering by parameter value

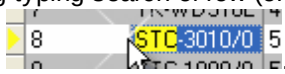
Click on the arrow in the combo box at the column top (between parameters values and header)  and choose parameter value from the list.

In this combo box you can specify following filters:

- **Order by descending**;
- **Order by ascending**;
- **Clear filter**;

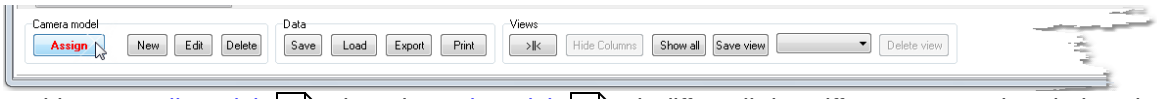
- **Custom**; - Combined custom filter with several conditions.
- **All** - all rows;
- **Not empty** - only not empty;
- **Empty** - only empty.
- **Boxes with possible field value**. Just select needed values.

Searching by parameter value

Select any cell in a column (just select by one click, the cell should not be in edit mode). Type fast a parameter value on the keyboard. During typing search of row (of model) will be carried out with the typing parameter value in this column 
.

See also: *Table of camera models* 419, *Tool bar* 425, *Pop-up menu* 428, *Parameters of camera models* 430

9.11.1.2 Tool bar



Tool bars on All models 419 tab and Used models 420 tab differ a little. Differences are given below, in tool descriptions.

Camera model

Assign

Assign model selected in the table to the active 164 camera.
As a result of assignment, model parameters 430 will be assigned to parameters of the active camera. Changing of some parameters of the active camera will be disabled or restricted according to model limits.
If model from the All models 419 tab is assigned it will be copied to the Used models 420 tab.

*To assign one model to **all selected cameras,** use pop up menu of the Model of active camera 185 combo box on the Tool bar 169 of the **Graphics window**.*

New

The button is present on the All models 419 tab only.

Create a new camera model. After clicking this button the form of new model parameters 430 will appear.

*The **red highlighted parameters** are used in camera modeling. The rest parameters exist only for information and comparison of different models. The majority of parameters can be chosen from lists.*

It is possible to specify parameters not only in the special form, but also directly in the table of models. For specifying parameter, click the cell of table twice with an interval not less half of second. To turn the selected cell to edit state press Enter.
It is convenient to move the focus on the cells using the arrow keys. If you press the "down arrow" on the bottom line, a new line will be created.

*It is possible to copy fragments into the table from **Excel** table. At that the number of cells and data types should coincide.*

See also. Parameters of camera model 430

Edit

Edit parameters of camera model. After clicking this button, the form of editing model parameters 430 appears.

*The **red highlighted parameters** are used in camera modeling. The rest parameters exist only for information and comparison of different models. The majority of parameters can be chosen from lists.*

It is possible to specify parameters not only in the special form, but also directly in the table of models. For specifying parameter, click the cell of table twice with an interval not less half of second. To turn the selected cell to edit state press Enter.
It is convenient to move the focus on the cells using the arrow keys. If you press the "down arrow" on the bottom line, a new line will be created.

*It is possible to copy fragments into the table from **Excel** table, it is possible to copy cells within the table of models. At that the number of cells and data types should coincide.*

See also. Parameters of camera model 430

Delete

Delete model selected in the table. As a result of deleting model from the Used models 420 tab, model assignment will be removed from cameras, to which the deleted model had been assigned.

Copy to All models

The button is present on the Used models 420 tab only.

Copy selected model from the Used models 420 tab to the All models 419 tab.

Data

Save

The button is present on the All models 419 tab only.

Save model database to file.

Load

The button is present on the All models 419 tab only.

Load model database from file.

Export

Export table of camera models to any of the following formats: ***.txt, *.csv, *.htm, *.rtf, *.xls**. File format can be chosen in **Save as** dialog box appeared.

You can export selected fragments using pop-up menu 428.

Print

Print full table of camera models or a selected fragment of the table. Print dialog box will open in which it is possible to adjust printing options.

Views

View - is a set, width and order of visible columns.
In the table there are more than hundred parameters 430 by which it is possible to describe the

majority of security cameras existing at the moment of VideoCAD release. In real projects there is no necessity to use all parameters. At various times different parameters sets are necessary. You can hide 427 unnecessary columns, place 423 the rest columns in required order and save 427 obtained view. After that at any moment you can restore 427 the saved view (i.e. set and order of visible columns).

Compress/Expand

Compress columns so that the table is placed completely on the screen or restoring normal width of columns.

Hide columns

Hide selected 422 columns.

Show all

Show all columns including hidden 427 ones.

Save view

Save current table view 426. Dialog box will open, in which it is necessary to enter view name. The name will appear in the Table view list 427.

Table view list

In the list there are all earlier saved views 426 of the table. To load a view, just choose its name in the list.

Delete view

Delete the view 426, the name of which is displayed in the Table view list 427.

See also: Table of camera models 419, *Table interface* 422, *Pop-up menu* 428, *Parameters of camera model* 430.

9.11.1.3 Pop-up menu

Pop-up menu appeares at right-clicking on the **Table of camera models**.

Hide selected columns

Hide selected 422 columns.

Freeze columns up to selected one

Freeze columns, beginning from the left column up to selected 422 one. Frozen columns will not be moved at horizontal scrolling of the table.

Show all columns

Show all columns including hidden 427 ones.

Cut selection

Cut contents of selected 422 cells to the clipboard.
The cut contents can be pasted 428 to other cells of the table or to **Excel** table.

Copy selection

Copy contents of selected 422 cells to the clipboard.
The copied contents can be pasted 428 to other cells of the table or to **Excel** table.

Paste

Paste clipboard contents to the selected 422 cells.

*The content can be copied 428 from other sells or from **Excel** table. The copying cell number and types of data in the copying cells should coincide.*

Delete selection

Clear selected 422 cells.

Print

Print selected 422 fragment of the table.
Print dialog box will open in which it is possible to adjust printing options.

Export selection

Export selected 422 fragment to any of the following formats: ***.txt, *.csv, *.htm, *.rtf, *.xls**. File format can be chosen in **Save as** dialog box appeared.

Select all

Select all cells.

Open Internet link

Internet link is a camera model parameter 430 too. To each model an Internet link to more detailed information can be assigned.

Help of parameter (F1)

Open help system topic with description of the parameter in the selected cell.

*Effect of the item is similar to **F1** pressing.*

Update cameras of the selected model

*At changing model parameters in the table, the parameters of cameras of this model, **do not change** automatically.*

Choose this item to bring parameters of all cameras **of the selected model** in correspondence with the parameters of this model.

The item is present only in the pop-up menu of Used models 420 tab.

Update cameras of all models

*At changing model parameters in the table, the parameters of cameras of this model, **do not change** automatically.*

Choose this item to bring parameters of **all cameras** in correspondence with the parameters of **all models**.

The item is present only in the pop-up menu of Used models 420 tab.

See also: Table of camera models 419, Table interface 422, Tool bar 425, Parameters of camera models 430.

9.11.2 Parameters of camera model

*The **bold parameters** are used in camera modeling. The rest parameters exist only for information and comparison of different models.*

See also: Table of camera models 419

9.11.2.1 Parameter description

*The **red highlighted parameters** are used in camera modeling. The rest parameters exist only for information and comparison of different models. The majority of parameters can be chosen from lists.*

Number

Unique model number in the base of models. At the moment of new model creation the number is generated automatically.

Name

Model name.

Producer

Producer of the model.

Key feature

Key feature of the model.

Type

TV system

Television system (CCIR/PAL, EIA/NTSC). Not used for digital (IP) cameras (N/A).

If EIA/NTSC is chosen, then maximal exposure time 435 sets to 1/60s, or else 1/50s.

Fixed, PTZ, Dome, Mini

Standard camera, PTZ camera, dome camera, mini-camera, auto-dome camera.

If the Display camera type box (on the Camera and Illuminator 483 Camera icon tab in the Options box 474) is checked:

- If **PTZ** or **auto-dome** camera is chosen, icons of cameras of this model in the Graphics window will correspond to PTZ camera .
- If **mini-camera** (**mini** or **mini-dome**) is chosen, icons of cameras of this model in the Graphics window will correspond to mini-camera .
- If **panoramic** is chosen, icons of cameras of this model in the Graphics window will correspond to panoramic camera or .

The icon type is influenced by Protection 441 parameter as well.

Output

Output type of camera.

Color

B/W (black&white), **color**, **day/night** (removeble IR filter) **easy day/night** (permanent IR filter). At illumination reduction **day/night** and **easy day/night** cameras are switched into black-white mode.

Color parameter influences 3D model 357 color as well as **spectral sensitivity** of cameras to various light sourses 464.

See more: Color 332

Image sensor

Model

Image sensor model. If **ExView HAD ™ CCD** is chosen, in calculation of illumination from different light sources special factors 464 will be used, considering increased relative IR spectral sensitivity of such image sensor.

See also: ExView 332

Size

The **Size** parameter determines **size of the image sensor** or **size of active area of the image sensor**.

See more: Image Sensor and Active area of image sensor

The **Image sensor size** can be specified by any of the following ways:

- By format (type) in inches. For example **1/3"**;
- By diagonal size of the image sensor in millimeters, in the form of **dX.Y**. For example: **d6.0.**
- By sensor sizes in millimeters horizontally and vertically via hash, in the form of **W#H**. For example: **4.8#3.6;**

After **format** or **length of diagonal**, separated by space, you can specify the **aspect ratio of the image sensor** in the form of **W:H.** For example: **1/3" 16:9** or **d6 16:9.** If the aspect ratio of the image sensor is not specified, it is assumed equal to **4:3**.

Active area size of the image sensor can be specified in millimeters horizontally and vertically via asterisk, in the form of **W*H**. For example: **4.8*3.6;**

See also: Image sensor size 293, *Specifying active area size of the image sensor* 636

Number of pixels

Horizontal and vertical numbers of effective pixels of the image sensor.
Number of pixels is used in modeling image resolution and in calculation of person detection, identification and license plate reading areas.
Number of pixels of output image are set separately 381 and can differ from the numbers of effective pixels of the image sensor.

See also: Number of pixels 332

Scan

Interlaced or progressive. Analog cameras always have interlaced scan. Digital cameras can have progressive scan.

Progressive scan is preferable.

Modeling interlace distortion can be enabled separately in camera parameters. This parameter of camera model does not affect the simulation of interlace scan .

See also: One field 382, Interlace 376

Aspect ratio

Aspect Ratio of the output image (horizontal side size of the **output image** to the vertical side size): 4:3, 16:9 etc.
The **Aspect ratio of the output image** may be different from the **Aspect ratio of the image sensor** (can be specified in the Size 432 field).

See more: Specifying the Aspect ratio on output image 641

You can enter custom values from keyboard in the form of <width> **:**<height>, for example **11:4**.

By specifying formats **3:4** or **9:16**, you can set the so-called **corridor format** in which the height of the frame is larger than its width.

For correct simulation resolution in the corridor format you must also swap the number of pixels horizontally and vertically in the camera parameters 432 and image processing 381 settings.

Via space character after the **Aspect ratio** you can set the **crop factor** - the ratio of cropping active area size of the image sensor when the active area does not touch the edges of the image sensor. Crop factor can be set as a vulgar fraction (separated by slash) or a real number. For example **4:3 0.67** or **16:9 720/1080**. If the crop factor is not specified, it is taken to be unity.

See also: Specifying 641 the crop factor 641, Aspect ratio 295, Specifying active area size of the image sensor 636

Rolling shutter

Row time (microsecond)

*This parameter is used for modeling distortion of moving 3D models 203 and rotating Rotakin 205 object arising from the **Rolling Shutter** effect.*

As a result of Rolling Shutter work, exposure of different rows of the image sensor begins and ends sequentially at different times, which causes a horizontal shift of moving objects.
*This effect occurs with many **IP cameras** with **CMOS** image sensor and doesn't occur with cameras with CCD image sensor.*

Row time (microsecond) is the time period **(in microsecond)** between the beginning of exposure of adjacent rows. Unfortunately this parameter is not given in the cameras' specification. To elucidate the value of the parameter you should contact the manufacturer or measured this time in practice.

See also: Rolling Shutter 378

Scan direction

This switch deternines direction of scanning strings by the Rolling shutter. Top-down or Down-top.

See also: *Rolling Shutter* 378

Resolution

LPH

Resolution of the camera, in LPH. At 3D modeling image resolution will be limited up to the value set in this field.

If **N/A** is chosen in the field, then resolution limitation is disabled.

Items **sharp+1**, **sharp+2**, **sharp+3** on the contrary increase image sharpness. With the help of these items it is possible to model effect of **Aperture corrector**.

Aperture corrector *is automatically switched-off at insufficient illumination.*

See also: *Resolution* 333

Contrast %

In the Contrast % you can specify a drop of contrast in % according to the MTF at the specified number of lines LPH 434.

Horiz. only

If **Yes** is set then only horizontal resolution is modeled, which is typical for analog cameras. If **NO** is set, the camera resolution will decrease horizontally and vertically in the same degree.

Maximal frame rate (fps)

Many of megapixel cameras have limits of frame rate, which depends on image number of pixels. The maximal frame rate of analog cameras is 25 fps (PAL) and 30 fps (NTSC).

For cameras of this model you can't set frame rate 375 more than the **Maximal frame rate**.

See also: *Frame rate* 375

Signal/noise (Max, dB, weighted)

Maximum signal/noise ratio. Unweighted value.

See more: *S/N max.* 335

Sensitivity

Min. scene illumination (lux)

In VideoCAD it is meant, that scene reflection factor is 0.75, light source - halogen incandescent lamp (color temperature 3100 +-200K) according to Standard ***CEA 639 'Consumer Camcorder or Video Camera Low Light Performance'****.*

For ***day/night*** 332 and **easy day/night** cameras in this box it is necessary to enter the minimum scene illumination **in black-white** mode.

For unambiguous description of sensitivity in VideoCAD, should be pointed also:

- with what lens aperture 435 the minimum illumination is measured;
- signal/noise 435 ratio of the image at the minimum illumination;
- IRE 435 of video signal at the minimum illumination.
- **exposure time** at what the minimum illumination is measured.

In VideoCAD the minimum illumination is specified at maximum exposure time 435.

See more: Min. illum. (lx) 334

AT:

Exposure (ms)

Exposure time (milliseconds) at which the minimum illumination has been measured.
Parameter is sometimes given in camera specifications. For analog cameras typically value is 20ms (PAL) or 16.5ms (NTSC). For IP cameras and analog cameras with light accumulation the exposure time may be up to 200ms or more.

*At modeling the exposure time assumed the truth of the **Reciprocity principle**, that is inversely proportional of sensitivity to the exposure time.*

See also: at exposure (ms) 335, modeling exposure 377.

Aperture (F)

Lens aperture at which the minimum scene illumination is measured.
The parameter is given in camera specification. Typical value from F1.0 up to F2.0.

Signal/noise (dB,unweighted)

Signal/noise ratio of the image at the minimum illumination 434, unweighted value.

According to CEA 639, limit value of signal/noise ratio at the minimum illumination determination is 17dB (7 times in voltage).

IRE

IRE of video signal at minimum illumination, at AGC switched on by default.

In VideoCAD 100 IRE corresponds full peak-to-peak amplitude of video signal and accordingly to maximum brightness amplitude on the image. 50IRE corresponds half of maximum brightness amplitude on the image, etc.

The parameter is given in camera's specification. Typical value is from 30 to 50.

AESC (ES, AES, shutter)

Exposure time limits within which electronic shutter operates.

The parameter is given in camera's specification. Modern **PAL** system cameras have exposure limits 1/50s-1/100000s. For cameras of **NTSC** system the maximum exposure is 1/60s. For **IP cameras** the maximum exposure time can be larger, up to several seconds.

See more: *AESC* 336

Processing

AGC (dB, Max.)

In this cell it is possible to specify **Maximum AGC gain (dB)** for cameras with switchable AGC gain: High AGC gain (High AGC, S-AGC, Super AGC) or LO AGC gain.
The box will be enabled and the set AGC limit will be considered in modeling, if the Set 337 box is marked.
Enter in the cell maximum AGC gain if it is given in the camera's specification.

Typical value is 26-42dB.

If the camera does not have switchable AGC gain, the maximum AGC gain is calculated by the program.

See also: *AGC* 336

Gamma

The parameter is given in cameras' specification. Normally gamma correction degree equals 0.45. The degree equal 1 is equivalent to absence of gamma correction.

See more: *Gamma* 337

DSP

Digital image processing inside of camera.

AWB

Automatic white balance.

Compression

Type of compression.

Modeling compression can be enabled separately in camera parameters. This parameter of camera model does not affect the simulation of compression.

See also: *Compression* 383

Other

Any other features of image processing inside of camera.

Connectors (sockets, input-output, I/O)

Presence or absence of various purpose connectors on camera case.

Switches and adjusments

AESC (shutter control)

Possibility of switching OFF/ON of electronic shutter and specifying its limits.
The parameter determines accessibility of shutter parameters 336 changing in the Sensitivity and Resolution 331 box for a camera of this model.

AGC

Possibility of switching OFF/ON of AGC and specifying its limits.
The parameter determines accessibility of AGC parameters 336 changing in the Sensitivity and Resolution 331 box for a camera of this model.

***Low/high** value corresponds to availability **of AGC gain switch**. AGC gain value in this case is specified by AGC parameter AGC (dB, max) 436.*

Gamma

Possibility of switching OFF/ON of Gamma correction and specifying its degree.
The parameter determines accessibility of Gamma parameters 337 changing in the Sensitivity and Resolution 331 box for a camera of this model.

Auto Iris DC (Direct)

Possibility of switching OFF/ON of Auto iris DC and specifying its level.
The parameter determines accessibility of Auto iris DC 338 changing in the Sensitivity and Resolution 331 box for a camera of this model.

BLC

Possibility of switching OFF/ON of Back light compensation and specifying its type.
The parameter determines accessibility of BLC parameters 337 changing in the Sensitivity and Resolution 331 box for a camera of this model.

Other 1..3

Any other switches and adjusments.

Remote control

Presence and type of remote control feature.

Lens

Model

Name of lens model.

Format

Lens format must be no less than camera sensor format 432.

Mount

Lens mount type.

Type

Lens type. If *fisheye* is chosen then the camera is a *panoramic* camera (180, 360 deg).

See more: *Panoramic* 312

IR correction

Lens infra-red correction. IR corrected lenses don't shift focus between normal scene illumination and IR illumination.

Focal length

Control

Focal length control type. For fixed focal length, changing focal length 185 is locked for camera of this model.

Min. (mm), Max. (mm)

Minimal focal length - camera view angles are maximal.
Maximal focal length - camera view angles are minimal.
For a camera of this model, changing lens focal length 185 is possible only **within the limits from minimal to maximal**.

*For a lens with the **fixed focal length** minimal and maximal focal length are equal.*

See also: *Lens focal length* 294

Angles of view (deg.)

Calculated angles of view of the lens. Angles of view are determined by VideoCAD, from camera sensor format 432 and lens focal length 438.

Real angles of view can differ from the calculated ones becouse of *Lens distortion* 431

Iris

Control

Iris control type. For fixed iris, changing aperture 339 is locked for camera of this model.

See also: *Iris type* 339

Max. (F), Min. (F)

Maximum aperture = the quantity of light passing through the lens is maximal = **minimal F number**.
Minimum aperture = the quantity of light passing through the lens is minimal = **maximal F number**.

The more the number is, the less light passes through a lens.

For a camera of this model aperture changing 340 is possible only within the limits from minimum to maximum.

See also: *Aperture limits* 340

Focus

M.O.D.

Minimum distance on which the lens can be focused.

Autofocus

Automatic focusing. This function can be found in cameras with built-in lens.

Resolution

lp/mm

Resolution of the lens in **line pairs per millimeter** (lp / mm).
Lp / mm - is the number of pairs of lines (black + white line) perpendicularly intersecting a segment on the image sensor of length of 1 millimeter.
Note the difference with the unit of *camera resolution, LPH*. Resolution of cameras is measured in the amount of black and white lines, but the lens resolution is measured in line pairs , that is, at the same actual resolution, the lp / mm value is in 2 times less than LPH.

Effect of lens resolution on the final resolution of the camera depends on the ratio of lens resolution in lp / mm to the number of pixels on the image sensor per 1mm (pixel density on the sensor) . Thus, the smaller the *size of the image sensor* 293 is and the more *pixels* 332 on it - the higher lens resolution must be in order that the lens does not spoil the resolution of the camera .

In the 3D Video 357 window image resolution will be limited by values in these boxed. If N/A is chosen, then the lens resolution limitation is disabled.

You can also simulate the camera resolution 333. *When the lens resolution simulation and camera resolution simulation are both enabled, then their effects are summarized.*

You can check resolution visually using the Test chart 388.

Contrast %

In the field you should enter contrast drop in % according to MTF (Modulation Transfer Function) at the specified value of **lp/mm** 439.

Distortion

ON

Turn ON/OFF simulating lens distortion.

See also: *Real angles* 439

Real angles

Lens distortion is defined by the values of the calculated and real view angles (horizontal, vertical , diagonal) . The calculated angles 438 are obtained by calculating from the focal length 438 and the image sensor size 432 (format). The real angles are usually given in the specifications of cameras and

lenses. If the real angle is unknown, you can get them by practical measuring 622.
To specify distortion it is enough to set one of three real angles: horizontal, vertical or diagonal. Preferable to set the horizontal angle. VideoCAD will calculate missing angles. For maximum accuracy, you can specify 2 or all 3 of the real angles .

If the column Set **Calc** is present, then this angle is not set, it will be calculated by the program, if there is **Set**, the corresponding real angle must be specified.

Attention! *Changing the lens* focal length 438 *or the* format / size of sensor 432 *at fixed real angles causes view area corruption and requires changing the real angles.*

See more: *Lens distortion* 308

Additional features

Synchro

Synchronization type: internal, linelock, genlock. Linelock and genlock are used in analog systems for preventing vertical jitter at multiplexing and for increasing speed of video capturing from several cameras.

BLC

Back light compensation control. The parameter determines accessibility of BLC control 337 in the Sensitivity and Resolution 331 box for a camera of this model.

See also: *BLC* 337

IR LED

Presence of build-in infra-red LED illuminators.

Microphone

Presence of a build-in microphone.

VMD

Presence of a build-in Video Motion Detector.

Flip

Automatic flip of an image is performed in such a manner that the top of the image always corresponds to the top of view area. Function could be found in AutoDome cameras.

Other 1..3

Any additional options.

Power supply

Voltage

Supply voltage of camera.

Consumption

Power (watt)

Power consumption of camera.

Current (A)

The consumption current of the camera. The current is calculated by VideoCAD from **power consumption** and voltage.

On the Used models 420 tab the total current and power consumption of all cameras of this model is displayed additionally.

Current type

Direct current, Alternating current or Power over Ethernet (PoE).

Case

Protection

Case protection.

*If protected housing (waterproof, outdoor or vandalproof) is selected and the **Display camera type box** is marked (on the Camera and illuminator 483 tab in the Options box 474), then the icon of the camera of this model in the Graphics window will correspond to the camera in housing .*

Environment

Temperature (C)

Environment temperature range.

Max. humidity (%)

Maximum humidity.

Form

Form of the case.

Size

Model sizes.

Weight

Model weight.

Color

Model color.

Compatible equipment 1..3

CCTV equipment, which is compatible with the model.

Compatible software 1..3

Software, which is compatible with the model.

Provider

Provider of the camera model.

Cost

Model cost.

Add. cost 1..3

Additional costs connected to using the model.

Total cost

The model price including additional costs. Value is calculated by VideoCAD by summing the Cost 442 and additional costs 442.

On the Used models 420 tab the total cost of all cameras of this model is displayed.

Add. information

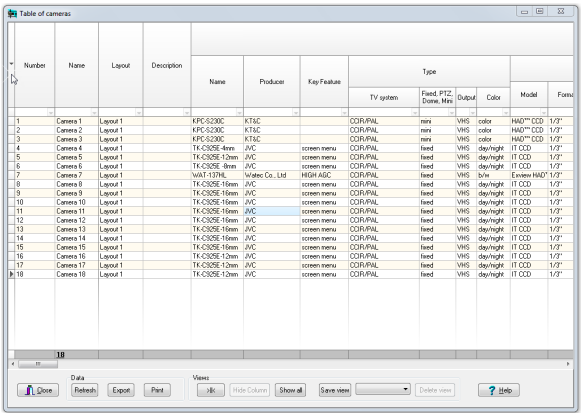
Any additional information about this camera model.

Internet link

Internet link to an information about this camera model.

9.12 Table of cameras

Graphics window
Tool bar
Table of cameras



The table of cameras can be used to control and edit camera parameters in the project, and for obtaining different reports as well.

In the table there are all input camera parameters 452 used in the program for calculation and all output parameters - calculation results.
Rows in the table correspond to cameras and columns in the table correspond to parameters.

To get help for any parameter, select a cell and press F1 or use the Help of parameter (F1) 451 item in the pop-up menu.

For different projects, different sets of parameters can be required.
Unused columns in the table can be hidden 449. It is possible to create variety of table views 448 with different sets of columns and switch between them.

Search 447 filtering 447, sorting 446 of cameras by parameters are possible

It is possible to print 448 or export 448 the table or its separate fragments into formats *.txt, *.csv, *.htm, *.rtf, *.xls.

It is possible to copy 450 fragments 450 to **Excel** using standard copying and pasting.

In the table the sums of some parameters are automatically calculated. The sums are displayed in the bottom row.

The Table of cameras is interactive. As a result of double clicking 445 on any cell, camera corresponding the row is activated and a box or several boxes are opened. In the boxes it is possible to control or change the parameter located in the cell. This function makes the table suitable for control and editing camera parameters.

See also: Table Interface 445, Tool bar 448, Pop-up menu 450, Camera parameters 452

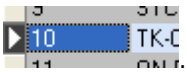
9.12.1 Interface

Interface of the **Table of cameras** includes:

Table Interface 445;
Tool bar 448;
Pop-up menu 450.

9.12.1.1 Table Interface

Selecting camera (row)

To select **camera (row)** bring the cursor to the left end of the row. The cursor should become **a right arrow**  . Then click on this place. The selected row will be highlighted and marked by the sign  .
To select adjacent cameras use **up arrow** and **down arrow** keys.

Selecting column

To select a column bring the cursor to the border between header and data of the column. The cursor should become **down arrow**  . Click on this border.
To select several columns hold **Ctrl.** To select range of columns hold **Shift** or move the cursor, holding the left mouse button.

Selecting fragment

Bring the cursor to a corner cell of a fragment, press the left mouse button and then move the cursor, holding the left mouse button pressed. After selecting the fragment release the left mouse button.

Selecting and editing cell

To select a cell, click on it. To edit, double-click on it.
It is possible to move around the cells using keys with arrows.

As a result of double clicking on cell:

- camera corresponding the row will be activated;
- box or several boxes will be opened. In the boxes it is possible to control or change the parameter located in the cell.

If it is an **input parameter** for calculation, it can be changed directly in the appeared box. If the parameter is a **result of calculation**, it is possible to change input parameters influencing this result.
If it is an **information parameter** of camera model, the Table of camera model 419 appears.

You can not edit parameters directly in the Table of cameras.

After editing parameter it is necessary to refresh 451 parameters of this camera in the **Table of cameras** using pop-up menu 450.

Changing column width

Bring the cursor to border of a column on the header. The cursor will become **a double arrow** . Press the left mouse button and move the cursor. After getting the necessary width release the mouse button.

Changing row height

Bring the cursor to border of a row on the left edge of the table. The cursor will become **a double arrow** . Press the left mouse button and move the cursor. After getting the necessary height release the mouse button.

You can change height only for all rows simultaneously.

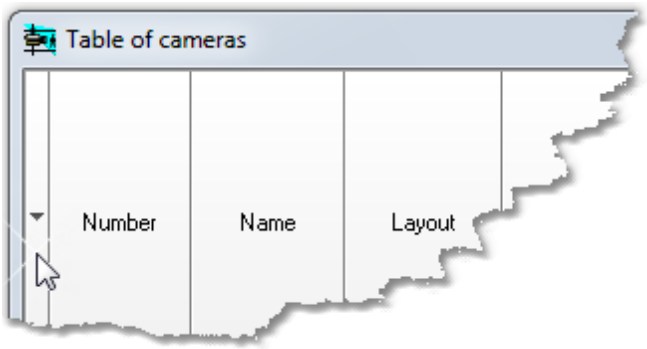
Moving columns

To move a column, place the cursor on the column header. Press the left mouse button and move the cursor. After moving column, release mouse button.

Visibility of columns

You can adjust visibility of columns, save and restore table structures as **Views**.

To show/hide any particular column:



- Click on the black triangle on the top-left corner of the table;
- In the appeared menu choose Visible columns;
- In the appeared list of all columns check or clear name of necessary columns.

See also: Table tool bar>Views 426

Table Views

You can adjust visibility of columns, save and restore table structures as **Views**.

See also: Table tool bar>Views 426

Sorting by column data

To sort by the parameter value in the column, just click on the column header. Reclick changes sort order to the reverse one.

*To disable sorting, sort by the **Number** column.*

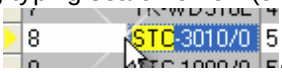
Filtering by parameter value

Click on the arrow in the combo box at the column top (between parameters values and header)  and choose parameter value from the list.

In this combo box you can specify following filters:

- **Order by descending**;
- **Order by ascending**;
- **Clear filter**;
- **Custom**; - Combined custom filter with several conditions.
- **All** - all rows;
- **Not empty** - only not empty;
- **Empty** - only empty.
- **Boxes with possible field value**. Just select needed values.

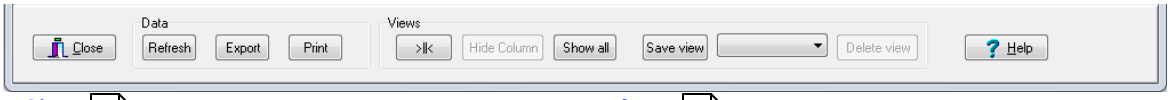
Searching by parameter value

Select any cell in a column (just select by one click, the cell should not be in edit mode). Type fast a parameter value on the keyboard. During typing search of row (of model) will be carried out with the typing parameter value in this column 

.

See also: *Table of cameras* 443, *Tool bar* 448, *Pop-up menu* 450, *Camera parameters* 452

9.12.1.2 Tool bar



Close

Close the **Table of cameras**.

Data

Refresh

As a result of choosing this item, data in the selected row will be refreshed.

Data are not refreshed automatically in program operation. Refreshing all data could take some time. *To refresh only one camera parameters select any cell on the row of the camera, right-click on the cell then choose Update camera parameters* 451 *in the pop-up menu.*

Export

Export table of cameras to any of the following formats: ***.txt, *.csv, *.htm, *.rtf, *.xls**. File format can be chosen in **Save as** dialog box appeared.

You can export selected fragments using pop-up menu 450 *.*

See also: PDF Report 216

Print

Print full table of cameras or a selected fragment of the table. Print dialog box will open in which it is possible to adjust printing options.

Views

View - is a set, width and order of visible columns.
In the table there are more than hundred parameters 452 by which it is possible to describe the majority of security cameras existing at the moment of VideoCAD release. In real projects there is no necessity to use all parameters. At various times different parameters sets are necessary. You can hide 449 unnecessary columns, place the rest columns in required order and save 449 obtained view. After that at any moment you can restore 449 the saved view (i.e. set and order of visible columns).

Compress/Expand

Compress columns so that the table is placed completely on the screen or restoring normal width

of columns.

Hide columns

Hide selected 445 columns.

Show all columns

Show all columns including hidden 449 ones.

Save table view

Save current table view 448. Dialog box will open, in which it is necessary to enter view name. The name will appear in the Table view list 449.

Table view list

In the list there are all earlier saved views 448 of the table. To load a view, just choose its name in the list.

Delete table view

Delete the view 448, the name of which is displayed in the Table view list 449.

See also: Table of cameras 443, *Table interface* 445, *Pop-up menu* 450, *Camera parameters* 452.

9.12.1.3 Pop-up menu

The pop-up menu appears as a result of right-clicking on the **Table of cameras**.

Hide selected columns

Hide selected 422 columns.

Freeze columns up to selected one

Freeze columns, beginning from the left column up to selected 445 one. Frozen columns will not be moved at horizontal scrolling of the table.

Show all columns

Show all columns including hidden 449 ones.

Copy selection

Copy contents of selected cells 445 cells to the clipboard.
The copied contents can be pasted to other cells of the table or to **Excel** table.

Print

Print selected fragment 445 of the table.
Print dialog box will open in which it is possible to adjust printing options.

Export selection

Export selected fragment 445 to any of the following formats: ***.txt, *.csv, *.htm, *.rtf, *.xls**. File format can be chosen in **Save as** dialog box appeared.

Select all

Select all cells.

Change parameter

The item is accessible, if the cursor is above selected cell. Effect of the item is the same as double clicking on the cell.

After choosing this item, camera corresponding the row will be activated and a box or several

boxes will be opened. In the boxes it is possible to control or change the parameter located in the cell.

If it is an **input parameter** for calculation, it can be changed directly in the appeared box. If the parameter is a **result of calculation**, it is possible to change input parameters influencing this result.
If it is an **information parameter** of camera model, the Table of camera models 419 appears.

It is impossible to edit parameters directly in the Table of cameras.

After editing parameter it is necessary to update 451 parameters of this camera in the **Table of cameras**.

Update camera parameters

As a result of choosing this item, data in the selected row will be refreshed.

Data are not refreshed automatically in program operation.

To refresh all data use the Refresh 448 button.

Refreshing all data could take some time.

Open Internet link

Internet link is a camera model parameter 430 too. To each model an Internet link to more detailed information can be assigned.

Help of parameter (F1)

Open help system topic with description of the parameter in the selected cell.

*Effect of the item is similar to **F1** pressing.*

See also: Table of cameras 443, *Table interface* 445, *Tool bar* 448, *Camera parameters* 452.

9.12.2 Camera parameters

The Table of cameras only displays camera parameters. Changing parameters is possible in other boxes of the program. Boxes for editing parameters can be called by double clicking 445 on a cell in the Table of cameras.
Detailed descriptions of each parameter are in Help topics of corresponding boxes.

Camera parameters include:

1. Basic parameters of camera:

- Number 213;

Unique number which is assigned to camera at its creation 171. It can be changed in the Camera list 509 box.

- Name 171;

It is assigned at creation 171. Later it can be changed in the Camera list 509 box or using the Camera numeration 511 tool or by double clicking on the cell in the Table of cameras.

- Layout 513;

Layout 513, on which the camera is placed.

- Layer 276;

Layer 276 to which the camera belongs.

- Description 171;

Any additional information about the camera. The information can be entered at camera creation 171 and can be changed in the Camera list 509 box.

2. Parameters of camera model 430;

Among **input parameters** of model in the **Table of cameras** there are calculation results obtained during image modeling:

- Current signal/noise ratio (dB, unweighted) 335;
- Current Electronic shutter exposure (1/s) 336;
- Current AGC gain (dB) 336;
- Current lens focal length (mm) 294;
- Current angles of view 294;
- Current aperture 341.

3. Camera installation parameters (Geometric parameters) 291;

4. Criteria of person detection, identification and license plate reading 498;

The criteria are combined into Quality levels 505.

5. Depth of Field and Spatial resolution:

- Name of Spatial resolution pattern 318;
- Depth-of-field parameters 457;

6. Parameters of 3D modeling:

- Scene parameters 371;
- Camera parameters 375;
- Parameters of Image processing 381;

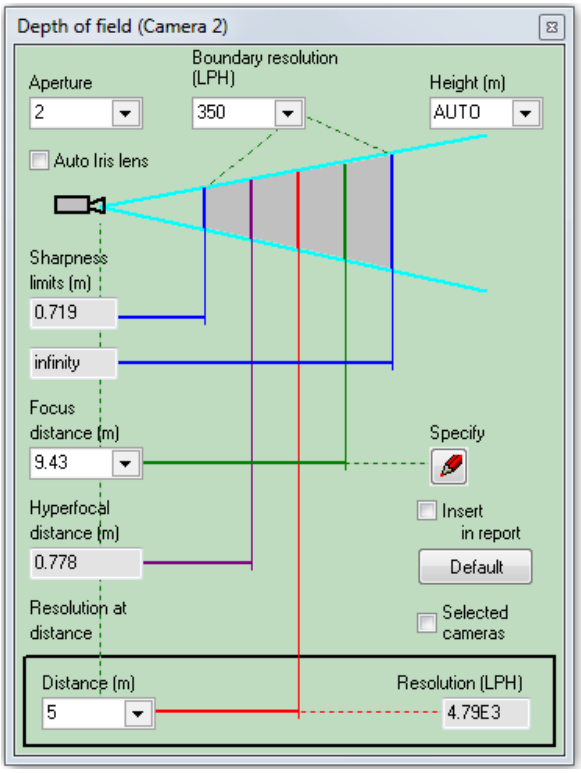
7. Cable parameters:

- Signal cable length 514;
- Power cable parameters 515.

See also: *Table of cameras* 443, *Table interface* 445, *Tool bar* 448, *Pop-up menu* 450.

9.13 Depth of field

Graphics window
Main menu
View
Depth of field



When using long-focus lenses the depth of field calculation may be necessary.
For example, in the case when one camera is used for the person identification at a short distance and for the person detection at a long distance. At that the sufficient resolution is required in both cases.

With the help of VideoCAD you can:

- Calculate the view area bounds, in which the resolution is not less than the predetermined value (**sharpness area**).
- Find the optimal **focus distance** of the camera lens to get the required sharpness area bounds.
- Find the **resolution in any point** in view area with other parameters specified.
- Simulate 379 Depth-of-Field distortion in the 3D Video 357.

The depth-of-field is influence by:

- **Lens focal length**. The less focal length 294 is the more is the depth of field. It makes sense to calculate practically the depth-of-field in CCTV beginning from the focal length 8-12 mm when resolution is less than 500-800 Lines per picture height (LPH). With less focal lengths the depth-of-field is sufficient at the correct lens focusing.

*As a rule with **Megapixel cameras** we need high optical resolution of lens.Therefore with **megapixel cameras** the Depth of field distortion can arise with the lesser focal length.*

- **Aperture**. The more the aperture number is the more is the depth-of-field. This dependence is clearly seen when using autoiris lenses. In the dark the diaphragm opens and the depth-of-field decreases.

- **Boundary resolution**. I.e. minimum acceptable resolution in the sharpness area. At that we should remember that **we won't get better resolution, than other video system components can give**. The boundary resolution should not exceed the real resolution of the in-focus image.
- **Focus distance**. I.e. minimum distance from the lens to the plane that is perpendicular to the main optical axes, on which the lens is focused.

  In most cases it is impossible to focus practically the lens on the predetermined distance, because the image sensor and monitor resolutions limit the possibility of viewing the maximal resolution at the focus point. Practically we are more interested in the sharpness area bounds. But operating with the focus distance we can calculate these bounds, and then achieve by the practical lens adjusting .

Hyperfocal distance

An important notion is the **hyperfocal distance** - the closest point of focus at a given aperture, at which infinity falls within the Depth of field.
When the lens is focused on the hyperfocal distance, the sharpness area extends from half the hyperfocal distance to infinity. In this case the sharpness area will have maximum extension.

The hyperfocal distance depends on:

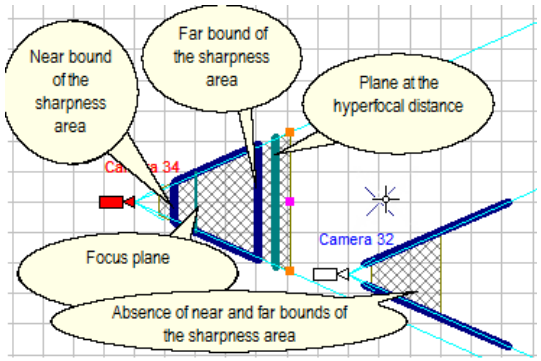
- lens focal length;
- aperture;
- boundary resolution.

In many cases the optimal focus distance is the hyperfocal distance. But there are exceptions when sharpness at a long distance is not required, but shrpness at a distance less than the half of the hyperfocal distance. But there are exceptions, when it is not required the sharpness at a long distance, but the sharpness at a less distance than the half of the hyperfocal distance. In this case it is necessary to focus the lense at the distance less than hyperfocal. At that we lose sharpnes at longer distances and get sharpness at shorter distances.

All these calculations can be performed with the help of the **Depth of field calculation box**. Calculations for the active camera in the numerical form is possible in any state.

When the depth of field box is visible, next to all cameras in the horizontal projection the following lines are displayed:
- sharpness area bounds 457;
- focus plane 458;
- plane at the hyperfocal distance 458.

These lines are calculated according to the depth of field parameters 457 of each camera at the height of depth of field measurement 458.



If the **focus plane** or the **plane at the hyperfocal distance** not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then the **focus plane** or the **plane at the hyperfocal distance** are not displayed.

If the near or the far bound of the sharpness area 457 not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then this bound is not displayed.

The absence of near and far bounds of the sharpness area indicates that the sharpness area

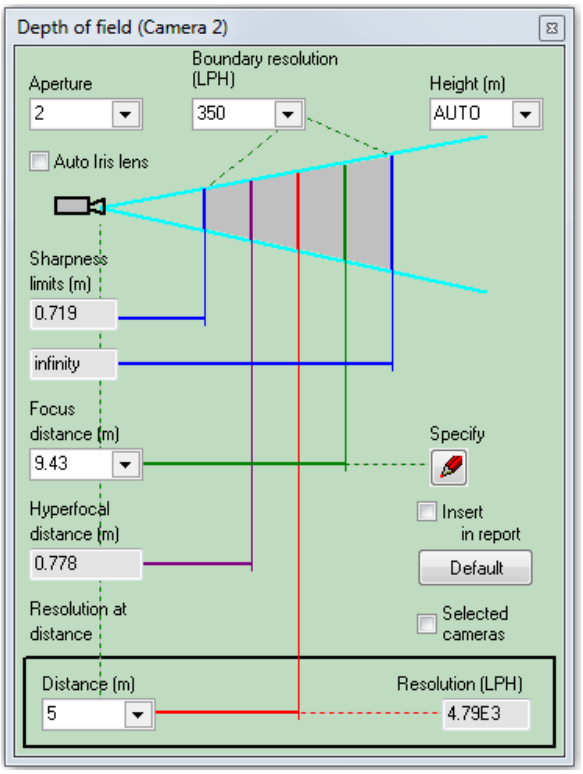
completely covers projection of view area, thus the depth of field does not reduce the resolution of the camera.

Depth of Field calculation doesn't take into account Lens distortion 310.

3D modeling 379 depth-of-field and modeling depth-of-field depending on scene illumination for auto iris 457 lenses are possible.

See also: Parameters in Depth of field box 457, *Example of Depth-of-field calculation* 539, *3D Video main menu>Depth-of-field* 363, *Checking Depth of Field in horizontal projection* 592

9.13.1 Parameters in Depth of field box



Aperture (f-number)

The number, characterizing the **amount of light, coming through the lens**. Set in this combo-box a value, given in the lens specification. If the **auto-iris lens** is used and the calculation for **minimum lighting** is required, set the minimum f-number, given in the lens specification. The minimum number characterizes opened diaphragm, at that the depth of field is minimum. If it is necessary to determine the minimum aperture to get the specified depth of the field, then in this box select the number necessary to get the required depth of field.

Auto Iris lens

If the box is checked, at depth of field calculation the aperture value 341, computed during 3D modeling illumination, will be used. If the box is not checked, the aperture value, specified in the box Aperture 457 (F number), is used.

Boundary resolution

The minimum acceptable resolution in the sharpness area in lines per picture height (LPH). At that we should remember that **we won't get better resolution than other video system components can give**. The boundary resolution should not exceed the real resolution with the in-focus image. The resolution on the calculated bound of the sharpness area will be equal to the specified boundary resolution, and inside the sharpness area the resolution will be higher. Changing the value in this box we can get the sharpness areas for different resolutions.

Height

Height of measuring Depth of Field in the horizontal projection.
If the main optical axis of the camera is not parallel to the horizon, the Depth of Field in the horizontal projection depends on the height above the ground.

In multi-level 3D projects the height of the ground surface equals to the base height 298 of the active camera.

The **AUTO** indicates that the height is equal to the middle height between the view area lower bound height 300 and the view area upper bound height 298.

Hyperfocal distance

It is calculated basing on the **lens focal length** 294 of the active camera, **aperture** and **boundary resolution**. If the lens is focused on the hyperfocal distance, then the sharpness area stretches from the half of this distance to the infinity. In this case the sharpness area will have the maximum extension.

Insert in report

If the box is checked, the calculation results of the active camera depth of field will be included in the text file, getting when Text report 216.

Focus distance

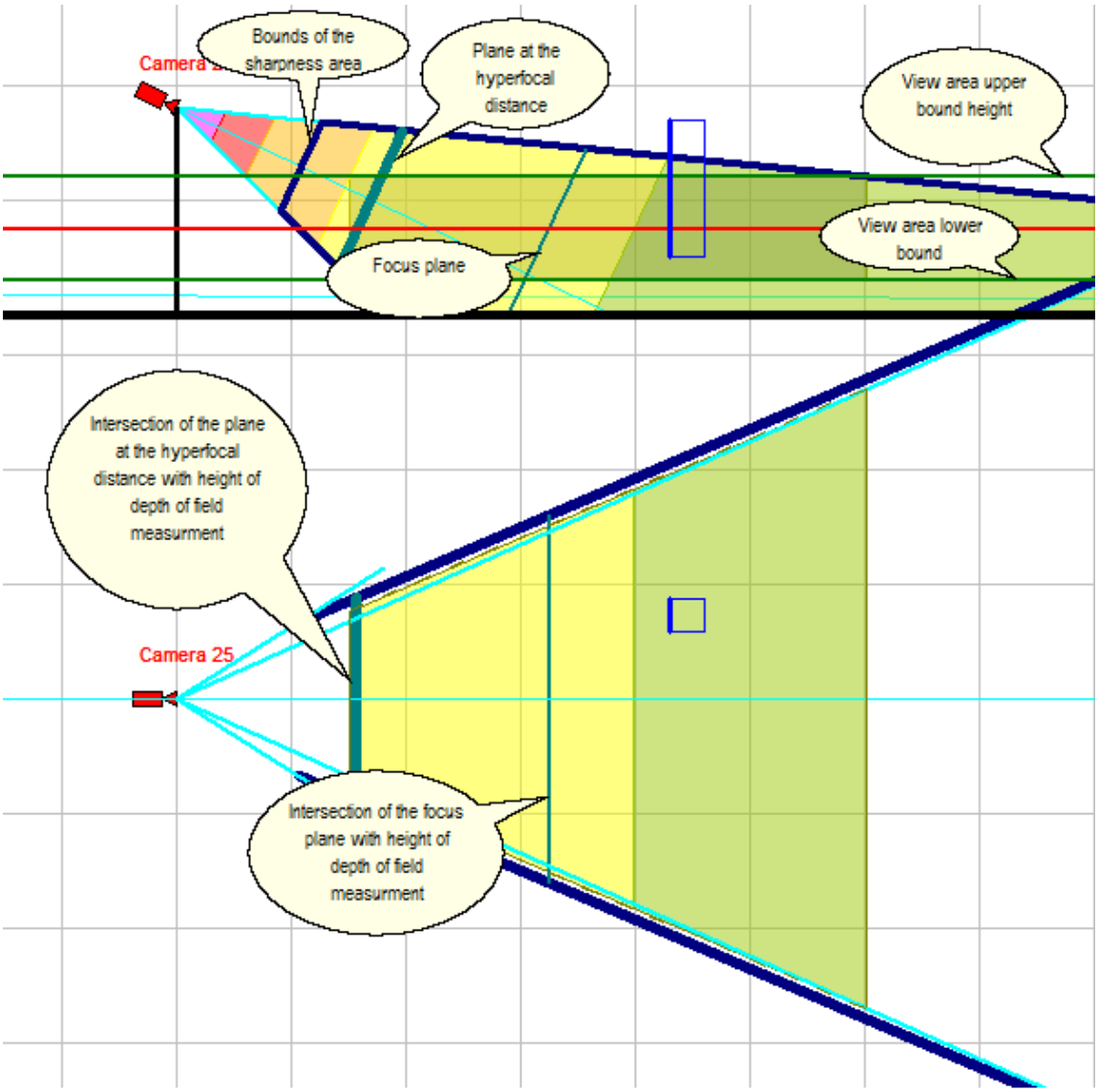
Minimum distance from the lens to the plane, perpendicular to the main optical axes, on which the lens is focused. Sharpness area bounds depend on the focus distance.

The button "Specify the focus plane

With the **Depth of Field** box opened, in the **horizontal projection**, but in the **graphical editing state** 210 of the active camera in the **vertical projection** too can be seen:

- sharpness area (heavy blue line);
- plane at the hyperfocal distance (heavy turquoise line);
- plane at the focus distance (thin turquoise line).

Line types can be changed in the Options box 475.



After clicking this button:

- A click on the view area set up a new **focal plane location**. At that all other parameters are recalculated.
- When moving the cursor over the view area of the active camera on the Status bar 275 at the bottom of the graphics window **the current distance from the lens** and **the resolution in the cursor point** are displayed.

In the horizontal projection calculations are performed at the height of measuring Depth of Field 458.

Sharpness area bounds

Near and far sharpness area bounds. The far bound can amount to infinity.

Resolution at distance

If in the **Distance** box to specify the **distance from the lens**, then in the **Resolution** box the **resolution at this distance** can be seen.
At that it is necessary to remember that we won't get better resolution than other video system components can give.

Default

Clicking this button assigns default depth of field parameters to the active camera:

- Boundary resolution 457 = 0.7* Phor/Aspect ratio;
  where:
  - 0.7 - **Kell factor**;
  - Phor - horizontal number of pixels (minimum value from number of pixel of the image sensor 332 and the number of pixel specified on the Processing 381 tab);
  - Aspect ratio - a ratio of Horizontal frame size to vertical one;
- Focus distance 458 = hyperfocal distance 458;
- Height 458=AUTO;

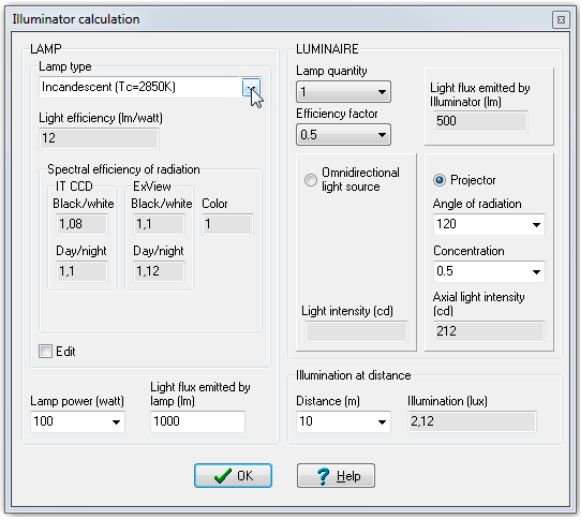
Selected cameras

If this box is checked, clicking on the Default 460 button assigns default depth of field parameters to all **selected** 189 **cameras** at once.

See also: General information on the depth of field in CCTV 454, *Example of Depth-of-field calculation* 539, *3D Video main menu>Depth-of-field* 363, *Checking Depth of Field in horizontal projection.* 592

9.14 Illuminator calculation

Graphics window
Current construction parameter panel
Illuminator calculation



The box is intended for specifying internal lighting and photometric parameters of illuminator 206 for modeling the illuminator in VideoCAD.
The box appears during illuminator creation and can be called at illuminator editing by the Illuminator calculation 286 button on the Current construction parameter panel 282.

The Illuminator calculation button is displayed on the Current construction parameter panel only during creation or editing of illuminator.

Illuminator parameters are divided into:

- Lamp parameters 463;
- Luminaire parameters 465.

Begin entering parameters from parameters of lamp (strictly from Lamp type at the up-left corner). During entering lamp parameters, the derivative parameters will be calculated automatically. After entering all parameters, it is possible to correct derivative parameters if necessary.

After entering parameters click **OK**.

The created illuminator model with specified parameters will be the calculation result.

For information in the box the following values are displayed:

- Axial light intensity 467;
- Illumination 468 produced by the illuminator at specified distance 468 an axis of radiation.

*Using a **luxmeter** you can check illumination value on specified distance from the real illuminator, then choose parameters to achieve full identity of the model and the real illuminator.*

You can change location of created illuminator model in horizontal projection by moving 192 and rotating 192 similarly to other constructions 193. Illuminators can be copied 191.
You can specify installation height 285, vertical inclination angle 285, dispersion 286, switch 286 illuminator ON/ OFF on the Current construction parameter panel 282.

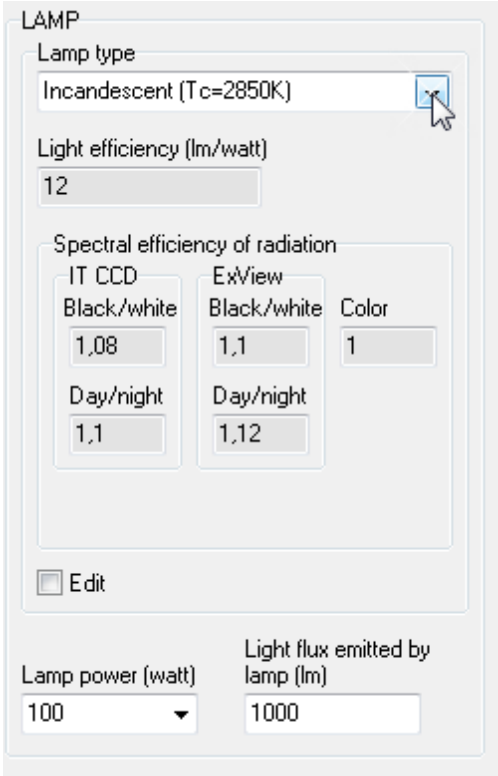
Created Illuminator will take part in 3D image modeling from some camera only if for this camera:
- Illumination modeling is switched on 372;
- Illuminators are enabled 373;
- The Illuminator is switched on 286.

While modeling Illuminators VideoCAD considers only direct light. Reflected light can be considered only approximately by specifying a part of light 286 from this Illuminator diffused on the scene. Shadows cannot be modeled in VideoCAD6.

See also: Lamp parameters 463, Luminaire parameters 465, IR illuminators 469, Illuminator 206, Current construction parameter panel>Illuminator 284, 3D Video>Image parameters panel>Scene 371.
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

9.14.1 Lamp parameters

Lamp parameters are located on the **Lamp panel**, on the left half of the Illuminator calculation 461 box.



In case of modeling infra-red illuminator, see IR illuminators 469.

Lamp type

In the box is necessary to choose lamp type.

Lamp type determines:

- Light efficiency 463;
- Spectral efficiency 464.

After choosing IR LED in the Lamp type box, units of measure in some boxes will be changed.
See more: IR illuminators 469.

Light efficiency (lm/watt)

Light efficiency determines what part of lamp power is converted to visible light. In other words, it is efficiency of the lamp as a source of visible light. Light efficiency is measured in **lumens/watts** and is given in lamp specifications.

Average value of light efficiency of chosen lamp type 463 is displayed in the box.

*VideoCAD offers **average** values of light efficiency for different lamp types. Light efficiency of real lamps can be different. For precise modeling, see lamp specification.*

For different lamp types the light efficiency is from 8-15 (incandescent lamps) up to 140-180 (sodium lamps) and more lumen/watt.

*Very often in lamp specifications Power (watt) and Full light flux (lumen) are given instead of the Light efficiency. In this case enter the **full light flux** value from lamp specification to the Light flux emitted by lamp 464 box.*

Spectral efficiency of radiation

Sensitivity of different types of image sensor to radiation of different wavelengths (spectral sensitivity) essentially differs from human eye spectral sensitivity (and luxmeter sensitivity coinciding with it).
Radiation spectrums of different lamp types can be different.

VideoCAD considers this difference through in advance calculated and experimentally verified 567 **spectral efficiency factors** of different light sources for different types of cameras.

During illumination modeling VideoCAD calculates efficiency of each illuminator depending on image sensor type 332 of the active camera.

During designing it is not necessary to change these factors.

See more: What is spectral efficiency 472.

Edit

Edit Light efficiency 463 and Spectral efficiency 464 of chosen lamp type 463.

In VideoCAD the calculated and experimentally verified 567 factors are given. In most cases there is no necessity to change them.

The same values of spectral efficiency factors are used in modeling *background light* 372 in the 3D Video 357.

Lamp power (watt)

In the box the **power consumption** of lamp (watt) is specified.

Light flux emitted by lamp (lm)

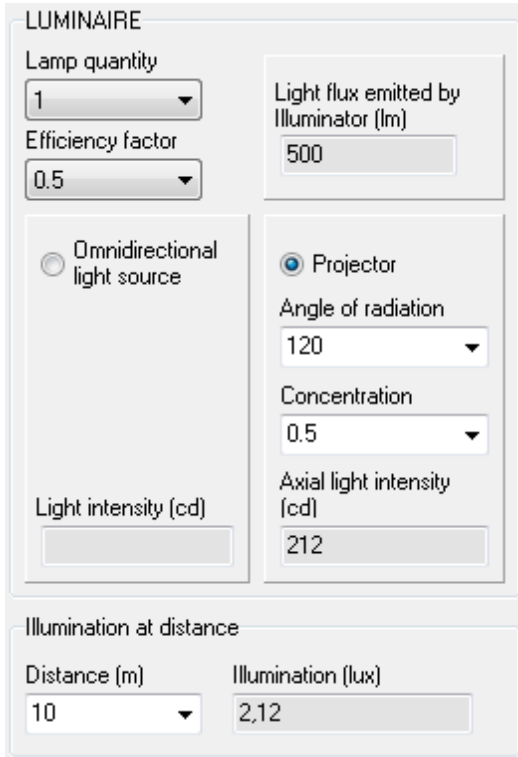
After specifying the **power consumption**, the full light flux emitted by the lamp (lumen) will be displayed in the box. The full light flux is calculated from the power consumption and average light efficiency 463 of chosen lamp type 463.

It is recommended to enter in this box value from specification for more precise modeling.

See also: Illuminator calculation 461, Luminaire parameters 465, IR illuminators 469, Illuminator 206, Current construction parameter panel>Illuminator 284, 3D Video>Image parameters panel>Scene 371.
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

9.14.2 Luminaire parameters

Luminaire parameters are located on the **Luminaire panel**, on the right half of the Illuminator calculation 461 box.



*To allow for lamp aging, supply voltage deviation, as well as luminaire dirt depreciation in operation it is necessary to set **Maintenance factor of illuminators** on the 3D modeling 481 tab of the Options box 474 according to **CIE 97.***

In case of modeling infra-red illuminator, see IR illuminators 469.

Lamp quantity

Number of lamps in the Luminaire.

Lamp parameters are set on the Lamp 463 panel.

Efficiency factor

Efficiency of the luminaire.

A part of the luminous flux emitted by lamps is consumed inside the luminaire or is emitted outside the angle of radiation 467.

Efficiency factor of the luminaire **is a ratio of the light flux emitted within the limits of radiation angle to the total light flux 464 of all lamps.**

Typical values of efficiency factor for **new** luminaires:

- For luminaires with angle of radiation of more than 100 degrees - 0.6-0.9;
- For luminaires with angle of radiation of 50-100 degrees - 0.5;
- For luminaires with angle of radiation of 20-50 degrees - 0.4;
- For luminaires with smaller angle of radiation, the efficiency factor can reach up to 0.2.

For IR illuminators 469 the recommended efficiency factor is 0.3-0.5.

In IR illuminators a part of consumed power is lost in internal circuits and filter.

In operation the luminaire efficiency factor is reduced depending on environment contamination.

It is possible to allow for environment contamination through the maintenance factor 481 of illuminators.

The efficiency factor is sometimes given in the luminaire specification, but **the light intensity curves 467 with the lamp with full light flux of 1000 lumen** are given more often. In this case, it is necessary to select efficiency factor in this box to obtain light intensity value, recalculated according to light flux of the lamp in the luminaire.

*For example: The total light flux of all lamps is F=3000 lumen. In this case an **axial light intensity** value obtained from the* light intensity curves *(with the lamp of 1000 lumen) has to be multiplied by 3.*

Light flux emitted by Illuminator (lm)

The light flux of the illuminator within the limits of angle of radiation 467. The light flux of the illuminator equals to the total light flux 464 of all lamps, multiplied by efficiency factor 466 of the luminaire.

Omnidirectional light source

The illuminator emits light in all directions with equal light intensity.
For example, a lamp without reflector.

An omnidirectional illuminator has one parameter - **light intensity** (candela).

Light intensity (cd)

Light intensity of the omnidirectional illuminator, equal in every direction. It is the most important parameter of the illuminator.

Projector

An illuminator with limited angle of radiation. The majority of real luminaires have limited angle of radiation.

Angle of radiation (deg.)

The full angle of radiation at the top of the light cone. The light flux of the illuminator is emitted within the limits of this angle.
The angle of radiation influences illumination area and light intensity 467 of the illuminator. Having identical lamps, the luminaire with a smaller angle of radiation will have higher **light intensity** and, therefore, produces higher **illumination**.

Concentration

The ratio of light intensity on the borders of the radiation cone to light intensity on the axis of the radiation cone.
Real luminaires have irregular light distribution within the limits of the radiation cone. As a rule, light intensity is maximal in the center of the cone.

In luminaire specification **the light intensity curves with the lamp with full light flux of 1000 lumen** are given. During construction or editing of the illuminator 206 in the Graphics window, the **light intensity curves of the luminaire model** are displayed.
By moving grips in the Graphics window (**Ctrl is** pressed) or by changing **concentration** it is possible to reach closer light intensity distribution. High precision is not required; a rough correspondence of the light intensity curves is enough. The axial light intensity 467 should be selected more precisely.

*When changing **concentration,** the full light flux 466 of the illuminator **is not changed**. If **light intensity** increases on the radiation axis, it weakens on the* borders *of the radiation cone and vice versa.*

*Using one illuminator model in VideoCAD it is possible to model only **a point light source with round symmetrical light intensity distribution**. Luminaires with non-round symmetrical light intensity distribution can be modeled by one illuminator only roughly. For accurate modeling several illuminators should be used. Recount their light fluxes, reaching the light intensity value similar to light intensity value of the real luminaire.*

Axial light intensity (cd)

Light intensity on axis of radiation.
It is the most important parameter of the luminaire. All the previous parameters are used for estimation of the light intensity.

If there are the **light intensity curves with the lamp with full light flux of 1000 lumen** in the luminaire specification, light intensity should be recalculated in proportion to the total light flux of the real lamps 464 in the luminaire.

For example: the total light flux of lamps is 3000 lumen. In this case the axial light intensity value obtained from light intensity curve (with lamp of 1000 lumen) has to be multiplied by 3.

Then by selecting the efficiency factor 466, it is necessary to reach an equal value of the **axial light intensity**.

If there are no light intensity curves in the specification, but there is an axial light intensity value, it is necessary to select an efficiency factor value for obtaining the equal axial light intensity.

If in the specification there are no such parameters, or the specification is absent, only estimation is possible. Specify 0.5 as the **efficiency factor** value and concentration 467 =0.5. In practice, the estimation is usually enough.

Illumination at distance

On the panel you can calculate illumination produced by the illuminator on the specified distance. For projector illumination is calculated on axis of radiation.

Values on this panel are given only for information and do not influence parameters of the illuminator model.

Illumination is calculated on the plane perpendicular to axis of radiation.

By means of luxmeter you can verify illumination value on the specified distance from the real luminaire and by selecting parameters reach complete identity of the model and the real luminaire.

Distance (m. or ft.)

Distance from the luminaire on which illumination is calculated. The distance is measured in meters or foots depending on measuring formats 215 in the project.

Illumination (lux)

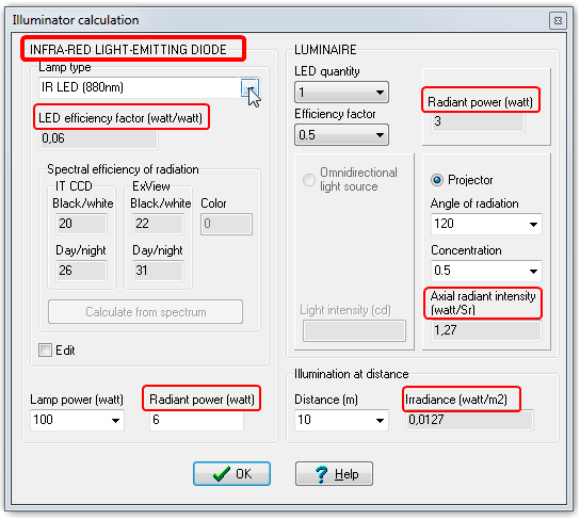
The calculated illumination. As in CCTV the sensitivity of cameras is measured only in lux, illumination is displayed in **luxes irrespective of the measuring format** in the project.

1 foot-candela equals 10.76 lux.

See also: *Illuminator calculation* 461, *Lamp parameters* 463, *IR illuminators* 469, *Illuminator* 206, *Current construction parameter panel>Illuminator* 284, *3D Video>Image parameters panel>Scene* 371,
External link: *"The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(*.pdf) .*

9.14.3 IR illuminators

IR LEDs radiate out of visible light range, therefore their characteristics **cannot be measured in photometric units (lumens, candelas and luxes)**. Characteristics of IR LEDs are measured **in power units (watts, watts/steradian, watts/m2)**.



In the same time black-white cameras are sensitive in the infra-red range, but their sensitivity **is measured in photometric units** (lux). Therefore, it is necessary to convert power values to the photometric ones.

After selecting **IR LED** in the Lamp type 463 box, measurement units are changed in the boxes:

Light efficiency (lm/watt)>LED efficiency factor (watt/watt) 469
Spectral efficiency of radiation (lumen / lumen) >Spectral efficiency of IR radiation (lumen / watt) 469
Light flux emitted by lamp (lm)>Radiant power (watt) 470
Light flux emitted by Illuminator (lm)>Radiant power (watt) 471
Axial light intensity (cd)>Axial radiant intensity (watt/Sr) 471
Illumination (lux)>Irradiance (watt/m2) 471

Light efficiency (lumen/watt)>LED efficiency factor (watt/watt)

Instead of **light flux (lumen),** for measuring IR radiation power **watts** are used.
Therefore, measurement unit in this box is the efficiency factor of LED, i.e. **the ratio of radiant power in the specified IR range to consumed electric power**.

Efficiency factor of modern IR LEDs is 0.06..0.35. To obtain efficiency factor it is necessary to divide the full radiant power by the consumed electric power.

These parameters are given in characteristics of LEDs. If the LED type, efficiency factor or radiant power are unknown, it is recommended to enter in this box efficiency=0.1.

Spectral efficiency of radiation (lumen / lumen) >Spectral efficiency of IR radiation (lumen / watt)

Black-white sensor sensitivity to IR radiation of different wavelength essentially differs. Between image sensors of different types, there is also a difference in spectral sensitivity.
Color cameras are practically insensitive to infra-red illuminators.

VideoCAD considers this difference through in advance calculated and experimentally verified 571 **spectral efficiency factors of IR illuminators** of different wavelengths.

The spectral efficiency factor for IR radiation (lumen/watt) of the specified wavelength and specified type of image sensor is equal to the light flux (lumen) of a halogen incandescent lamp with color temperature Tc=3100K having equal efficiency with IR radiation of the specified wavelength having power of 1 watt for the specified type of image sensor

Through the spectral efficiency factor the power of IR radiation is converted to photometric equivalent. This is necessary, as camera sensitivity is measured in photometric units (lux).

*Cameras' sensitivity in VideoCAD is given to the light from **halogen incandescent lamp**, according to standard CEA 639 ' Consumer Camcorder or Video Camera Low Light Performance '.*

Spectral efficiency factors are given for five basic types of image sensors:

- **Standard black-white CCD and CMOS** sensors;
- **Sony ExView HAD™** 332 **CCD sensors**, having increased relative spectral sensitivity to infra-red radiation;
- **Standard color sensors** of day/night cameras with color filters (without IR filter).

Color filters weaken sensitivity in visible light range more strongly, than in infra-red range. As a result, image sensors of day/night cameras have lower sensitivity in visible light range, or, that is the same, the increased relative sensitivity in infra-red range.

- **Sony ExView HAD ™ sensors** of day/night cameras with color filters (without IR filter).

Effects from decreasing sensitivity in visible light range by color filters and from increasing sensitivity in infra-red range due to Sony ExView HAD ™ technology are added. Such image sensors have the highest relative sensitivity in infra-red range.

- **Standard color sensors** with color filters and IR filter. Color cameras are practically insensitive in infra-red range.

During modeling images, VideoCAD automatically calculates efficiency of each illuminator depending on image sensor type 332 of the active camera.

Reflecting ability of different objects differs in light of incandescent lamps and in IR light. Spectral efficiency factors are obtained from tests with **white paper** and a **human body**.

Example 1: Scene is illuminated by halogen incandescent lamp with color temperature Tc=3100K, the luxmeter shows illumination of 0.1 lux.
To reach exactly the same image from the camera at illumination from IR illuminator with the spectral efficiency factor of 50 lumen/watt, IR illumination should be 0.1/50=0.02 watt/m2.

As color cameras are insensitive to IR radiation, for them the spectral efficiency factor of IR radiation is equal to zero.

During design it is not necessary to change these factors.

Light flux emitted by lamp (lumen)>Radiant power (watt)

Instead of **light flux (lumen)** for measuring IR power **watts** are used.
After specifying the consumed power 464, in the box **the total radiant power of IR LED (watt) is displayed. Total radiant power of IR LED** is calculated **from consumed power** and efficiency factor 469 of the IR LED.

You can enter in this box the value from LED specification for more accurate modeling.

Light flux emitted by Illuminator (lumen)>Radiant power (watt)

It is **projector radiant power within the limits of the radiation angle** 467. The projector radiant power is equal to the sum of radiant powers of all LEDs (if they are several), multiplied by efficiency factor 466 of the illuminator.

Axial light intensity (candel)>Axial radiant intensity (watt/steradian)

Instead of **light intensity (candelas)** for measuring IR radiant intensity **the watt/steradian** is used.
It is an axial IR radiant power.
It is the most important parameter of the illuminator. All previous parameters are used for estimation of the radiant intensity.

If in specification of IR illuminator the **radiant intensity curves** are given, it is necessary to reach by selection of Radiant power 470 (watt) equal value of an **axial radiant intensity**.

If in specification there are no radiant intensity curves, but there is a value of the **axial radiant intensity,** it is necessary to select value of the **Radiant power** to obtain equal **axial radiant intensity**.

If in the specification there are no such parameters, or the specification is absent, only estimation is possible.

Specify:
Efficiency factor 466 **=0.3** for the narrow angle luminaire (radiation angle 467 of 20-50 degrees);
Efficiency factor 466 **=0.5** for the wide-angle luminaire (radiation angle of 60-120 degrees).
Concentration 467 **=0.5**.

In practice the estimation is enough.

Illumination (lux)>Irradiance (watt/m2)

Instead of **Illumination (lux)**, the **Irradiance (watt/m2)** is used.

See also: Illuminator calculation 461, *Lamp parameters* 463, *Luminaire parameters* 465, *Illuminator* 206, *Current construction parameter panel>Illuminator* 284, *3D Video>Image parameters panel>Scene* 371.

9.14.4 What is the spectral efficiency

Sensitivity of different types of image sensor to radiation of different wavelengths (spectral sensitivity) essentially differs from human eye spectral sensitivity (and luxmeter sensitivity coinciding with it). Radiation spectrums of different lamp types can be different.

For example, luminescent and Incandescent lamps produce equal scene illumination according to luxmeter reading. But the image from a black-white camera directed on this scene will not be equal at scene illumination produced by different lamps. The difference in the equivalent illumination can reach four or more times. Color cameras are practically insensitive to IR illuminators, and black-white cameras have sensitivity depending on maximum wavelength of the IR illuminators.

VideoCAD considers this difference through in advance calculated and experimentally verified 567 **spectral efficiency factors** of different light sources for different types of cameras.

Spectral efficiency factor for specified lamp and camera types is equal to light flux (lumen) produced by halogen incandescent lamp with color temperature Tc=3100K. At that, this light flux is equivalent for the specified camera type to one lumen of the light flux from the specified lamp type.

In other words:

Spectral efficiency factor for specified lamp and camera types shows for how much efficiency of light produced by this lamp for this camera higher or lower than efficiency of light produced by halogen incandescent lamp with color temperature Tc=3100K, in case when both lamps create equal illumination according to luxmeter reading.

*Cameras' sensitivity in VideoCAD is given to the light from **halogen incandescent lamp**, according to standard CEA 639 ' Consumer Camcorder or Video Camera Low Light Performance '.*
Spectral efficiency factors are given for five basic types of image sensors:

- **Standard black-white CCD and CMOS** sensors;
- **Sony ExView HAD™** 332 **CCD sensors**, having increased relative spectral sensitivity to infra-red radiation;
- **Standard color sensors** of day/night cameras with color filters (without IR filter).

Color filters weaken sensitivity in visible light range more strongly, than in infra-red range. As a result, image sensors of day/night cameras have lower sensitivity in visible light range, or, that is the same, the increased relative sensitivity in infra-red range.

- **Sony ExView HAD ™ sensors** of day/night cameras with color filters (without IR filter).

Effects from decreasing sensitivity in visible light range by color filters and from increasing sensitivity in infra-red range due to Sony ExView HAD ™ technology are added. Such image sensors have the highest relative sensitivity in infra-red range.

- **Standard color image sensors** with color filters and permanent IR filter.

*Spectral sensitivity of color sensors with permanent IR filter is similar to human eye spectral sensitivity and a luxmeter spectral sensitivity, therefore the **Spectral efficiency factor** is closed to one.*

During modeling images, VideoCAD automatically calculates efficiency of each illuminator depending on image sensor type 332 of the active camera.

*For color cameras and visible light sources the **Spectral efficiency factors are closed to one** (0.8..1.2), but for black-white cameras the factors can be from 0.25 to 1.2.*
*For special light sources the **Spectral efficiency factors** can be in wide range.*

Example 1: *Black/white camera sensitivity 334, given in specification, is equal to **0.1 lux** at scene illumination produced by halogen incandescent lamp.*
*Sensitivity of the same camera to the mercury lamp light with **spectral efficiency factor 0.45** will be equal to **0.1*0.45=0.22 lux.***

Example 2: *The scene is illuminated by standard incandescent lamp with **spectral efficiency factor 1.15,** the luxmeter shows scene illumination **0.1 lux**.*
*If obtain the same image from camera at illumination produced by sodium lamp with **spectral efficiency factor 0.35**, the luxmeter will show* 0.1*1.1/0.35=**0.31 lux.**

Example 3: *Efficiency of any lamp for a human eye is equal to the light efficiency 463. Relative efficiency of any lamp for CCTV is equal to the product of **light efficiency** multiplied by **spectral efficiency**. Spectral efficiency of halogen incandescent lamp (Tc=3100C) is considered to be one.*

9.15 Options

Graphics window
Main menu
View
Options

The box is intended for adjusting various parameters of the program.

The box can be opened by choosing the item **View > Options** 245 in the Main menu of the Graphics window 161 or by double-clicking on the Line type panel 280 or the Font type panel 281.

The box consists of the following tabs:

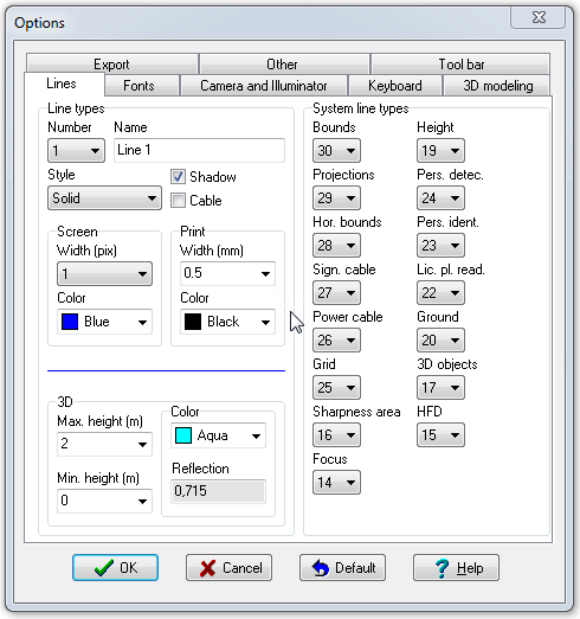
- Lines 475
- Fonts 477
- Keyboard 479
- Camera and Illuminator 483
- 3D modeling 480
- Export 485
- Miscellaneous 490
- Tool bar 489

All the parameter changes in the tabs become valid immediately and you can see their result.

To **save** the introduced changes click **OK**.
To **cancel** the changes click **Cancel**.
To assign default values to all parameters on the opened tab click **Default**.

9.15.1 Lines

Graphics window
Main menu
View
Options
Lines



Left side of the tab

In the left side of the tab you can see and change parameters of any VideoCAD **line type**.

Up to **2000 types of lines** can be used in VideoCAD project.

Parameters in the left side of the tab :

- **Number** - the number of the displayed line type. Each line type has unique number from 1 to 2000.
- **Name** - the name of the line type. The name can be changed.
- **Style** - the name of line style. It can be chosen from the list (**Solid, Dash, Short Dash, DashDot, DashDotDot**, etc).
- **Shadow** - If the box is checked then all constructions made by this line type are considered as obstacles at calculating shadows 178.

In addition, to make a construction be considered as obstacle in calculation of shadows, it must belong to a layer with the shadows 277 option marked

See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

- **Cable** - If the box is checked then line segments 195 made by this line type are considered as cables. Their lengths are included in the cable report 271, their names present in the **Cable brand** lists in the Signal cable 514 and Power cable 515 length calculation boxes.
- **Screen width** - line width on the screen (pix).

- **Print width** - line width when printing (mm,inch).
- **Screen color** - line color on the screen.
- **Print color** - line color when printing.

Parameters, relating to the 3D tools:

- **Maximum height** - maximum height above the ground of **3D objects** 193, made by the line of this type. Also the height above the ground of **3D models** 259.
- **Minimum height** - minimum height above the ground of **3D objects**, made by the line of this type.

Heights can also take on negative values, and at that 3D model plunges under ground.

*In multi-level 3D projects **the ground height** equals to the base height of a layer 277 to which the construction belongs.*

It is possible to change the heights on the Current construction parameters panel 282 irrespective of line type.

- **Color** - the color of **3D objects**, made by the line of this type.
- **Reflection** - reflection factor of the selected color in illumination modeling.

The reflection factor is calculated automatically and is given for information.

Right side of the tab

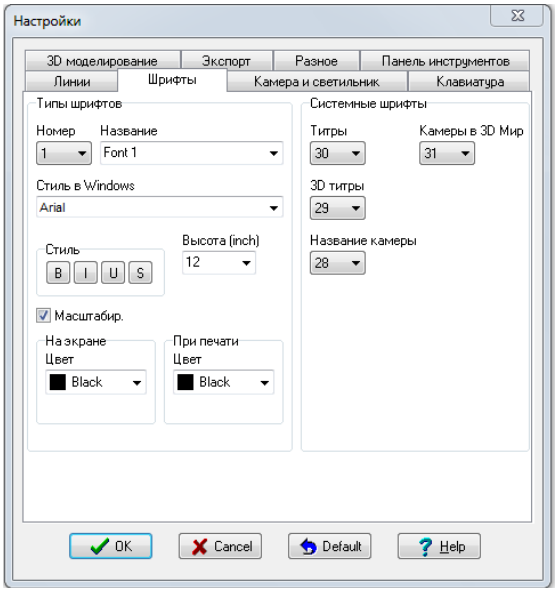
In the right side of the tab you can see and change the numbers of **line types for displaying the system objects**:

- View area edges.
- View area projection bounds.
- Horizontal bounds.
- Signal cable.
- Power cable.
- Grid.
- Person detection area projections.
- Person identification area projections.
- License plate reading area projections.
- Ground indication.
- Height indication.
- Sharpness area.
- Focus plane.
- Plane at the hyperfocal distance.
- Default line type for 3D models.

Don't use the system lines for constructions and change their parameters without necessary. Sometimes it leads to confusion.

9.15.2 Fonts

Graphics window
Main menu
View
Options
Fonts



Left side of the tab

In the tab left part you can see and change parameters of any VideoCAD **font type**.

Up to **100 types of fonts** can be used in VideoCAD project.

Parameters in the tab left part:

- **Number** - the number of the displayed font type. Each font type has unique number from 1 to 30.
- **Name** - the name of the font type. The name can be changed.
- **Style in Windows** - the name of **font typeface**. It can be chosen from the list.

  *It is necessary to remember that not all the font typefaces are scaled correctly. To use VideoCAD it is recommended to use only scalable typefaces (**True Type** or **Open Type**). Using bit-mapped fonts (e.g.,MS Sans Serif) is not recommended.*
- **Height** - The font height in inches (in the actual drawing sizes). **1 inch = 2.54cm**.
  *If the **Scalable box** is not checked, then the height has only relative sense.*
- **Style** - Bold, Italic, Underline, Strike out
- **Screen color** - font color on the screen
- **Print Color -** font color at printing.
- **Scalable** -
  - If the **box is checked**, then the font size will change together with changing the drawing scale. The text typed in such font can be rotated to any angle. The box should be checked for the majority of fonts.
  - If the box **is not checked**, the font size will not change at changing the drawing scale, and at rotating text typed in such font it will be always horizontal. Such fonts are used for the **camera names** and **titles**. They prove to be convenient for creating labels to be read at any scale.

Right side of the tab

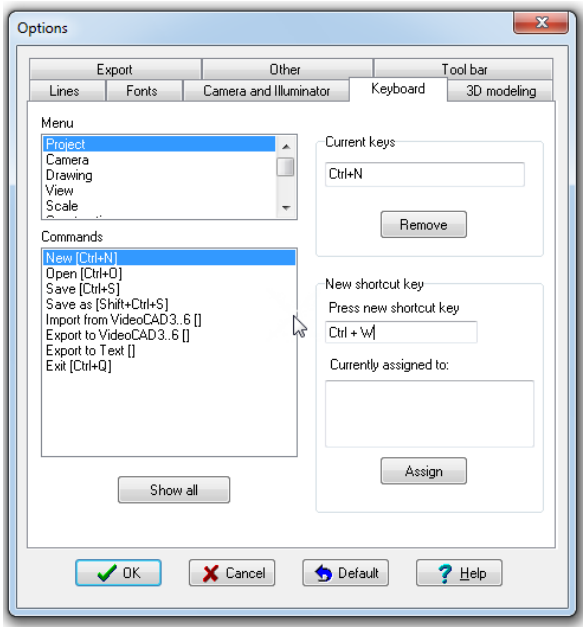
In the **tab right part** you can see and change numbers of **system fonts**:

- Font of the **titles** displaying;
- Font of the **titles** displaying in 3D Video 357;
- Font of the **camera name** displaying in the Graphics window 161.
- Font of the **camera name** displaying in the 3D World 342..

It is not recommended to use the system fonts and change their parameters without necessary. Sometimes it leads to confusion.

9.15.3 Keyboard

Graphics window
Main menu
View
Options
Keyboard



On the tab you can assign **Shortcuts keys (keyboard shortcuts)** for the items of the Main menu 213 of the Graphics window.

Keyboard shortcuts allow fast activation of various commands from the Main menu, by pressing shortcuts on the keyboard.

The order of shortcuts assignment to item of the Main menu:

In the **Menu** box choose section of the Main menu 213.

*In the **Commands** box the list of items of the chosen section will appear. Already assigned shortcuts are indicated in brackets after the names of menu item.*

*By the **Show all** button it is possible to call the full list of all menu items with assigned shortcuts. This list can be saved to text file.*

In the **Commands** box select the name of the menu item.

If the menu item has already assigned shortcut, the shortcuts will be displayed in the box on the **Current keys** panel.
*To remove assigned shortcuts click **Remove**.*

To assign new shortcuts:

- Set input focus on the **Press new shortcut key** box on the **New shortcut key** panel.
- Press shortcut key on the keyboard.

*The pressed shortcuts will appear in the **Press new shortcuts** box.*

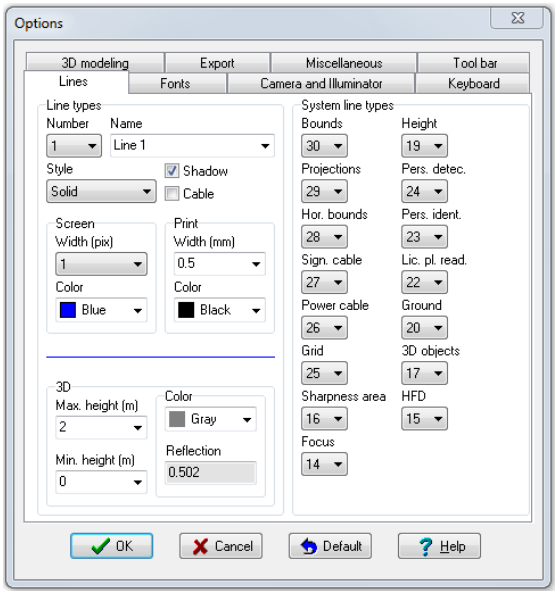
*If pressed shortcuts has been already assigned to other menu item, the name of this item will be displayed in the **Currently assigned to** box.*

- To assign typed shortcuts click **Assign**.

*Shortcut assignment will be removed from the item displayed in the **Currently assigned to** box*

9.15.4 3D modeling

Graphics window
Main menu
View
Options
3D modeling



3D panel

Plate height

- vertical size of the license plate in the 3D Video 357 and 3D World 342.

Plate width

- horizontal size of the license plate in the **3D Video** and **3D World**.

Specify in these boxes the sizes of license plate, accepted in you country.
*Also create ***.bmp** file with the image of you license plate, name it **Number.bmp** and replace with it the file of the same name in the folder **\Models** in the VideoCAD installation directory.*
!! The size of file sides, in pixels, must be equal to powers of two:
16,32,64,128,256,512,1024,2048 ….
After that 3D models 259 - cars will be displayed with your license plate.

Ground color

- ground color in the **3D Video**. In the **3D World** the ground color is specified separately 351.

Licence plate and test chart antialiasing

If these boxes are checked- the license plates and test chart are displayed more realistic in the 3D Video, but at that it takes more time for repainting the 3D Video and there can be errors on some outdated graphic card.

Space limits

At the use of some **outdated graphic card** the occurrence of distortions on the image in the **3D Video** is possible. For reduction of the distortions it is recommended to reduce **Model space**.

*The increase of the **near space limit** has the much greater influence on distortions, than reduction of the **far space limit.***
The objects which are closer to the camera, than **near space limit** or farther than **far space limit** will not be displayed, but the distortions of the objects which are **between space limits** will be reduced or removed completely.

Background res.

In this box you can set resolution of vector background in the 3D Video 388 and 3D World 342.

Illumination modeling panel

Parameters on this panel are considered in 3D image modeling only if the illumination modeling 372 is switched on.

Using **Speed <> Accuracy** slider you can choose a compromise solution between accuracy of modeling light bounds and performance of illumination modeling.

Maintenance factor of illuminators

- allows for supply voltage and lamp parameters variation, lamp aging, luminaire dirt depreciation.

Suggested Maintenance factors, according to **CIE 97**:

0.8 - very clean environment, maintenance cycle 1 year;
0.67 - clean environment, maintenance cycle 3 years;
0.57 - normal environment pollution load, maintenance cycle 3 years;
0.5 - dirty environment, maintenance cycle 3 years;

*If the supply voltage is not stable or below normal then it is necessary to decrease the **Maintenance factor** proportionally to possible voltage slump.*

Maintenance factor of cameras

- allows for lens contamination, dirt, camera degradation and parameter variation in the lifetime.

Suggested Maintenance factors:

0.7 - very clean environment, maintenance cycle 1 year;
0.6 - clean environment, maintenance cycle 3 years;
0.5 - normal environment pollution load, maintenance cycle 3 years;
0.4 - dirty environment, maintenance cycle 3 years;

Redrawing 3D Video

On this panel you can optimize the speed of redrawing 3D Video 357 according to computer's performance, current design features and designer's habits.

Draw 3D Video in separate thread

Use separate program thread for redrawing image in the 3D Video. When the checkbox is checked, redrawing the 3D Video doesn't retard work of other windows but is carrying out with delay.

This checkbox is checked by default. If errors occur while redrawing the 3D Video, try to clear this checkbox.

With the help of the **Priority** combo box, you can control the priority of redrawing 3D Video **in separate thread**. The higher the priority is, the faster the image in the 3D Video is redrawn, but the more hinders operation in the Graphics window.

In the the **Mode** combo box you can switch the method of redrawing image in the 3D Video.

- **Normal** - drawing image in the usual way, in one stage;
- **2 stage** - drawing in 2 stages. on the first stage "raw" image is rapidly shown, and then a resource-intensive image processing is carried out;

- **2 stage+2 priority** - like a **2 stage**, but the first stage is faster with higher priority.

Redraw 3D image only by clicking

Modeling complex 3D scenes, especially taking into account illumination, require high computer performance.
If the image in the 3D Video is redrawn too slowly and that hinder operation in the Graphics window, mark this box. After that the image in the 3D Video 357 will be redrawn automatically only at activation of cameras. To force redrawing click on the image.

The box is duplicated in the Main menu 369 of the 3D Video.

Disable image processing

If this box is marked then the image processing will not be modeled.
Modeling gamma, noise, brightness, contrast, resolution, sharpness, compression will be disabled.

Redraw speed will increase, errors with outdated video cards may be removed.

The box is duplicated in the Main menu 369 of the 3D Video.

Modeling Depth of Field and Shutter

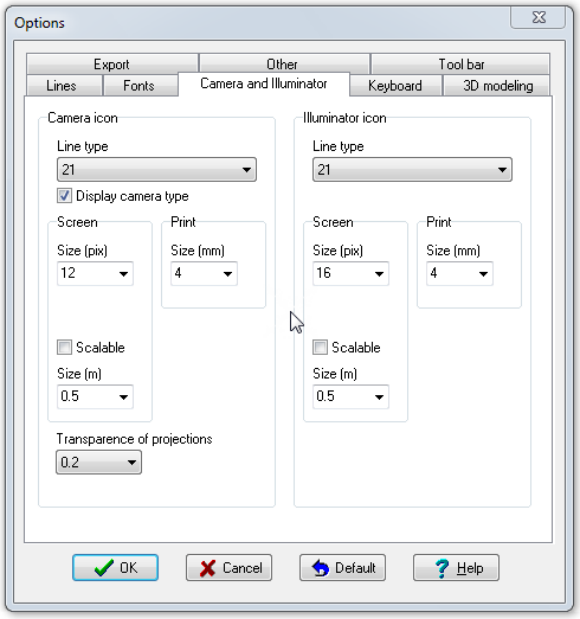
Using **Speed <> Accuracy** slider you can choose a compromise solution between realism and performance of modeling depth of field 379, exposure time 377 and rolling shutter 378.
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

Rotakin speed (rpm)

In the box you can specify number of revolutions of the Rotakin 205 object in revolutions per minute.

9.15.5 Camera and Illuminator

Graphics window
Main menu
View
Options
Camera and illuminator



On this tab can be changed:

Size and line type for icons of camera and illuminator

The icon size is specified separately when displaying on the screen and when printing.

You can set any line type 475 for a camera or illuminator during creating the camera 171 or placing the illuminator 206.
The camera or illuminator will be drawn by default line type, if another line type has not been specified during creation and placing.
Later on, you can change line type using Change line type 268 tool.

Show camera type

If the box is marked, then cameras of different types 171 will be represented by different icons:
, , ..
In this case, camera tilt is not represented by the icons.

If the box is not marked, then all cameras will be represented by identical icons, which represent the camera tilt.

Scalable

If **Scalable** box is checked, then cameras' (illuminators') icons are scaled with the other constructions. Size of icons is specified in meters (feet) in the Size box below**.**
If **Scalable** box is not checked, then cameras' (illuminators') icons are not scaled. Size of icons is specified separately: on the screen in pixel - in the **Size (pix) box,** for printing in millimeters, - in the **Size (mm) box.**

Size

Size of scalable icons in meter (foot), when the **Scalable** box is checked.

Transparence of projections

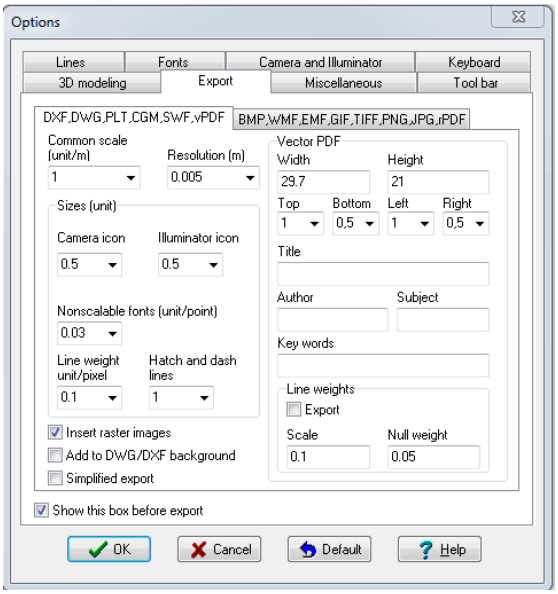
This combo box allows to adjust transparence of filling view area projections 175 in the Graphics window.

See also: *Transparence in the 3D World* 348

See also: *Move active camera name* 219

9.15.6 Export

Graphics window
Main menu
View
Options
Export



On the tab you can adjust parameters of drawing export 219.

The tab is divided to 2 sub-tabs:

- Parameters on the DXF,DWG,PLT,CGM,SWF,vPDF 485 sub-tab are related to the export to AutoCAD DXF,DWG,PLT,CGM,SWF, vector PDF formats.
- Parameters on the BMP,WMF,EMF,GIF,TIFF,PNG,JPG,rPDF,PDF 487 sub-tab are related to the export to raster BMP,GIF,TIF,PNG,JPG, PDF formats and windows metafile vector formats (WMF, EMF). The tab includes the Raster PDF 487 panel.

If the **Show this box before export** is marked, the Export tab will be shown before each export.

See also Drawing>Save as 219

DXF,DWG,PLT,CGM,SWF,vPDF

Common scale (unit/m, unit/ft.)

Common scale of exporting drawing. The scale can be set in **AutoCAD unit per meter (or foot)** on the VideoCAD layout.

When the background in AutoCAD DXF or DWG format is used and Add to DXF/DWG background 486 checkbox is checked, then the Common scale is determined by the background file and can't be changed.

Resolution (m. or ft.)

Resolution is the accuracy of export. Objects having sizes smaller than the set resolution could be exported with errors. In most cases the resolution of 0.005m (0.5 cm) is optimal. For big size drawings (kilometers) the export with such resolution can lead to errors. In this case, it is needed to increase resolution and repeat export.

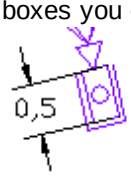
*The **Resolution** influences on all constructions only during Simplified export 487. When the **Simplified export** is not checked, the precision doesn't depend on the **Resolution** and always maximal.*

Sizes (unit)

As the export is usually executed with resolution, different form the screen resolution, it is necessary to adjust the size of nonscalable objects. In case of nonscalable objects become too small or too big in the exporting file.

Sizes (unit)
Camera icon, Illuminator icon (unit)

In the boxes you can specify sizes of camera and illuminator **nonscalable** icons in AutoCAD units.



See also: Scale 483

Sizes (unit)
Nonscalable fonts, Hatch and dash lines

In the boxes you can specify scale factors for Nonscalable fonts (unit/point), Hatch and dash lines. The factor for Hatch and dash lines also applied for arrows.

Sizes (unit)
Line weight unit/pixel

In the box the scale factor of line weights is specified in **units of line weight in AutoCAD** divided by **pixel of line weight on the screen**.

This option is not used when the Simplified export 487 *is checked.*

Insert rastrer images

Insert in the obtained vector file the raster inserts (raster background, projections 399 of 3D models). If you are exporting to DXF or DWG format, then add links to external raster files and copy the raster files themselves to a separate sub-directory named **<export file name> _img** in the directory of export.

This option is not used when the Simplified export 487 *is checked.*

Add to DXF/DWG background

If background in DXF or DWG format is used and this checkbox is checked, the exported file will be a copy of the background with cameras and constructions added on separate layers 276.

If background in DXF or DWG format is used and this checkbox is not checked, then a new file with cameras and constructions will be created. This file will include a link (XREF) to the background file in DWG format. The background in DWG format will be saved in the subdirectory **<export file name> _img** in the directory of export.

This option works only when the background in AutoCAD DXF or DWG format is used and when exporting to AutoCAD DXF or DWG format.

This option doesn't work when the Simplified export 487 *is checked.*

*If the **Add to DXF/DWG background** checkbox is checked, then the Common scale* 485 *is determined by the background file and can't be changed.*

Simplified export

Simplified export gives the worst result and it is left only as a legacy tool.
All cameras and constructions splits into separate lines, parts of cameras are not combined into blocks, the structure of the background is broken. Filling of the view areas is not saved, it can be saved as hatching. When the shadows 235 is enabled, view areas with shadows are not saved.

Simplified export is possible to DXF format only. Resolution is limited by the value in the Resolution 485 combo box.

While simplified export layers 276 of VideoCAD is not saved, but export file will be multi-layers. In obtained *.dxf file there will be the following layers:
- Background;
- Constructions;
- Cameras;
- Additional (grid, titles, horizontal);
- Frame for printing (if it is enabled).

Raster objects (projections of 3D models 259) are saved in the form of rectangles.

During the simplified export the following options don't work:
- *Line weight unit/pixel* 486;
- *Insert rastrer images* 486;
- *Add to DXF/DWG background* 486.

Vector PDF

On the panel you can adjust options for export to vector PDF:

- Page Width and Height in centimeters or inches
  To change page orientation, invert Width and Height.
- Page margins, in centimeters or inches;
- Title, Author, Subject, Keywords.

On the Line weight tab you can enable exporting weights of lines, adjust the scale of the line weight and specify weight for zero-weight lines.

Parameters on the left side of the DXF,DWG,PLT,CGM,SWF,vPDF 487 sub-tab also have an influence on vector PDF.

BMP,WMF,EMF,GIF,TIF,PNG,JPG,PDF

Scale factor

Unlike **DXF,DWG,PLT,CGM,SWF,vPDF** 485, the scale is not related to drawing size (in meter or foot), it is related to screen size only.

Common scale

Common scale of exporting drawing relatively layout size on the screen.

Camera icon, Illuminator icon, Nonscaleable fonts and hatches.

In the boxes you can specify scale factors of **nonscalable** Camera icon, Illuminator icon, Nonscaleable fonts.

See also: Scale 483.

Raster PDF

On the panel there are tools for export to raster PDF.

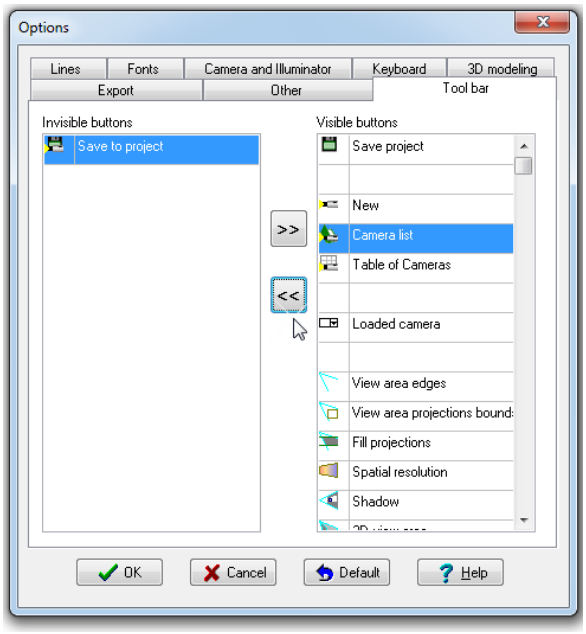
- Page Width and Height in centimeters or inches
  To change page orientation, invert Width and Height.
- Page margins, in centimeters or inches;
- Title, Author, Subject, Keywords.

Parameters on the left side of the BMP,WMF,EMF,GIF,TIF,PNG,JPG,PDF 487 sub-tab also have an influence on raster PDF.

*An alternative way to export to ***.pdf** is to print 215 to a virtual printer, which produces printing result as a PDF file. In this method, the weight and color of lines 475, fonts 477 will match the values specified for printing.*

9.15.7 Tool bar

Graphics window
Main menu
View
Options
Tool bar



On this tab you can control visibility of buttons on the Tool bar 169 of the Graphics window.
In the left window there are **Invisible buttons**, in the right window there are **Visible buttons**.

With the help of buttons << and >> you can move buttons between these two windows making them visible or invisible.

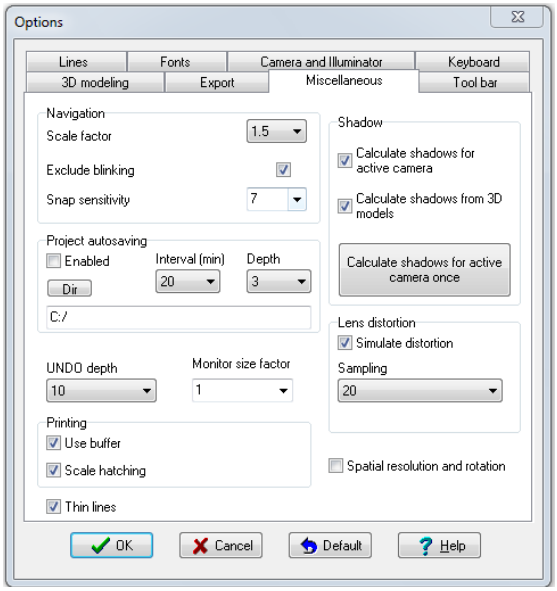
To move a button to other window:

- select it by clicking;
- click on the appropriate button >> **Make the button visible** or << **Make the button invisible**.

If after changing buttons' visibility the Tool bar looks incorrectly, - restart VideoCAD.

9.15.8 Miscellaneous

Graphics window
Main menu
View
Options
Miscellaneous



Scaling factor when turning the mouse wheel

At a large factor the navigation becomes quicker, but less precise. Also use the key **Ctrl** 287. Sign of this factor determines the reaction for direction of rotation the mouse wheel. The factor has an influence on scaling in the Graphics window 161, 3D World 342 and 3D Models 397.

Exclude blinking

If the box is checked, then the redrawing is carried out in the computer memory and displayed on the screen only at the end. At that there is no image blinking, but the redrawing speed lowers slightly.
If the box is not checked, the redrawing is carried out directly on the screen.

Snap sensitivity

You can adjust a distance on which the cursor will be snapped to points, lines and grid as a result of snap 258 effect.
Lesser sensitivity allows to control mouse more precisely.
Higher sensitivity allows to use some imprecise pointer devices or work with high resolution monitors.

Calculate shadow for active camera

Enable/ disable calculating shadows 178.

Automatic calculating is performed for the active camera 164 only.
To disable automatic calculating shadows (with keeping already calculated shadows) clear this box.

This box is duplicated in the Main menu 239 of the Graphics window.

This checkbox has an influence on calculation of shadows in the Graphics window only, it hasn't influence on the 3D World 342.

See also: Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing

the best place for PTZ (dome) camera 583, *Visualization of the camera control area projections and spatial resolution within them* 580

Calculate shadow from 3D models

The calculation of shading from complex 3D models 202 in the Graphics window - resource-intensive operation.

The calculation is disabled by default to save resources. To enable the calculation of shading from 3D models, mark the **Calculate shadows for 3D models** box.
Additionally, for each 3D model, which must be taken into account when calculating the shading:

- *double click on the model to switch it to editing state* 164;
- *on the appeared **Current construction parameter panel** check* Shadow 283 *checkbox.*

In addition,

- **line type** of the instance of 3D model must have Shadow 475 checked;
- the 3D must belong to a **layer** with Shadows 277 field checked;

This checkbox has an influence on calculation of shadows in the Graphics window 161 *only, it hasn't influence on the 3D World* 342. *Calculation of shadows from 3D models in the **3D World** requires* much less computer power. *It is convenient to use this checkbox to disable shadow calculation from 3D models in the Graphics window only, where this calculation requires a lot of resources, but leave the calculation of shadows from 3D models in the 3D World.*

3D models with marked the Shadows 402 *checkbox in the **3D models window** are considered as obstacles in the calculation of shading regardless of state of this checkbox **Calculate shadow from 3D models**.*

See also:Shadows 178, *Main menu>View>Calculate shadows for active camera* 239, *Main Menu>View>Recalculate shadows* 239, *Line type>Shadow* 475, *Layers>Shadow* 277, *Options box>Miscellaneous>Shadow* 490, *Options box>Calculate shadows from 3D models* 491, *Current construction parameter panel>3D model>Shadows* 283, *3D Models window>Shadows* 402, *Choosing the best place for PTZ (dome) camera* 583, *Visualization of the camera control area projections and spatial resolution within them* 580

Calculate shadow for active camera once

As a result of clicking this button, shadows for active camera will be calculated once, then the **Calculate shadow for active camera** box will be cleared and shadows will not be calculated anymore. Shadows have been calculated will be saved in project.

Project auto saving

With this panel, you can adjust auto saving VideoCAD's working projects to chain of files in intervals specified in the **Interval (min)**. The number of files is specified in the **Depth** box . The more files in the chain are and the larger the file size of the project, the more hard disk space will require. After full filling the chain, saving each new file will remove the oldest. You can specify autosave directory by clicking on the **Dir** button.

*Files in the chain are the usual project files of VideoCAD. The newest file called **vcadproject_1.vc7**, previous **vcadproject_2.vc7** etc.*
Auto saving works while working with the program. When no work, saving stops.

Printing

On the panel you can enable printing via buffer that allows to print without error on printers which do not support GDI+ drawing commands of transparent fills, gradient and transparent projection of 3D models. Via the buffer you can print without errors on most virtual printers, such as printing to PDF.

When using the buffer printing on the raster buffer is performed firstly, and then the raster buffer is passed to the printer.
Without the use of the buffer the image is passed to the printer in vector form, as printing commands. If the printer does not support all commands, the distortions of the printed image are possible.

However not all printers can work with the **Use buffer** mode in all cases. In case of issues clear the **Use buffer** checkbox. Try also to decrease printer DPI resolution, hide raster background.

When using the **print buffer** or if the printer does not scale hatching, to print hatching properly check the option **Scale hatching**. If the printer scales hatching on their own and the buffer is not used, clear the **Scale hatching**, otherwise the hatching will be printed too rare.

Thin lines of raster background

Mark of this checkbox increases the thickness of the thin dark lines on a light background to one pixel when displaying raster background in the Graphics window. In most cases it improves readability of the background when it is scaled.

This mode decreases speed of redrawing background.

UNDO depth

VideoCAD keeps several previous states for the possibility to undo operations using the Undo 211 function.
The number of keeping states can be adjusted in this box. The more states are kept and the more the project size, the more RAM is needed.

Monitor size factor

Correction factor to bring the physical size of the Monitor window 407 on the computer screen to the value specified in the Monitor diagonal 410 box on the **Tool bar** of the **Monitor window**.

To set the factor:
- open the **Monitor window**;
- specify in the Monitor diagonal 410 box on the **Tool bar** of the **Monitor window** approximately a half of the physical diagonal of your computer screen. The **Monitor window** must be visible on the screen as a whole;
- measure by a ruler the physical diagonal of the **Monitor window** on the computer screen;
- calculate the needed **Monitor size factor = (value in the Monitor diagonal box) / (Physical diagonal of the Monitor window).**

The Monitor diagonal is measured in inches. 1 inch = 25.4 mm.

For various physical monitors and screen settings in Windows may require different Monitor size factors.

Simulate distortion

This checkbox can globally enable and disable simulation of lens distortion of cameras with lens distortion enabled.

See also: *Lens distortion* 310

Sampling

Modeling the lens distortion in VideoCAD is performed with limited sampling, which can be changed in this box. Than more the value in the box is, the more segments will be used in calculation of

distortion, the more precision, less artifacts, but the longer it takes for redrawing images with distortion.

See also: *Lens distortion* 310.

Spatial resolution and rotation

- If this checkbox **is not checked**, then rotation of the camera around its axis 297 does not affect the position of the vertical and horizontal in the frame when calculating the spatial resolution 316. Horizontal and vertical directions **are tied to the camera and not to the scene**.
- If this checkbox **is checked**, then each time you rotate the camera around its axis by an angle greater than 45 degrees, vertical number of pixels will be considered as horizontal and horizontal number of pixels - vertical. Further, at every rotation by an angle more than 135 degrees, vertical number of pixels will be considered vertical and horizontal number of pixels - horizontal. Thus the vertical and horizontal in the spatial resolution calculation will be **tied to the scene, not to the camera**.

9.16 Utilities

Utilities for measuring camera and image parameters:

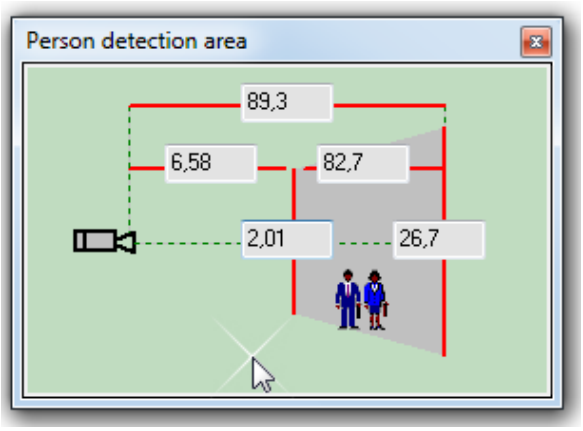
- Image analyzer;
- Live video analyzer;
- Lamp spectrum analyzer;

- were separated out from VideoCAD in the separate product - **CCTVCAD Lab Toolkit**.

Please visit our website for details: http://www.cctvcad.com

9.17 Person detection area size box

Graphics window
Tool bar
Person detection area



The box displays an approximate view and sizes of person detection area projection.

The projection is calculated according to **person detection criteria** attached to a quality level 505 assigned to **camera**. The criteria can be edited in a criteria-editing box 498 of person detection area.

The **person detection area projection** unlike the other areas' projections is calculated on a condition of person getting in the area *at any height* within the specified range. For instance, the presence of a person's leg or head in the area is enough to detect the person.

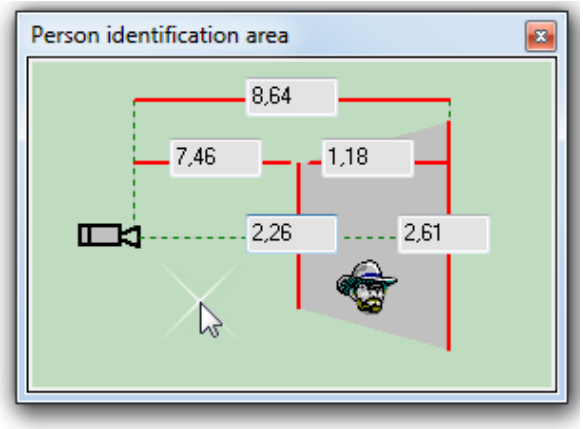
If there are no numerical values in the box, then the **person detection area projection** is missing. The missing projection of detection area implies the failure of capacity to detect at all points of view area, e.g. a camera is looking upwards from the height greater than the **upper bound of detection area**.

This tool doesn't take into account rotation of camera around its axis 297, *shadows* 178 *and lens distortion* 310.

See also: Recommendations on the program use 649, *Criteria editing box of person detection area* 498, *Spatial resolution* 177.
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.18 Person identification area size box

Graphics window
Tool bar
Person identification area



The box displays an approximate view and sizes of person identification area projection.

The projection is calculated according to **person identification criteria** attached to a quality level 505 assigned to **camera**. The criteria can be edited in a criteria-editing box of person identification area 500.

The **person identification area projection** is calculated on a condition of person face getting in the area *at all the heights* within the specified range. The identification condition becomes a presence of a face of person of any height.

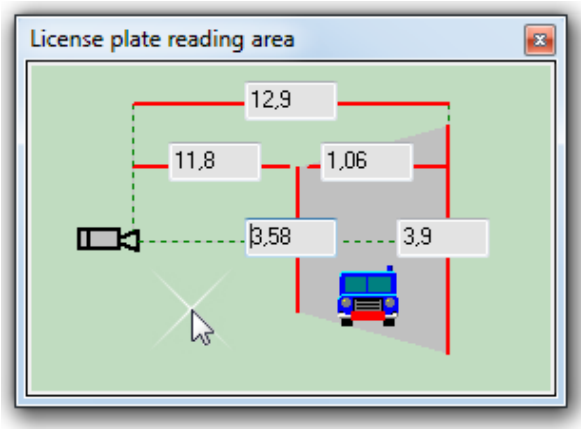
If there are no numerical values in the box, then the **person identification area projection** is missing.
The missing projection of identification area doesn't imply the failure of capacity to identify at all points of view area. To create an **identification area projection** all these criteria are to be observed in the *whole range* of heights specified in these criteria, i.e. for a person of any height

This tool doesn't take into account rotation of camera around its axis 297, *shadows* 178 *and lens distortion* 310.

See also: Recommendations on the program use 649, *criteria editing box of person identification area* 500, *Spatial resolution* 177.
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.19 License plate reading area size box

Graphics window
Tool bar
License plate reading area



The box displays an approximate view and sizes of license plate area projection.

The projection is calculated according to **license plate reading criteria** attached to a quality level 505 assigned to **camera**. The criteria can be edited in a criteria-editing box of license plate reading area 503.

The **license plate reading projection** is calculated on a condition of license plate hitting in the area *at all the heights* from the customized range. The reading condition becomes a presence of license plates of either lorries (high vehicles) or passenger cars (low vehicles).

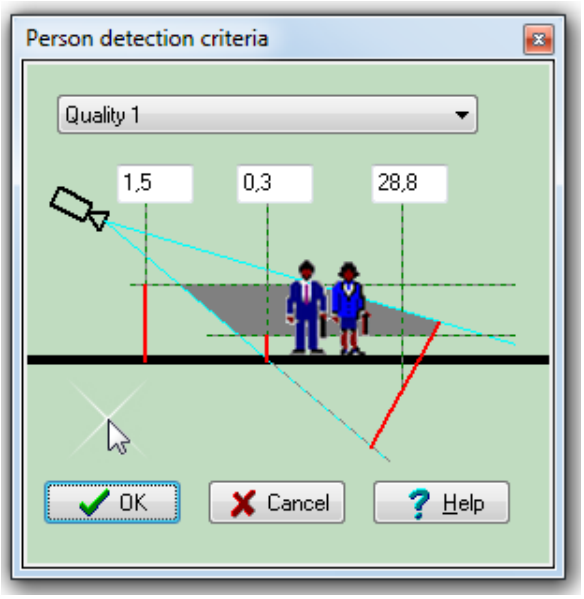
If there are no numerical values in the box, the **license plate reading area** projection is missing consequently.
The missing **projection of reading area** doesn't imply the failure of capacity to read-out plates at all points of view area. To create a reading area projection all the criteria are to be observed in the *whole range* of heights specified in the criteria, i.e. for the vehicles of any size.

This tool doesn't take into account rotation of camera around its axis 297, *shadows* 178 *and lens distortion* 310.

See also: Recommendations on the program use 649, *criteria editing box of license plate reading area* 503, *Spatial resolution* 177.
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.20 Criteria editing box of person detection area

Graphics window
Main menu
Criteria
Person detection area



These criteria are the following:

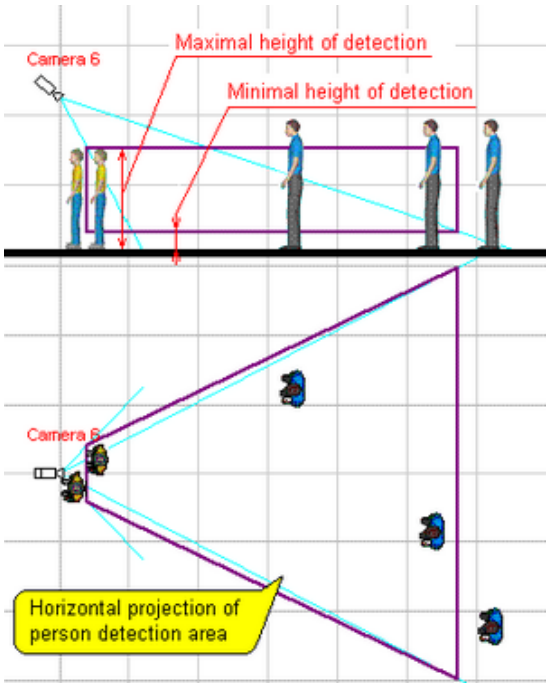
- **Minimal height of detection**;
- **Maximal height of detection**;
- **Minimal vertical resolution (pixel/m, pixel/ft).**

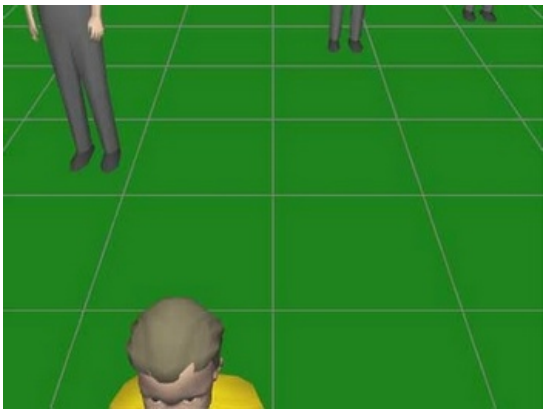
The criterion **Minimal vertical resolution (pixel/m, pixel/ft)** *depends on vertical number of pixels. Vertical number of pixels influences person detection, identification and license plate reading areas.*
For criteria calculation minimal number of pixels from parameters of camera image sensor and parameters of output image is used.
Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box.
Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.

If a camera is rotated by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution** (pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.
In other respects the person detection area *doesn't take into account rotation of camera around its axis 297, shadows 178 and lens distortion 310.*

If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (768 on horizontal), what corresponds to analog camera.

In multi-level 3D projects the heights in the criteria are calculated relative the Base height 298 of the camera, for which the person detection, identification, license plate reading areas are calculated.





The person detection area projection unlike the other areas' projections is calculated on a condition of person hitting in the area *at any height* from the customized range. For instance, the presence of a leg or a head of person in the area is enough to detect a person.

The box upper part contains a **quality level combo box** enabling to choose any **quality level**. The box immediately displays the **criteria values** relevant to the chosen **level of quality**. The **criteria values** can be edited, by typing the new values.

If the **quality level** being edited coincides with the **quality level** of the **active camera**, all the criteria alterations are immediately taken into account when calculating the **person detection area**.

When moving the cursor to a box with the chosen **quality level**, the **additional information** on this **quality level** appears.

To save the introduced changes click **OK**.
To cancel the introduced changes click **Cancel**.

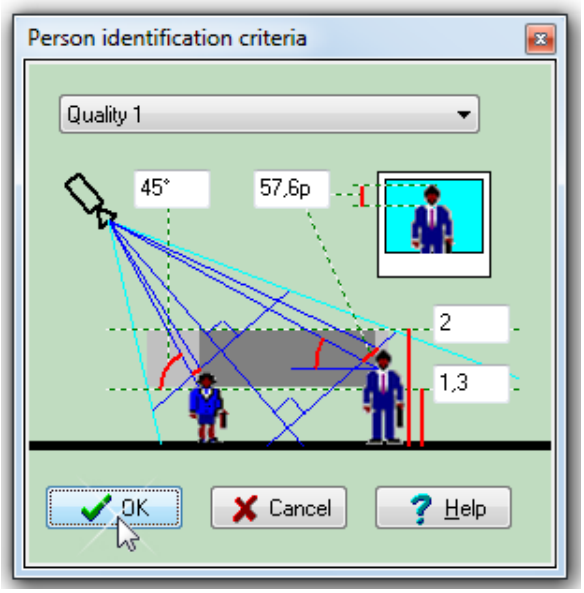
You can set your own criteria 542 using the 3D Video 357 as a control monitor and moving 3D models 259 in the camera view area.

You can change the criteria values of several **quality levels** outright. Clicking **OK** saves all the introduced changes.

See also: Recommendations on the program use 649, Example 6 Determining person identification criteria by the real image 542, Spatial resolution box.
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.21 Criteria editing box of person identification area

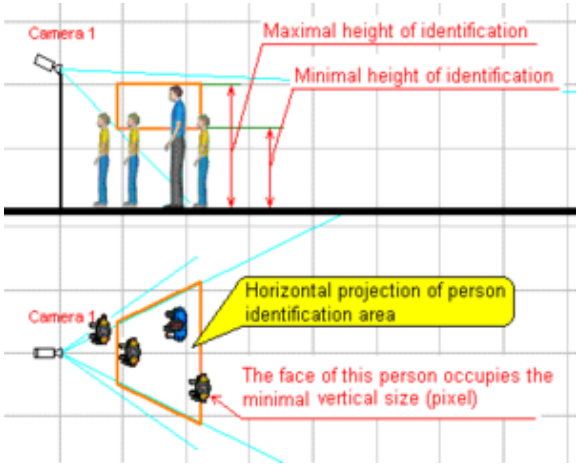
Graphics window
Main menu
Criteria
Person identification area

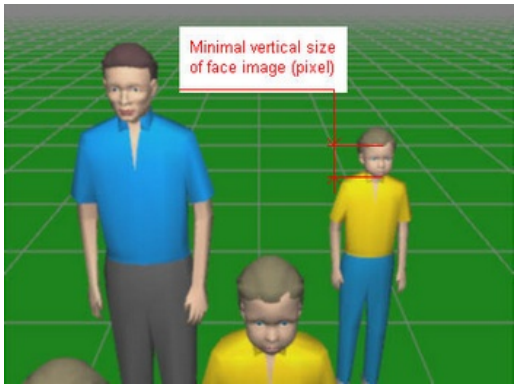


These criteria are the following:

- **Minimal height of identification;**
- **Maximal height of identification;**
- **Minimal vertical size of face image (pixel);**
- **Maximal angle between a direction on the camera and horizontal.**

*A face height is taken as equal to **0,2**m (0,66 ft).*





In multi-level 3D projects the heights in the criteria are calculated relative the Base height 298 of the camera, for which the person detection, identification, license plate reading areas are calculated.

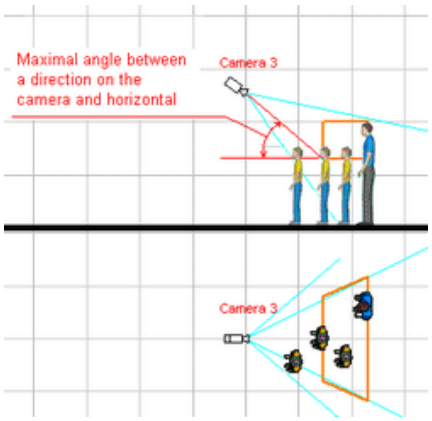
The criterion **Minimal vertical size of face image (pixel)** *depends on vertical number of pixels. Vertical number of pixels influences person detection, identification and license plate reading areas.*
For criteria calculation minimal number of pixels from parameters of camera image sensor and parameters of output image is used.

Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box. Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.

If a camera is rotated by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution** (pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.
In other respects the person identification area *doesn't take into account rotation of camera around its axis* 297, *shadows* 178 *and lens distortion* 310.

If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (768 on horizontal), what corresponds to analog camera.

The criterion **Maximal angle between a direction on the camera and horizontal** is introduced due to the reduction of identification capacity, if a camera is viewing a person downwards, despite the adequate sizes of person face on a display.



The person identification area projection is calculated on a condition of person face hitting in the area *at all the heights* from the customized range. The identification condition becomes a presence of a face of person of any height.

The box upper part contains a **quality level combo box** enabling to choose any **quality level**. The box immediately displays the **criteria values** relevant to the chosen **level of quality**. The criteria values can be edited, by typing the new values.

If the **quality level** being edited coincides with the **quality level** of the **active camera**, all the criteria alterations are immediately taken into account when calculating the **person identification area projection**.

When moving the cursor to a box with the chosen quality level, the **additional information** on this **quality level** appears.

To save the introduced changes click **OK**.
To cancel the introduced changes click **Cancel**.

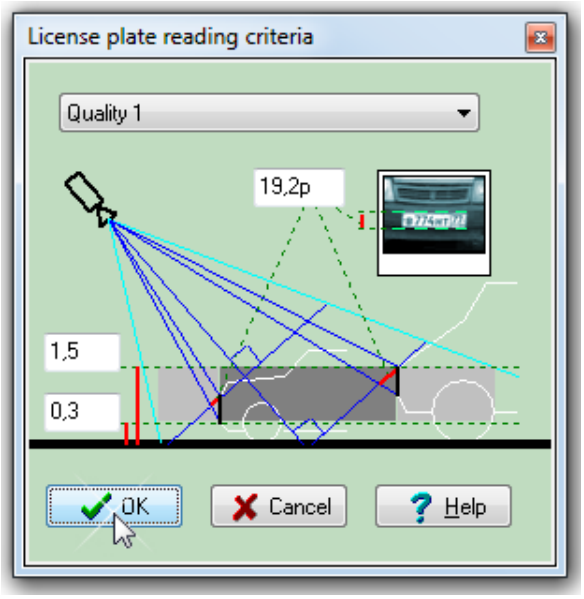
You can set your own criteria 542 *using the 3D Video* 357 *as a control monitor and moving 3D models* 259 *in the camera view area.*

You can change the **criteria values** of several quality levels outright. Clicking **OK** saves all the introduced changes.

See also: Recommendations on the program use 649, *Example 6 Determining person identification criteria by the real image* 542, *Spatial resolution box.*
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.22 Criteria editing box of license plate reading area

Graphics window
Main menu
Criteria
License plate reading area

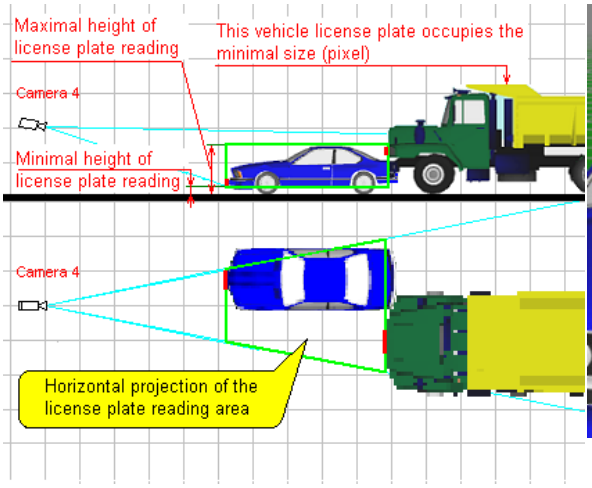


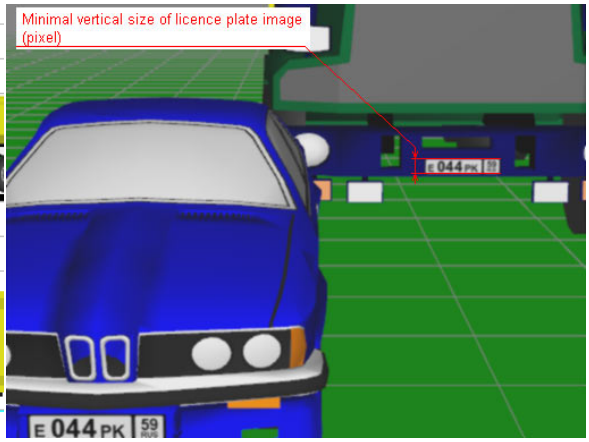
These criteria are the following:

- **Minimal height of license plate reading;**
- **Maximal height of license plate reading;**
- **Minimal vertical size of license plate image (pixel).**

*A license plate height is taken as equal to **0,1**m (0,33 ft).*

In multi-level 3D projects the heights in the criteria are calculated relative the Base height 298 of the camera, for which the person detection, identification, license plate reading areas are calculated.





The criterion **Minimal vertical size of license plate image (pixel)** *depends on vertical number of pixels. Vertical number of pixels influences person detection, identification and license plate reading areas.*
For criteria calculation minimal number of pixels from parameters of camera image sensor and parameters of output image is used.

Number of pixels of image sensor is specified on the Sensitivity and Resolution 332 box.
Number of pixels of output image is specified on the Processing 381 tab of the Image parameter panel 370.

If a camera is rotated by an angle more than 45 degrees, when calculating person detection 498 and identification 500, license plate reading 503 areas, the parameters: **minimum vertical resolution** (pixel/meter, pixel/ft), **the minimum vertical size of face image** (pixels), **the minimum vertical size of license plate** (pix) are calculated based on the number of pixels along the horizontal, instead of the number of pixels along the vertical, as in this case the vertical side of the field of view is located along the horizontal.
In other respects the license plate reading area *doesn't take into account rotation of camera around its axis* 297, *shadows* 178 *and lens distortion* 310.

If number of pixels is not set (N/A), calculation is performed for vertical 576 pixels (768 on horizontal), what corresponds to analog camera.

Since the license plate is a *flat object*, the angle included between an **optical axis** of camera lens passing through a license plate and a **horizontal** has a smaller value comparing to a license plate reading procedure. It is to be kept in mind though that with the angle large values the sensitivity to a vertical skew of license plate ascends.

The license plate reading projection is calculated on a condition of license plate hitting in the area *at all the heights* from the customized range. For instance, to read the license plates of the passenger cars out only, the maximal height parameter is to be changed. In this case the **calculated license plate area** extends.

The box upper part contains a **quality level combo box** enabling to choose any **quality level**. The **criteria values** relevant to the chosen level of quality are immediately displayed in the box. The **criteria values** can be edited, by typing the new values. If the edited **quality level** coincides with the **quality level of the active camera**, all the criteria alterations are immediately taken into account when calculating the **license plate reading area**.

To save the introduced changes click **OK**.
To cancel the introduced changes click **Cancel**.

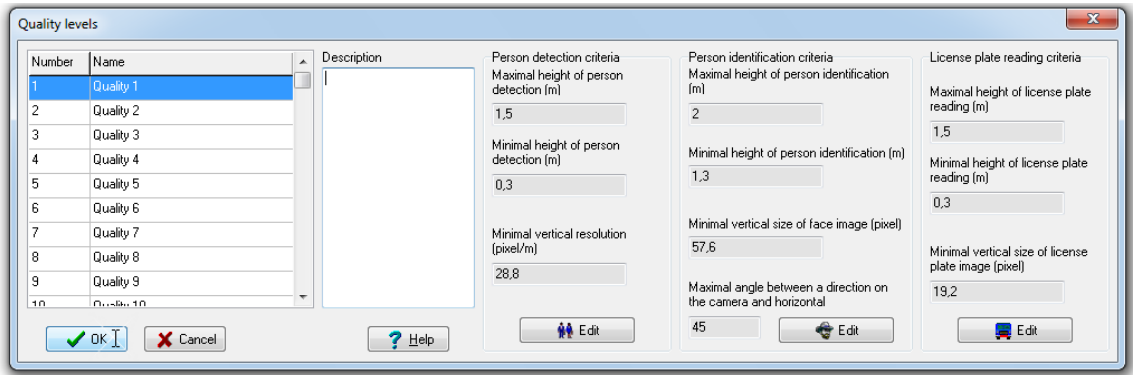
You can set your own criteria 542 using the 3D Video 357 as a control monitor and moving 3D models 259 in the camera view area.

You can change the **criteria values** of several quality levels outright. Clicking **OK** saves all the introduced changes.

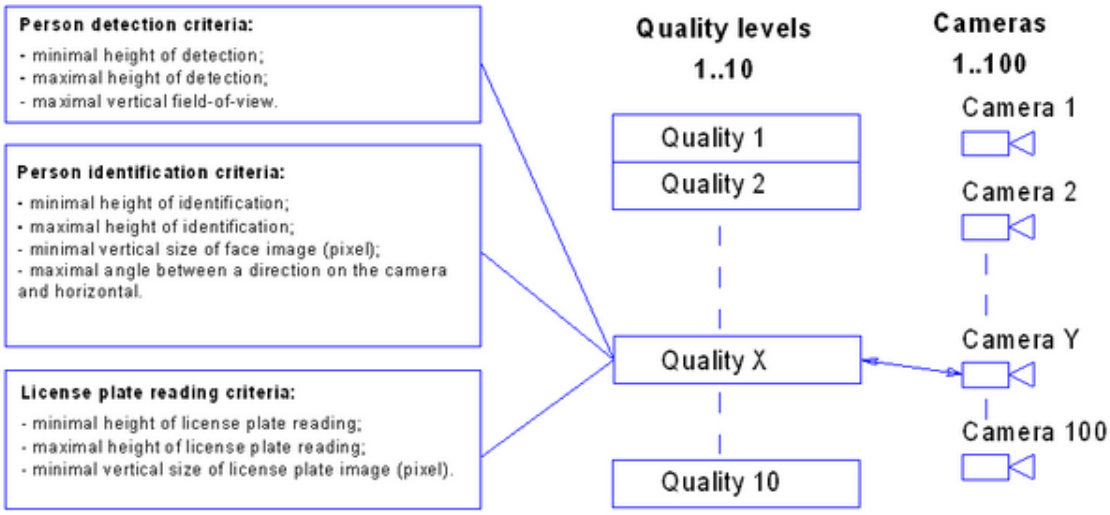
See also: Recommendations on the program use 649, Example 6 Determining person identification criteria by the real image 542 , Spatial resolution box 316.
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.23 Quality level box

Graphics window
Main menu
Criteria
Quality levels



Quality level is a set of criteria according to which VideoCAD calculates person detection 498, identification 500 and license plate reading 503 areas.
The criteria values for each quality level can be adjusted using the Quality level box.
Calculated projections are displayed in the Graphics window 161 and in the size boxes of person detection 495 and identification 496 , license plate reading 497.



The **Quality levels** can be assigned to cameras in the Quality level box. As a result of the quality level assignment to a camera, the person detection, identification and license plate reading areas of the camera will be calculated according to criteria which are included in the assigned Quality level.

To **change the name** click the left mouse button on the selected quality level in the table.

Editing the additional information is available in the description box.

The additional information appears when moving the cursor to a quality level box in the boxes of editing the criteria of person detection 498, identification 500 and license plate reading 503.

Using the **pop-up menu** of the table you can rename a quality level.

In the right part of the box on the separate panels there are values of criteria of the person detection, identification and license plate reading, which are included in the Quality level selected in the table .

To edit the criteria, click the **Edit** button on the corresponding panel. **Criteria editing box** will appear.

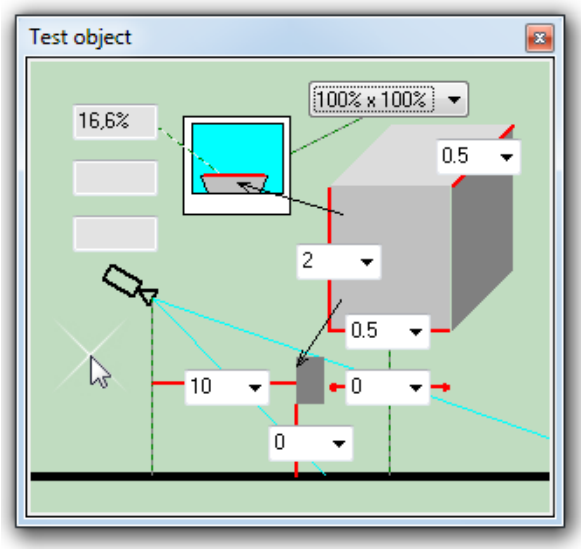
More in detail about criteria see:
Criteria editing box of person detection area 498
Criteria editing box of person identification area 500
Criteria editing box of license plate reading area 503

- To save the introduced changes and assign the selected quality level to the active camera click **OK**.
- To cancel the introduced changes click **Cancel**.

See also: Recommendations on the program use 649, *Example 6 Determining person identification criteria by the real image* 542, *3D Video general information* 357 *, Spatial resolution box..*
External link: "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf) .*

9.24 Test object box

Graphics window
Tool bar
Test object



The box displays a **test object** and its image on the display conventionally.

Test object is a vertical parallelepiped situated perpendicular to the **ground projection of camera lens main optical axis**.

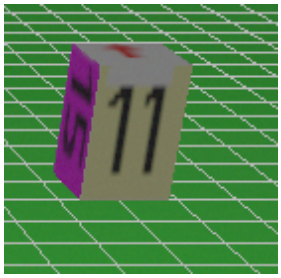
You can change the **horizontal** and **vertical sizes** of parallelepiped, its **depth**, its **height above the ground**, **shift from the lens main optical axis projection** and the **distance between camera location and test object** as well.

In multi-level 3D projects the height of the test object is calculated relative the Base height 298 of the camera, for which the test object belongs.

In the display box you can see an approximate image of the **closest to the camera parallelepiped surface** and the information on which part of screen is occupied with this surface **top**, **bottom** and **height**.

You can choose a parameter taken as a **full screen** and correspondingly obtain the information on this surface sizes in **percentage**, **pixels** and **millimetres** (inches in case of **Imperial** format). Using the **test object** you can obtain the better part of geometrical and resolution parameters on different sections of view area.

In the 3D Video 357 in the graphical editing state 210 of the active camera you can see the actual image of test object as a parallelepiped with numbers on sides. Changing the location of the test object and its sizes you can estimates of the symbol readability on the sides in different sections of view area.

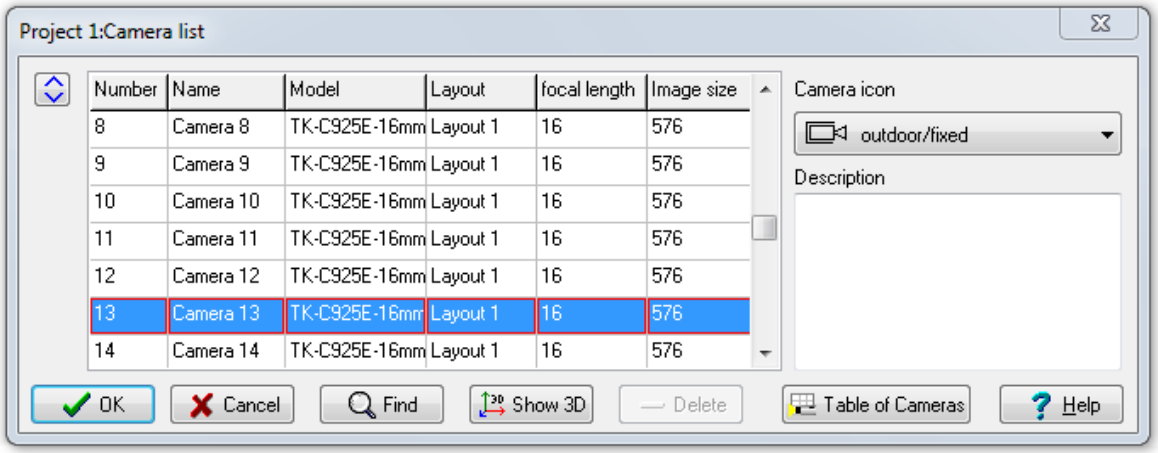


Using the button Test object location 207 or the corresponding item of the graphics window menu 213 you can also change a **test object location**.
The same window allows observing an actual image of test object in **horizontal** and **vertical projections**.

Working with a test object in the graphics window 161 and in the 3D Video is available only within a graphical edit state 167 of active camera.

9.25 Camera list

Graphics window
Tool bar
Camera list



In the **Camera list box** list of cameras in the project is displayed. **Active camera** is highlighted by **red frame**. Any camera can be activated, removed, renamed, found on layouts, it is possible to show 3D image from this camera. It is also possible to sort cameras in the list.

In the **Camera list** box only basic camera parameters are given. To obtain the list of all camera parameters in the project, the Table of cameras 443 multifunctional window is used. It can be called by the **Table of cameras** button or by the same button on the Tool bar of the Graphics window.

To perform any manipulations with the camera first select its name in the list by clicking.

For the chosen camera, it is possible to change **Additional information** and **Camera type**, which determines **camera icon type**.

Cameras are displayed by different icons, only if the Display camera type 483 box in the Options box 474 is marked.

To activate camera without closing the box, double click the row with camera name in the table.

*It is convenient to activate any camera by double clicking on its lens on the layout or by camera's selection in the Active camera 172 list on the **Tool bar** of the Graphics window. It is possible to activate cameras from the Monitor window 415.*

To find a camera on layouts select it in the table by clicking it once and then click **Find on layouts**. To show **3D image** from a camera select it in the table by clicking it once and then click **Show 3D**.

Choosing the items of **pop-up menu**, which appears when clicking the camera selected in the table with the right mouse button, can perform the same actions.

Using the pop-up menu it is also possible to **rename the camera** and select camera model 419.

Choosing the item **Copy to clipboard** you can copy whole camera list to Windows' clipboard. After copying you can paste the camera list to **MS Word**, **MS Excel** or other software.

You can rename the camera from the Table of cameras 443 and rename any number of cameras simultaneously using the Numerate cameras 511 dialog box.

To sort the cameras in the list click the **Sort cameras** buttons. Then will appear the buttons, by using which it is possible to move the cameras selected in the list upwards on one position, downwards, to the beginning or to the end of the list.

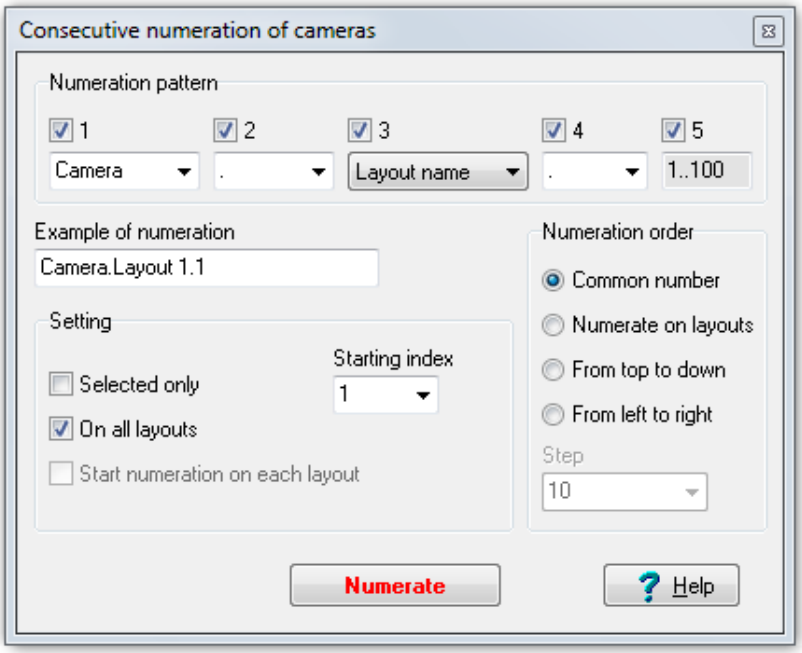
It is not recommended to change the order of cameras without necessity.

- To activate a camera and save the introduced changes click **OK**.
- To cancel the introduced changes and camera activation click **Cancel**.
- To switch promptly between cameras in the **graphics window** use the shortcut **Ctrl+Spacebar**.

See also: Table of cameras 443, *Active camera combo box* 172

9.26 Numerate cameras

Graphics window
Main menu
Camera
Numerate cameras



This tool allows renaming and serial numeration any quantity of cameras simultaneously.

Order of work:

1. Adjust Numeration pattern 511.
2. Adjust Numeration order 511.
3. Adjust additional Setting 512.
4. Click Numerate 512.

Numeration pattern

Numeration pattern can be adjusted by combo boxes and check boxes placed above the combo boxes.
In order that position of a combo box presents in the pattern, the box above this combo box should be marked.
It is possible to select variants of using the positions.
In the **Example of numeration** box the camera name example according to the specified pattern is displayed.

Numeration order

Camera numeration order on layouts is adjusted on the panel.

Common number - numerate in camera number increasing order all over the project. Camera numbers are displayed in the Camera list 509 box and the Table of cameras 443 window in the **Number** column.

Numerate on layouts - numerate in camera number increasing order separately on each layout 274.

From top to down - numerate cameras from top to down according to their position on layouts.

From left to right - numerate cameras from left to right according to their position on layouts.

Step - numeration step on layouts when numerating from top to down and from left to right (meters or foots).

Setting

Selected only - if the box is marked, numerate only selected[164] cameras, otherwise all cameras.

On all layouts - if the box is marked, numerate cameras on all layouts in the project, otherwise only on the current layout.

Start numeration on each layout - on each layout the numeration will be started over again. At that on different layouts in the project, cameras with identical names could be found.

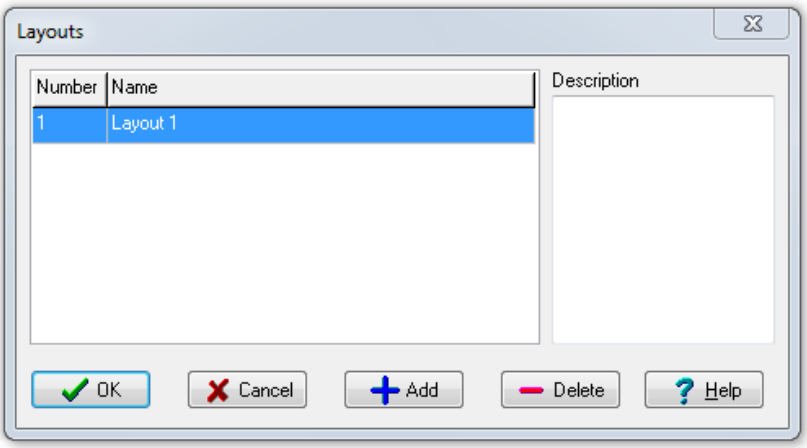
Starting index - index, from which to start numeration.

Numerate

- start numeration.

9.27 Layouts

Graphics window
Main menu
Drawing
Layouts



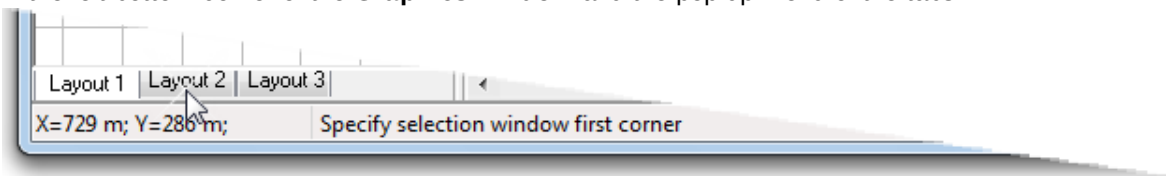
In this box a list of project **layouts** is displayed.

The project may contain up to **10** layouts. Originally one layout is created into project.
You can create, delete or rename any project **layout**. To delete the **original layout** and any layout with the cameras present in it is not allowed.

The layouts are separate sections of monitored object (building, room, territory and storey). A layout contains the horizontal and vertical projections locating backgrounds, **cameras**, illuminators 206, cables 269 and constructions 193. Each camera can be displayed in one **layout** only, though the camera **cables** may pass through several layouts.

- To **choose** a **layout** for displaying it in the graphics window 161 and saving the introduced changes select it in the table by clicking it once and then click **OK**.
- To **delete** a layout select it in the table by clicking it once and then click **Delete**.
- To **create** new layout click **Add**.
- To **rename** a layout double-click a line with its name in the table.
- To **cancel** the introduced changes and layout loading click **Cancel**.

It is convenience to switch the layouts, create, delete, rename the layouts using the Layout 274 tabs in the left bottom corner of the **Graphics window** and the pop-up menu of the tabs.

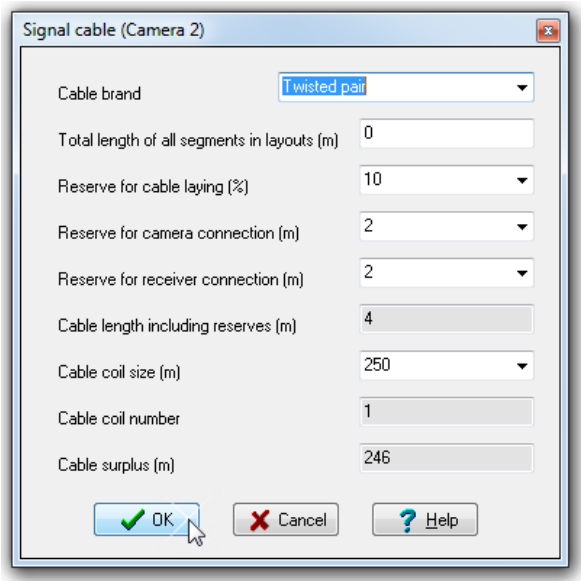


To switch promptly between layouts in the **graphics window** use the shortcut **Ctrl+TAB**.

See also: *Layers* 276.

9.28 Signal cable length calculation box

Graphics window
Main menu
Cables
Signal cable



VideoCAD summarises the lengths of all the **segments**, considers the **reserves** and calculates the **total length of cable**.

To change the default parameters and obtain the calculation results double-click on any **cable segment** or click Signal cable 208 again.
A dialog box of the same name appears after that.

Cable brand

In this box you can assign a **brand** to the **signal cable of the active camera**. Cable brands are **Names** of line types 475, which are considered as cables (the **Cable** box in the line type parameters 475 is checked).. Thus we assign simultaneously cable brand and correspondent **line type** by which the cable will be drawn on layouts.

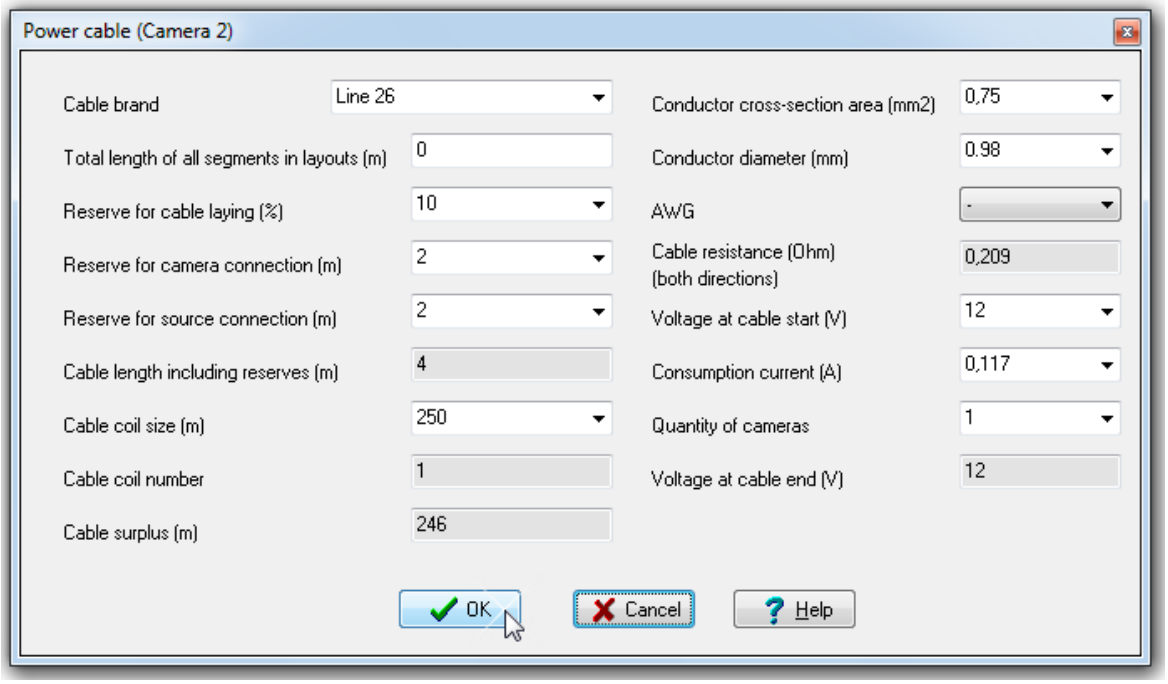
We can obtain Cable report 271 which contains cable lengths of each brand separately.

The results of the cables' calculation on each individual camera and on the project as a whole are included into the text file obtained by Text report 216 and in the Table of cameras 443.

See also: Power cable electrical parameters and length calculation box 515, *View>Active camera cables* 242, *View>All cameras' cables* 242, *Length calculation of line segments* 517, *Cable report* 271.

9.29 Power cable electrical parameters and length calculation box

Graphics window
Main menu
Cables
Power cable



VideoCAD summarizes the lengths of all the **segments**, considers the **reserves** and calculates the **total length of cable**.

To change the default parameters and obtain the calculation results double-click on any **cable segment** or click Power cable 208 again.
A dialog box of the same name appears after that enabling to choose a **section area** of **power cable** to fit the requirements of **camera voltage supply**.

It is assumed that the conductor material is copper and the conductor temperature is + 50° C

Cable brand

In this box you can assign a **brand** to the **power cable of the active camera**. Cable brands are **Names** of line types 475, which are considered as cables (the **Cable** box in the line type parameters 475 is checked).. Thus we assign simultaneously cable brand and correspondent **line type** by which the cable will be drawn on layouts.

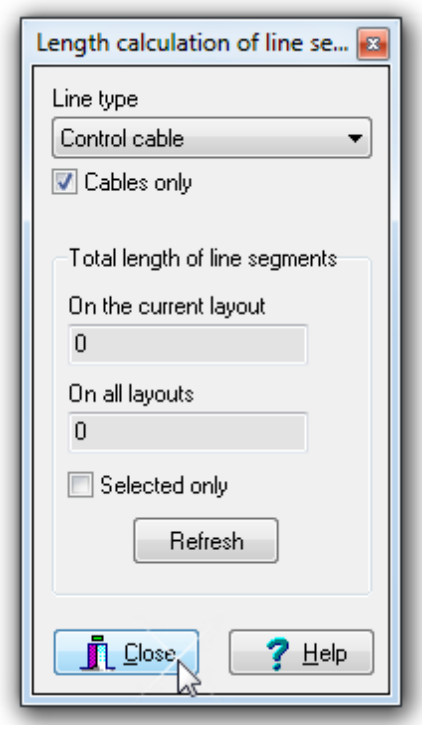
We can obtain Cable report 271 which contains cable lengths of each brand separately.

The results of the cables' calculation on each individual camera, each individual section area and on the project as a whole are included into the text file obtained by Text report 216 and in the Table of cameras 443.

See also: Signal cable length calculation box 514, View>Active camera cables 242, View>All cameras' cables 242, Length calculation of line segments 517, Cable report 271.

9.30 Length calculation of line segments

Graphics window
Main menu
Cables
Length calculation of line segments



With this tool it is possible to calculate total length of line segments 195 of the chosen line type 475. Thus, it is possible to use certain **line types** as **cables**.

Only line segment 195 lengths are summarized. Lengths of other type constructions 193 are not summarized.

Line type

In the combo box you can select line type 475. Line segments made by the line type will be summarized.

Cables only

When this box is checked, in the **Line type** combo box only line types which are considered as cables are shown (the **Cable** box in the line type parameters 475 is checked).

Selected only

Summarize selected 164 segments only.

After selecting **line type,** in the **On the current layout** and **On all layouts** boxes calculation results will appear.

Additional buttons:

Refresh - Recalculate.

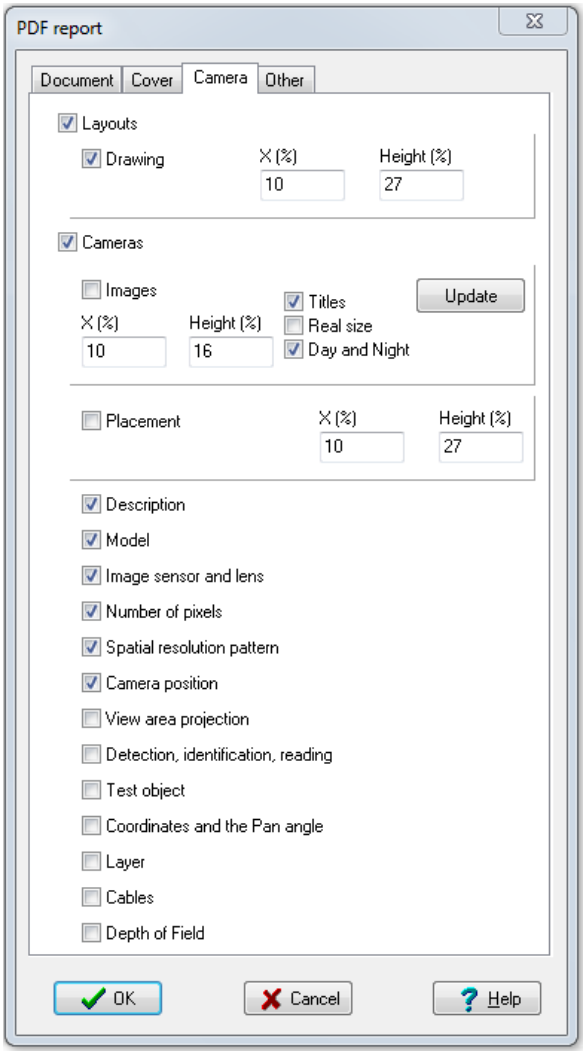
Close - Close the box.

Help - open this Help topic.

See also: *Cables* 269, *Signal cable length calculation box* 514, *Power cable electrical parameters and length calculation box* 515, *Cable report* 271.

9.31 PDF Report

Graphics window
Main menu
Project
PDF Report



The dialog box is used to configure the report in PDF format.
The box consists of the following tabs:

Document 519
Cover 520
Cameras 521
Other 521

To get a report you should adjust the settings on each tab, then click **OK**.

Document

On the tab the common parameters of a PDF document are specified.

Page **Width** and **Height** in centimeters or inches
To change page orientation, invert Width and Height.

Page **Margins**, in centimeters or inches;
Title, Author, Subject, Keywords.

In the **Font (codepage)** combobox a font for the document can be specified. The font must be TrueType. This can either be the name of the font as shown in the Windows\Fonts folder (for example "Times New Roman") or it can be the font family name with an optional style specifier in square brackets (for example "Times New Roman [BoldItalic]").
Possible optional specifiers are: [Bold], [Italic] or [BoldItalic].
A codepage can also be specified (for example "Arial [Bold] {1250}") which allows other encodings to be used.

If the report is in characters other than the Latin alphabet is not displayed correctly - select your codepage.

Possible code pages are:
{0} Direct mapping
{437} OEM_CHARSET
{850} OEM_CHARSET
{852} OEM_CHARSET
{874} THAI_CHARSET
{1250} EASTEUROPE_CHARSET
{1251} RUSSIAN_CHARSET
{1252} ANSI_CHARSET
{1253} GREEK_CHARSET
{1254} TURKISH_CHARSET
{1255} HEBREW_CHARSET
{1256} ARABIC_CHARSET
{1257} BALTIC_CHARSET
{1258} VIETNAMESE_CHARSET
{1361} JOHAB_CHARSET

Below, you can set the **Font height** in % of the height of the sheet and **Line spacing**.

If the **Page Numbers** checkbox is checked, at the bottom of report pages the page numbers will be printed.

The **Headlines** checkbox enables drawing horizontal lines on top and on bottom of each page.
Below you can specify **Header** and **Footer**.

Cover

On the tab parameters of the cover sheet can be specified.

If the **Cover** checkbox is marked, the cover is included in the report.
If the **Frame** checkbox is marked, the frame is drawn on the cover.

If the **Logo** checkbox is marked, then any image can be drawn on the cover.
X (%), Y (%) - the position of the image on the sheet in % of the sizes of the sheet.
W (%), H (%) - the size of the image on the sheet, in % of the sizes of the sheet.
In the **Path** box the path to the image file can be entered. To select a file click on the button ... . Possible file formats: **bmp, jpeg, gif, tif, png, wmf, emf.**

Below there are 4 identical panels where you can specify blocks of text.
Checkboxes **Text 1..Text 4** include corresponded blocks of text on the cover.
X (%), Y (%) - the position of the text on the sheet in % of the sheet size.
Height (%) - the height of the text on the sheet in % of the size of the sheet.

By clicking button, you can select color of the text block.
In the **Alignment** combobox you can select text alignment.

The text itself can be entered in the box at the bottom of each panel.

Cameras

The tab is intended for adjusting information about the cameras that you want to include in the report.

If the **Layouts** checkbox checked, the report will include the names of layouts.
If the **Drawing** checkbox is marked, the report will include drawings of the layouts.
X (%), Height (%) - the position and height of the drawings on the sheet, in % of the size of the sheet.

If the **Cameras** checkbox is marked, the report will include parameters of cameras.

If the **Images** checkbox is marked, the report will include images from the cameras.
X (%), Height (%) - the position and height of the images from the cameras on the sheet, in % of the size of the sheet.
If the **Titles** checkbox is marked , the images from the cameras will include titles 365.
If the **Real size** checkbox is marked, then the images from the cameras will be generated in real-size in pixels.
If the **Day and Night** checkbox is marked, the report will include 2 images for each camera: for day and night time.

Clicking on the Update button starts updating the stored images.
Generation of images from the cameras can be time consuming.

If the **Placement** checkbox is marked, then the report will include fragments of layouts with positions of the cameras.
X (%), Height (%) - the position and height of the fragments of the layouts on the sheet, in % of the size of the sheet.

If cameras occupy too small fragments of plans, reduce the Maximum distance of drawing view area 307 in the camera parameters.

Below there are checkboxes, by which you can select the camera parameters that should be included in the report.

Other

On the tab additional information in the report can be adjusted.

Cameras summary - the number of cameras, the number of used models of cameras 419, lens focal lengths, the camera resolutions in pixels, the total cost of the cameras (if the cost 442 is assigned to the used camera models).

Cables summary - the sum of the lengths of the cables.
All line segments 195 and cables 208 made by **line types** with marked Cable 475 box in the parameters of the line type will be calculated.
These **line types** are considered as **cable brands**. These line types can be assigned to the Signal cable 514 and the Power cable 515 of any camera.
You can simply draw cables as **line segments** on layouts using these line types. In this case, the cables are considered as **main cables** which are not attached to any camera.

The report includes the cables attached to cameras and the **main cables** as well. Cable lengths are calculated for each brand (line type) separately.

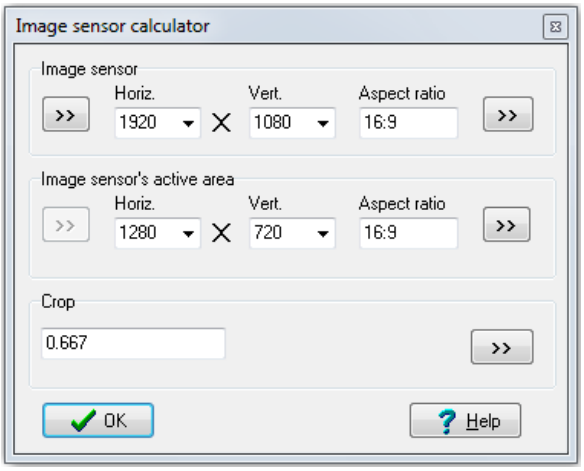
See also *Cable report* 271

Spatial resolution patterns - information about Spatial resolution patterns 316 used in the project.

Date - the date and time of generating the report.

9.32 Image sensor calculator

Camera Geometry
Sensor and Lens
Calculator



The Calculator is intended for convenient calculation :

- Aspect Ratio of Image sensor;
- Aspect Ratio of active area of Image sensor (=Aspect ratio of the output image);
- Crop-factor.

About use of the calculator, see: Specifying active area size of the image sensor/ 636

The calculator can be invoked by the **Image sensor calculator** button in the Sensor and Lens 308 box.

The calculator consists from the three lines:

Image sensor

As a result of click on the left button >> numbers of pixels of image sensor horizontally and vertically are copied from the Sensitivity and resolution 332 window to the **Hor.** and **Vert.** boxes. If the numbers are not specified, the left button is not available.
To the **Hor.** and **Vert.** boxes you can type any values.

In the **Aspect ratio** box the calculated ratio of horizontal to vertical numbers of pixels of the Image sensor will be displayed.

Attention! To calculate the Aspect ratio of Image sensor you must divide **maximum** number of horizontal pixels to the **maximum** number of vertical pixels **in all possible modes of the camera**. In general, the maximum number of pixels may be different from those specified in the Sensitivity and Resolution window..

For example, a camera has the following resolution modes
***1920** x 1080, 1280 x 720, 640 x 360, 320 x 180, 160 x 90*
*1600 x **1200**, 1280 x 960, 800 x 600, 640 x 480, 400 x 300, 320 x 240, 160 x120*

*The maximum horizontal number of pixels - **1920**, The maximum vertical number of pixels - **1200**.*
*Probable Aspect ratio of the image sensor 1920/1200=1,6=**16:10***

Clicking the right button >> the calculated aspect ratio of image sensor will be copied to the

Aspect ratio 308 box in the **Sensor and Lens** box.

Image sensor's active area

As a result of click on the left button >> numbers of pixels of output image 381 horizontally and vertically are copied from the **Processing** tab of the Image parameter panel 381 to the **Hor.** and **Vert.** boxes. If the numbers are not specified, the left button is not available.
To the **Hor.** and **Vert.** boxes you can type any values.

In the **Aspect ratio** box the calculated ratio of horizontal to vertical numbers of pixels of the output image will be displayed.

Clicking the right button >> the calculated aspect ratio of the output image will be copied to the Aspect ratio 295 box in the Camera Geometry 289 box.

Crop

The Crop factor value is calculated from the **Aspect ratio of the Image sensor** and **Aspect ratio of the output image**.

Attention! The calculated value of Crop has sense only if the **active area on the image sensor does not touch the edges of the image sensor.** Otherwise Crop = 1 and the result of calculation does not matter.

See more: Specifying the crop factor 641

To be able to calculate Crop it is necessary that numbers of pixels of image sensor are greater than or equal to the numbers in pixels of the active area. Otherwise, the **Crop** box displays **Error**.

Clicking the right button >> the calculated **Crop factor** will be copied to the Crop 309 box of the **Sensor and Lens** box.

Part X

Examples of work with VideoCAD

10 Examples of work with VideoCAD

10.1 Example 1 Choice of camera installation height and parameters

Problem

We have a number of objects spread in a space.
The objects have certain locations and sizes.
It is required to determine the **height of installation** and **lens focal length of the camera** to display all the objects properly.

Solution

1. Place the objects in **horizontal** and **vertical** projections according to their actual sizes and location using the tools on the Tool bar 169. High-usage tools are:

- Line segment 195
- Polyline 195
- Rectangle 196
- Inclined rectangle 196
- Wall 198
- Aperture in Wall 199
- Circle 200
- 3D model 202
- 3D image 205

*It is necessary for **3D modelling** to place objects only in the **horizontal projection**, color of the objects preset in the line type 475, by means of which the object is drawn. **Heights of the objects** can be specified on the Current construction parameter panel 282 during drawing constructions.*

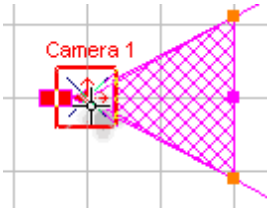
*As the objects prepared 3D models 259 can be used (people, cars). Choose necessary 3D model from the **Tool bar** then specify by clicking the place of the model on layout.*

2. Open 3D Video 357. Control image in the 3D Video during next operations.

3. Switch to Select/Edit 189 mode by successive pressing **ESC** key.

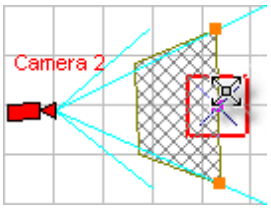
4. To move the camera:

- Select the camera by clicking on its lens;
- Move the cursor to the lens, then press the left mouse button;
- Keeping mouse button pressed, move the selected camera to a new place;
- Release the left mouse button.



5. For tilting and panning the Active camera 166 **on the layout** in Select /edit 189 mode:

- Move the cursor to the pink grip in the middle of the view area bound. Thereupon, the point will be outlined by red square;
- Click on it by mouse;
- Move the cursor;
- To stop tilting or panning click once again on a point

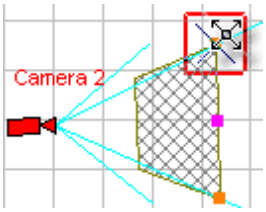


where the middle of the view area bound is to be located.

Current focal length value is displayed in the Lens focal length 185 combo box on the Tool bar 169.

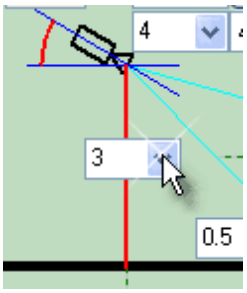
6. To change lens focal length 294 of the active camera on the layout in Select /edit 189 mode:

- Move the cursor to any orange grip on the ends of view area bound. Thereupon, the point will be outlined by red square;
- Click on it by mouse;
- Move the cursor;
- To stop changing focal length click Once again on a point where the end of view area bound is to be located.



7. You can change **Camera installation height** by choosing value from the combo box 296 in the Camera Geometry 186 box .

You can also specify the height by clicking in vertical projection after choosing the Change installation height 209 tool.



8. According to **the image in the 3D Video** and **view area projections** on the layout choose the optimal camera position and its lens focal length 185.

You can see your project in 3D form in the 3D World 342.

External link: The principles of CCTV design in VideoCAD. Part I. Camera view area (.pdf) .*

10.2 Example 2 Choice of cameras' quantity and location

Problem

- It is required to monitor a room of arbitrary form and sizes.
- **Person detection** is required at all the space of a room.
- **Person identification** is requires beside an entrance door, a safe and a manager's table.
- The manager's workplace itself must not hit in the view area.
- Cameras might be installed anywhere, though not lower than **2.5 m**.
- It is required to choose the **camera quantity**, **lenses**, **locations** and **cables**.

Solution

1. Create project 215 and Camera 216.

2. Using the tools of Constructions group 193 create an **actual plan** of a room.
All the details are not to be kept, our task is to observe the sizes carefully.

It is possible to load as a background 222 prepared drawing in any of the following formats:
***.bmp** - a bitmap (e.g., the layout scanned from a paper copy);
***.dxf** - AutoCAD format (created in AutoCAD or other program supporting export to *.dxf);
***.dwg** - AutoCAD format (created in AutoCAD or other program supporting export to *.dwg);
***.jpg** - the compressed image (e.g., a digital picture of the plan);
***.wmf, *.emf** - Windows Metafile (export to *.wmf is supported by the majority of the Windows graphics applications)

*It is necessary for **3D modelling** to place objects only in the **horizontal projection. Color of the objects** is specified in the line type 475, by means of which the object is drawn.*
***Heights of the objects** can be specified on the Current construction parameter panel 282 during drawing constructions.*
*For example to model a **grey wall** it is necessary to use lines with the **minimum height 0 m** and **maximum - 3 m (the height of the wall)**; to model a door draw a rectangle using a **line with the heights 0-2 m**; to model a table surface draw a rectangle in the **height range 0,73-0,75 m** etc.*
Windows and door apertures can be cut through walls made by the Wall 198 tool with the help of the Aperture in Wall 199 tool. Or model walls by several constructions: under aperture, on each side of aperture, above aperture.
*It is possible to put **3D models** 259 of people in some places.*

3. Create the essential quantity of cameras, using the copying 191 and paste 191.

4. Enable showing person detection and identification areas of created cameras.

5. By changing camera disposition in the **graphics window** and lenses' focal lengths 185 we obtain the best location, when person detection and identification areas cover necessary areas on the layout.
See. Example 1 529.

6. In the 3D Video 357 we can see 3D models of camera images.

7. Choose **Filling** in the drop-down menu of the Fill projection 175 button on the **Tool bar**.

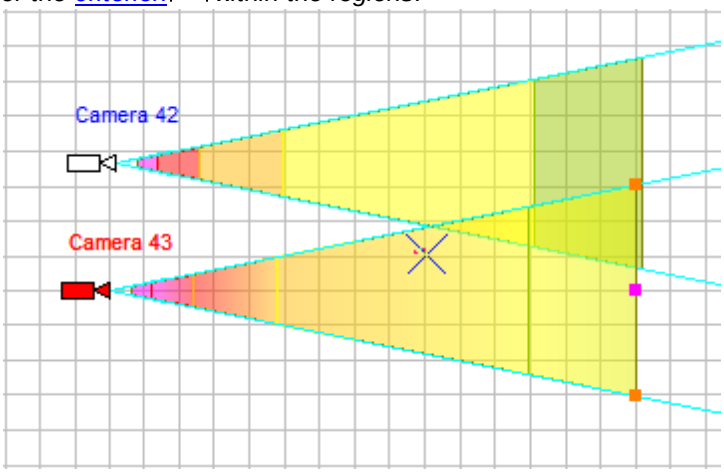
View area projection will be filled by blend color.

The color of filling is determined by the line type 175 of the camera.

8. Choose **Discrete color** in the drop-down menu of the Spatial resolution 186 button on

the **Tool bar**.

*View area projection will be divided into the **regions**. The regions will be colored according to values of the criterion 316 within the regions.*

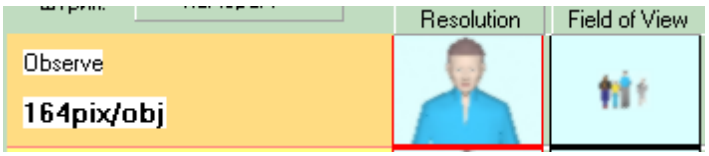


9. Open the Spatial resolution 186 box.

In the Pattern criterion 319 combo box you can see which criterion is chosen in the pattern assigned to the active camera.

In calculation of spatial resolution, the Vert.(Horiz.) number of pixel 321 is taken into account.

In the Table of regions 322 you can see what color corresponds to each range of the criterion value. On the images in the Resolution 323 column, you can see with which resolution people at the far bound of each region will be visible.
On the images in the Field of view 323 column, you can see which part of the **field of view** people at the far bound of each region will cover.



10. Create additional layouts if needed (e.g. several storeys).

You can see your project in 3D form in the 3D World 342.

External link: The principles of CCTV design in VideoCAD. Part I. Camera view area (.pdf), The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(*.pdf).*

10.3 Example 3 Choice of cameras' quantity and location on the original layout

Problem

There is a **location plan of site** in any of the following formats:

***.bmp** - a bitmap (e.g., the layout scanned from a paper copy);
***.dxf** - AutoCAD format (created in AutoCAD or other program supporting export to *.dxf);
***.dwg** - AutoCAD format (created in AutoCAD or other program supporting export to *.dwg);
***.jpg, *.gif, *.tif, *.png** - the compressed image (e.g., a digital picture of the plan);
***.pdf** - cross-platform format of electronic documents developed by Adobe Systems;
***.wmf, *.emf, *.emf+** - Windows Metafile (export to *.wmf is supported by the majority of the Windows graphics applications)

The length of a building frontal wall - **80m**. (Or any other size) is known.
It is required **to create a project of site surveillance system**.

Solution

1. Choose menu item **Drawing > Load background > Horizontal projection** 222.
2. In the appeared dialog box choose a **layout file** and click **Open**.
3. In the appeared dialog box Adjust Background 223 click **Ruler**.
4. Click the beginning of the frontal wall in the loaded layout.
5. Then click on the end of the frontal wall.
6. After that enter the known length of the frontal wall - **80m** in the **Real distance** box.
7. Then click **OK** in the **Adjust background** dialog box .

If the loaded background is in PDF format, the Adjust background dialog includes fields for selecting page in the PDF document and to set resolution of the PDF document. If the loaded background is in DXF or DWG format, the dialog includes tools to select a layout and to control visibility of layers of the background, as well as a checkbox to hide texts.

8. To obtain 3D model of the site 357, draw out lines on the background by Constructions 193 in VideoCAD.

If the loaded background is in AutoCAD DXF or DWG format, you can import lines and polylines from the background to VideoCAD constructions automatically using the tool Import DXF/DWG background 224.

9. Further place cameras and cables on the original layout as well as in previous Examples 527.

See more: Work with background in AutoCAD formats 631
External link: The principles of CCTV design in VideoCAD. Part I. Camera view area (.pdf)*

10.4 Example 4 Calculation of camera view area parameters

Problem

It is required to calculate a horizontal projection of view area in a height range of **0.5-2 m** and projections of person detection and identification **areas** to a camera with **1/4" image sensor** and lens of **12-mm focal length**.

The camera is installed at **3,5-m height** above the ground. View area far bound is to be **10 m** away from the camera location.

The camera is designed to **detect a person**. It is required to determine **identification capacity**.

The lighting is adequate, camera resolution is high, and a digital system of high resolution is used for displaying and recording. Compression level is minimal.

The solution by calculating

1. If the project is not created, click Main menu>Project>New 215. Then type a **project name** and choose **Metric**.

In the Camera Geometry box 289 set:

- **Camera parameters**:
  - Image sensor format 293 - **1/4"**;
  - Lens focal length 294 - **12 mm**;
  - Quality level 293 - **Quality 1** (the best);
- **Installation parameters**:
  - Installation height 296 - **3,5 m**.
- **Required view area limitations**:
  - View area upper bound distance 301 - **10 m**;
  - View area lower bound 298 - **0,5 m**;
  - View area upper bound 300 - **2 m**.

2. After the last parameter in the Camera Geometry box 291 is entered, an approximate image of view area and the exact sizes of view area horizontal projection are displayed:

- View area horizontal projection lower bound 302 (the near one, in this case) distance - **7,69 m**;
- View area lower bound width 306 - **2,46 m**.
- View area upper bound 305 (the far one, in this case) width - **3,01m**.

Now we see color frames on the buttons 183 on the Tool bar 169: **Person detection area**, **Person identification area** and **License plate reading area**, designating the presence of the areas.

*Presence and sizes of the areas depend on set **criteria of** person detection 498, person identification 500 and license plate reading 503.*

3. When clicking **Person detection area** the sizes of a person detection area projection are displayed:

- Near bound distance - **5,12 m**;
- Near bound width - **1,63m**;

- Far bound distance - **21,3 m**;
- Far bound width - **6,41m**.

The information on person identification and license plate reading areas' projections is obtained by analogy.

4. If the information obtained is not satisfactory, for instance:
The **view area lower bound distance** is too large (**7,69 m**), though possessing **person detection area** margins, we easily change **lens focal length** to **8 mm**.
In this case, the bound of **person detection area** remains within the required limits, and the **near bound distance** reduces to **5,73 m**. When using a **12 mm** lens we lower a camera up to **2.5 m**, then the **view area near bound** distance becomes **7,14 m**.

5. Thus selecting parameters, we can choose the most suitable ones to provide the required view area.

To view the projections' image of view areas obtained, click the buttons Person detection area 183, Person identification area 184, License plate reading area 184 on the Tool bar 169 of the **Graphics window**, after which the calculated projections are displayed.

To save the drawing obtained to a file, click Save drawing as 219 menu item.

To copy the drawing into the Windows clipboard, click **Copy to clipboard** 222 menu item after which the drawing can be pasted into a graphic editor, e.g. Paint.

To **print** the drawing choose the menu item **Drawing>Print** 226.
To save the project, click **Project>** Save as 215 and save the project to a file.

If the project information is to be exported into a **text file**, e.g., to execute an explanatory note promptly or print it out for the installers, we click menu item Project > Text report 216 and thus save the text file.

To obtain all camera parameters as a table, click Table of cameras 172 button on the **Tool bar**.

You can see your project in 3D form in the 3D World 342.

External link: The principles of CCTV design in VideoCAD. Part I. Camera view area (.pdf) , "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(*.pdf)*

10.5 Example 5 Calculation of cameras' parameters and choice of their relative locations

Problem

It is required to monitor a wall of building at a level of ground floor windows.

- Wall length - **60 m**.
- Height of windowsills - **1 m**.
- Height of windows - **2 m**.

*The minimal height to install cameras under the requirements of vandalism guard - **3.5 m**.*

- **Person detection** by the digital **video motion detector** for the wall space is required. The **video motion detector** can detect an object with no less than **5x5** pixel size.
- An entrance is situated within a **20-m** distance from the wall edge. It is required to identify all people coming in and out of the building.
- A busy highway is situated within a **10-m** distance from the wall. It is required to minimise the highway hitting in the camera view areas.
- The lighting is adequate and at night luminaires are used.
- The high-resolution cameras are used, with **1/3"** image sensor, **752x582** effective pixels.
- A digital system of the high resolution with the full frame input is used for displaying and recording. Output image size is **768x576 pixels.**
- The compression level is minimal.
- The image is color.
- Real horizontal resolution is 350 LPH

Solution

The example describes the calculation method for better understanding. It is much easier to solve the problem by graphics methods, as described in previous examples[527]**.**

First we will calculate **2 variants of camera placing** and will compare both the variants,
Then we will check depth-of-field[539], then we will obtain 3D images[540] from the cameras.

Calculation of variants of cameras placing

- In this case the best solution might be the disposition of two cameras looking towards each other on a building wall.
- The best height is a minimal possible height, i.e. **3.5 m**. It is required to choose the cameras' lenses and location.

1. If not to consider a door the problem comes to choosing a lens for a camera installed at **3.5-m** height. Its view area projection length[304] (i.e. a distance between a near bound and a far one) in a height range of **1-2 m** is to be equal to a half of wall length (i.e. **30 m**). A **view area width** is to be minimally possible to enhance the object resolution for the wall space and reduce the highway hitting the view area.

1.1 If a project is not created, click Main menu>Project>New 215, and type a **project name**.

1.2 At creation of new project one camera are created automatically.

1.3 Then customize a **criterion of person detection** by the **video motion detector** (if it is not customized earlier).

1.3.1 Choose the **Main menu**>**Criteria**>Person detection area 271.

Minimum size of detected object is **5x5 pixels**. If a human figure occupies 5 horizontal pixels, it will occupy no more than 45 vertical pixels. To detect 1.5 m tall person, the minimum vertical resolution should make **45/1.5=30 pixels per meter**. Enter this value to the **Minimum vertical resolution (pixel/meter)** box. Click **OK** to save changes.

1.3.2 Enter **Number of pixels of the image sensor.** Click Sensitivity and resolution 186. In the Sensitivity and resolution box, in the Number of pixels 332 boxes select **752 x 582.** Close the box and confirm the changes.

1.3.3 Enter **Image size.** Open 3D Video 357 , right click on it. On the appeared Image parameter panel 370 select the Processing 381 tab.
On this tab in the Image size 381 combo boxes select horizontal and vertical sizes: 768x576. Click Save 384 to save change of the image size of this camera and close the box.

1.4 Then we choose **lenses**. Since the **view area width** is to be minimal, we start with the maximal **focal length**.

1.4.1 In the Camera Geometry box 289 set up:

Camera parameters:

- Image sensor format 293 - **1/3"**;
- Lens focal length 294 - **36 mm** (for a start);
- Quality level 293 - **Quality 1** (don't change).

Installation parameters:

- Installation height 296 - **3.5 m**.

Required view area limitations:

- View area lower bound 300 - **1 m**;
- View area upper bound 298 - **2 m**;
- View area upper bound distance 301 is selected so that the view area length 304 constitutes **30 m**. The obtained value - **50 m**.

2.1 Then we construct a situation model using buttons of Constructions group 193.
Click Rectangle 196 and construct a rectangle of **60-m length** in **horizontal** projection.
To obtain the required accuracy we switch a grid step 188 - **10 m** on and by clicking the right mouse button choose a Local snap 258> **To grid**.

Using another **rectangle** mark a door at **20-m** distance from the edge of **rectangle**.

Using **horizontal line** mark a highway boundary at **10-m** distance from the rectangle in the **horizontal projection**.

2.2 Then switch displaying person identification area on by clicking Person identification area 184 . The area obtained will be displayed in orange frames.

2.3 Then click Select/Edit 189 and select the camera. Then click Move 192 , and on **camera lens**. Then select a place for camera location on the wall visually so that the door hits in the **person identification area**.

2.4 Now we see that the **calculated view area** doesn't get slightly to the end of wall. Click Change view area upper bound 210 and then the far edge of building's wall. We see that the **person identification area** has shifted slightly. In such a way, the first camera is placed.

2.5 Then click **Select/Edit** and select the only camera we have, by clicking its lens or capturing it with a **selection window**. If at clicking the other **objects** were selected too, deselect them, by clicking them while holding **Ctrl** down.

2.6 Click Copy 191 and specify a **base point** for the copying, i.e. a camera lens in the **horizontal projection**.

2.7 Then click Paste 191 and locate a camera phantom on the opposite wall end in the **horizontal projection**. Click a point of a second camera location. After that the New camera 171 dialog box appears, enabling to change the offered values or to agree with them, by clicking **OK**. The **new camera** is created. Since the second paste is not required, click Stop operation 188.

2.8 Then select 189 the created camera, deselecting other **objects** simultaneously. Click Rotate 192, and specify **rotation centre**, i.e. a camera lens in the **horizontal projection**. After that specify the **initial** and **final** points of rotation and rotate the camera to **180°**.

2.9 To remove a hatch of view areas, select cameras then click Actual projections 175 and hide it.

2.10 At the end, activate the created camera.

2.11 Now we see in the **horizontal projection** the calculated view areas of the cameras intersecting while the calculated view area of the second camera doesn't get to the end of a wall. It means that the cameras are used inefficiently.

2.12 Click Change view area upper bound 210 and then click the windows' boundaries on the left end of the wall. Thus, the view area bound is set up.
Then click Move active camera 210 and select a place for the second camera location so that the intersection of the cameras' view area was insignificant (margins).

It is seen simultaneously that if the second camera is moved, then the person identifications area of the second video camera also covers the door, i.e. the identification of the coming in and out is realized by both cameras on both sides. Undoubtedly it increases the identification probability, but in the view areas in the door zone there appears a gap that can not be viewed.

We slightly rotate the cameras from the wall in the **horizontal projection**.

2.13 The **person detection areas** of both cameras are displayed so that we see that the **person detection** is provided along the full length of wall.

2.14 Now we read-out the obtained results by measuring the distances using the **line segments**.

- the first camera is to be located within a **1.3 m**. distance from the left end of the wall.
- the second camera is to be locate within a **13 m**. distance from the right end of the wall.

There's no doubt the decision is true, still the lenses with a 36-mm focal length are expensive and hard to get.

3. Now we make calculation for the available lens with a **16-mm focal length** and compare it to the results obtained.

3.1 For comparison we make another drawing on another **layout**. To do that right click on the Layouts 274 tabs then choose in the pop-up menu **Add Layout**. The new **layout** is created.

3.2 By pressing **Ctrl+A** all **objects** on the **first layout** are selected 164. Then click Copy 191 and specify a **base point** on the first camera lens.

3.3 Switch to the new **layout** using the shortcut **Ctrl+TAB**.

After that click Paste 191 and specify a **base point** on lens of the same camera.
Two dialog boxes of the creation of **new cameras** appear. Click **OK**. Since the second paste is not required, we click Stop operation 188. Thus, we have a copy of the **first layout**.

3.4 Load the third camera from the new layout by double clicking on its lens.

3.5 Using the Lens focal length 185 box change **focal length** of the active camera lens to **16 mm**. Activate another camera and change its **focal length**, too.

3.6 Now we see that the **person identification area** is insignificant, though present. Select and move the **third camera**, superposing the person identification area and a door. Activate the third camera (if the fourth one is active) and click **Change view area upper bound**. Specify the **upper bound** of view area by clicking the boundaries of windows on the left end of wall.
Then activate the fourth camera.

3.7 Now we see in the horizontal projection the calculated view areas of the cameras intersecting. It means that the cameras are used inefficiently. Click **Change view area upper bound** and click the boundary of windows on the left end of a wall.
The view area bound is set up.
Then click **Move active camera** and select a place for the fourth camera location so that the intersection of the cameras' view area was insignificant (margins).
Then slightly rotate the cameras from the wall in the **horizontal projection**.

3.8 When displaying the **person identification area** of the fourth camera we see that due to its shorter length of **view area** the **person identification area** has larger sizes. Hence it' s correct to use the fourth camera for the **identification**.
Relocate it when clicking **Move active camera**, and superpose the **person identification area** with the door.

3.9 Activate the third camera again. Then click **Move active camera** and select a place for the fourth camera location so that the intersection of the cameras' view area was insignificant (margins).
Slightly rotate the cameras from the wall in the **horizontal** projection

3.10 The **person detection areas** of both cameras are displayed so that we see that the **person detection** is provided along the full length of a wall.

3.11 Now we read-out the obtained results by measuring the distances using the **segments**.

- the third camera is to be located within a **7.6 m**. distance from the left end of the wall.
- the fourth camera is to be located within a **31 m**. distance from the right end of the wall.

4. By switching between the **layouts** using **Ctrl+TAB** we compare both variants and see, that the one with **36-mm** lenses is more preferable in most of the cases, as it provides the larger length of **person identification area**.

Graphical calculation of depth of field

5. As the **long-focus lenses** are used, it makes sense to check the **depth of field** 454 for the first camera with the **36 mm lens** which is used for the person identification and the detecting along the wall at the same time. Activate this camera.

5.1 The calculation of the **depth of field** requires one more parameter - **aperture**. As the cameras

are external, then a wide aperture is necessary for the conservation of sensitivity. Let's preset the aperture **2.0** typical of mini lenses.

5.2 Open the Depth of field calculation box 454 by clicking the **Depth of field** 186 button .

5.3 Specify the **aperture** equal to 2 in the **Aperture** 457 box.

5.4 Specify the **boundary resolution** 457 **350** LPH . This is a real resolution of the color picture according to camera parameters.

5.5 When the Depth of field calculation box 454 is opened, the sharpness area limits 459 and the plane at the hyperfocal distance 458 are seen in the graphics area. We see that while focusing at the hyperfocal distance and further the door doesn't get into the sharpness area

5.6 Click the **Specify the focus plane** 458 button in the **Depth of field calculation box**.

5.7 By clicking the view area make the sharpness area cover the door and touch the end of the wall.

5.8 As we succeeded, then the **depth of field is sufficient**. For the necessary depth of field the camera should be focused at the distance **26 m**.

Getting 3D image models from video cameras

6.1 Build the **wall with windows and door** and the **highway** with the help of the tools: Wall 198 , Aperture in Wall 199 and Rectangle 196 in the **horizontal projection**.

First build the Wall.

- Choose Wall 198 .
- On the Current construction parameter panel 282 enter:
- **3D H min** (minimum height of 3D construction) = 0;
- **3D H max** (maximum height of 3D construction) = 3;

Build the **wall** (0-3m) by specifying its ends.

Then make window apertures in the Wall.

- Choose Aperture in Wall 199 .
- On the Current construction parameter panel 282 enter:
- **3D H min** (minimum height of 3D construction) = 1;
- **3D H max** (maximum height of 3D construction) = 3;
- Specify by clicking ends of each aperture within the projection of the Wall.

Build the highway (0-0.1m) using the Rectangle 196 tool within the heights 0-0.1m.

6.2 Using 3D object 202 tool, place people next to the door and along the edges of the wall and cars on the highway.

6.3 Open **3D Video** by clicking the **3D Video** 187 button.

6.4 Activate all the cameras of the project by turns, see real pictures from them.

6.5 Save obtained pictures with the help of the item in the menu in **3D Video Image>Save as *.bmp** 360 **or Image>Save as *.jpg** 360.

In such a way, using VideoCAD we have solved a problem in the best way, using two cameras only. **Since for the solution of the similar problems 3 cameras are used as a rule (with an individual camera at the entrance), we have saved no less than $200.**

- *To save the project, we click Main menu*>Project>Save as 215 *and thus save the project to file.*
- *To **print** the drawing choose the menu item **Drawing>Print*** 226

- *If the project information is to be exported to a **text file**, e.g., to execute an explanatory note promptly or print it out for the installers, we click Project > Text report 216 and thus save the text file.*

You can see your project in 3D form in the 3D World 342.

External link: The principles of CCTV design in VideoCAD. Part I. Camera view area (.pdf) , "The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(*.pdf), The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(*.pdf)*

10.6 Example 6 Determining person identification criteria by a real image

Sizes of the person detection, identification , license plate reading areas, calculated by VideoCAD, depend on the numerical values of the criteria of person detection 498, identification 500 and license plate reading 503 and Image size (pixels).

*The **criteria are specified by the designer**, based on the **image quality of the video system** being used and aspects of the problem.*

Image quality in VideoCAD is modeled by the following parameters:

Camera parameters (Sensitivity and resolution 331 box):
- color 332;
- Horizontal and Vertical number of effective pixels of image sensor 332;
- horizontal resolution 333;

Image processing parameters (Processing 381 tab on the Image parameter panel 370):
- Horizontal and Vertical size of output image 381;
- full frame 382 or one field;
- brightness 383;
- contrast 383;
- sharpness 383;
- compression 383.

Knowing the video system parameters and having one or several **exemplary images** with people and cars from this video system, it is possible to fit the quality parameters and criteria for modeling person detection, person identification, license plate reading areas produced by this video system.

The best image is that, on which many people are captured at different distances, at the same time some of the people can be considered identified.

It is necessary to remember that:

- the result of identification, detection and reading depends on many factors; it is impossible to model all of them, and even if it were possible, then the labour-intensiveness and the probability of error of such modeling would be very high;
- by video system is implied a video camera with the lens, video signal transmission channel, recorder and display device. Each component can cause specific distortion;
- from one and the same video system images of different quality can be obtained depending on its settings and scene features;
- detection and identification depend on personal qualities of the operator, on the degree of acquaintance with the identifiable person;
- video system resolution, measured with the help of the test chart is not a sufficient parameter for getting detection and identification criteria.

In spite of all these complexities it is quite possible to get correct criteria for VideoCAD with the enough accuracy for practice.

Problem

There are some images from video system with the images of people. It is planed to build a large-scale CCTV system on the basis of this video system.
For this it is necessary to determine the person identification criteria according to the designer

requirements.

Video system parameters:

- high resolution cameras with 752x582 image sensor are used;
- camera is **black-and-white;**
- video signal is captured with 768x288 resolution (**by interlaced fields**);
- in the video system simple **notch** (not comb) filters are used for the separation of the luminance and chrominance, which **don't become disconnected** when the black-and-white signal is incoming;
- **middle level compression** is used (by the DVR settings).

Problem solution consists of two stages:

Determining the quality parameters of the image model

1. Determine the quality parameters of the active camera basing on the video system parameters.

1.1 Open the Sensitivity and resolution 331 box.

1.2 Enter to the Number of pixels 332 combo boxes 752x582.
In the Resolution 333 box choose the maximum possible resolution in case of using **notch** (not comb) filters - 350 TV-lines.
Close the Sensitivity and resolution 331 box and confirm changes.

Open 3D Video 357. Open Image parameter panel 370 by right-clicking on the **3D Video**. On the **Image parameter panel** choose Processing 381 tab.

1.3 Enter on the **Processing** tab:

- **Horizontal size** - 768 pix;
- **Vertical size** - 576 pix;
- **One field** - mark;
- **Color** - clear;
- **Brightness** - 5 (to begin with);
- **Contrast** - 5 (to begin with);
- **Sharpness** - move to middle positions;
- **Compression** - 3 (to begin with).

Horizontal resolution is already specified as Camera resolution 543.

1.4 Click **Save** for saving the parameters.
Choose View 385 tab and mark According to camera parameters 385 box. As a result the 3D image size will be 768x576 pixels.

2. Open the **Camera Geometry box** 289 by clicking the **Camera Geometry** 186 button.
Determine approximately the same **height**, **inclination**, **lens focal length**, as of the camera, from which the exemplary image is taken.

3. Open the **exemplary image** using any graphical viewer (without scaling!) and place next to the **3D Video.**

It is possible just to load the image as the background 222 and to fix its size equal to 3D Video.

4. Place **3D model** 259 - a person on the **horizontal projection** of the graphics area within the bounds of view area projection. Person's figure appears in **3D Video**.
By moving the **3D model** in the graphics area try to make person's face take about the same

location and size as on the **exemplary image**.

5. Compare face legibility on the exemplary image and in the **3D Video**. If necessary correct the **quality parameters** (see above) achieving person's face equal legibility.

*Place several **3D models** at different points of camera view area.*
It is desirable to repeat p. 3... 5 with several exemplary images.

When all adjustments have been made, click **Save** on the Processing 381 tab to save the parameters.

As a result of the given source data the following quality parameters are:

- **Brightness** - 4;
- **Contrast** - 7;
- **Compression** - 2;
- **Horizontal sharpness** - minus 1;
- **Vertical sharpness** - minus 1;

The fragments of the real image and the image model (additional processing has not been done):


Determining the person identification criteria on the image model

6. Open the **Camera Geometry box** and specify the following parameters:

- **installation height** = 0.2 m above the maximum height of identification (2.2 m);
- **height of view area upper bound** =0.1 m above the maximum height of identification (2.1 m);
- **lens focal length**=4,5 mm;
- **image sensor format** =1/3".

These parameters are optimal for the person identification area size not to be limited by the view area bounds. Look at the vertical projection. If there is a limit, change the parameters.

7. Place several **3D models** - people of the minimum height (1,5 m) within the bounds of the camera view area.

*The **angle between a direction on the camera and horizontal** 500 is maximum exactly to the figure of the minimum height.*

8. Show the **Person identification area** by clicking the **Person identification area** 184 button.

9. Open the **Criteria editing box of person identification area** 500, by choosing the menu-item **Criteria>Person identification** 271.

10. By examining the image in the **3D Video** and the bounds of the calculated identification area in the graphics window, determine the **near and far identification bounds** according to your

demands, by correcting the parameters:

- **Maximal angle between a direction on the camera and horizontal** (the near bound);
- **Minimal vertical size of face image (pixel)** (the far bound).

Minimum and maximum heights of identification depend on the possible range of the human height and the roughness of the area. These parameters don't depend on the image quality that's why they are not recommended to be changed.

As a result of modeling according to our views on identification the following criteria are:

- **Maximal angle between a direction on the camera and horizontal** is 35 degree;
- **Minimal vertical size of face image (pixel)** is 30 pixels.

Image fragments at the near and the far identification bounds:

Determination of the criteria of person detection 498 *and the license plate reading* 503 *is carrying out in a similar manner.*

External link: The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(.pdf)*

10.7 Example 7 CCTV design using Monitor window and PTZH frame

The Monitor window 407 and the new tool in the 3D Video 357 - PTZH frame 365 allow to project video surveillance system by a new method, working directly with images from video cameras. This method can be very convenient.

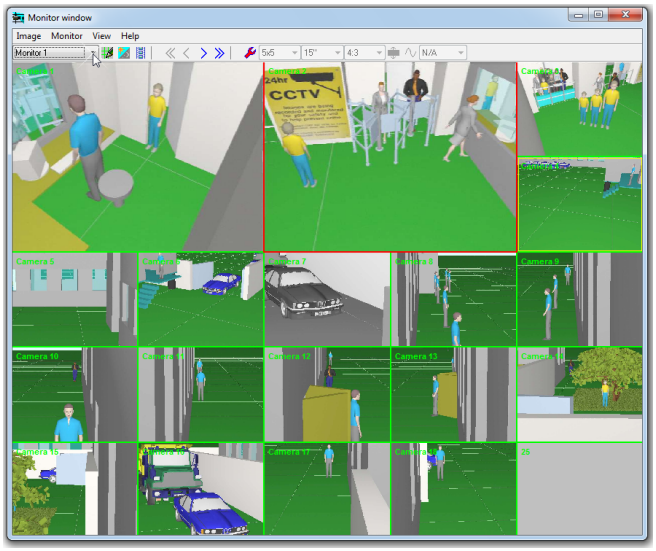
Order of work:

1. Create 215 the project, load background 222, by means of constructions 193 create **3D model of environment** and place 3D models 202 of people and cars at control points.

2. Preliminary place cameras in the **Graphics window**.

3. Choose camera models 419 if necessary.

4. Open 187 the **Monitor window**, choose Dimension 410 of monitor. This dimension must be a little bit greater than quantity of cameras. Connect 417 all cameras to this monitor. On the monitor images from preliminary placed cameras will be visible.



5. Analyze images. If an image is not optimum, do the following:

- Double click the image. **3D Video** will appear.
- In the Main menu of **3D Video** choose item View> PTZH frame 365.
- Using the frame, adjust position and parameters of the camera to get optimum image. At the same time, changes in the **Graphics window** are performed automatically.

- Thus adjust all cameras. If necessary move 192 cameras in the **Graphics window**, create additional cameras and delete the cameras, which have become unnecessary.

- If one monitor is not enough to control video surveillance system, connect cameras to other monitors 408 in the **Monitor window**.

6. As a result we receive ready project:

- Drawing of cameras' placement in the **Graphics window**;
- Images of video surveillance system on monitors;
- Description 216 of all cameras for an explanatory note;
- A table 443 with all camera parameters.

External link: "The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(.pdf)*

10.8 Example 8 CCTV project

In the **Examples** directory you can find an example of a video surveillance system project of an administration building that **was designed in VideoCAD**.

In this project **locations and parameters** 291 **of cameras were chosen**. Models 419 are assigned to the cameras.

When locating the cameras, its person detection areas, person identification areas, license plate reading areas were considered depending on **cameras' purpose**.

In the project a prepared background 222 is used in the ***.dxf** format, walls and objects in the cameras view areas are outlined by VideoCAD constructions. There are 3D models 202 and 3D images 205 in the project.
There are Illuminators 206, which switch ON in the nightime.
You can look into each camera having activate it and opening 3D Video 357 .

It is convenient to load camera by double clicking on its lens or by choosing in the Active camera 172 combo box.

You can display all cameras on the Monitor, by clicking the Monitor window 187 button. You can switch between daytime and nighttime, by clicking Day/Night 409 button on the **Monitor window** Tool bar.

In the the **demo-version** you can not edit the cameras. When activation of any camera its **lens focal length** 294 will become **4 mm, image sensor format** 293 **- 1/3"**, **lens aperture** 340 **- F1.2** and **light sensitivity** 334 **- 1 lux**.
In the **full version** you can edit the project and choose more suitable location and parameters of cameras.

You can see your project in 3D form in the 3D World 342.

External link: "The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(.pdf)*
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10.9 Example 9 Choice of camera model according to known scene illumination

See before: About camera sensitivity 651

Problem

There is a **black/white** mini camera with known sensitivity parameters: **Minimum scene illumination** 0.04 lx with lens **F1.2** at **signal/noise ratio**=10dB, **IRE30**.

Mini lens **F2.0** is mounted on the camera.

At night the scene is poorly illuminated by the illuminator with a **mercury high pressure lamp**, placed far from the scene. Illumination measured by the luxmeter is **0.1 lx**.

It is required to obtain and evaluate image model from the camera.

Solution

1. Create camera by clicking the Create camera 171 button and place it on layout.

2. Modeling the scene.

2.1 Open the 3D Video 187.

2.1.1 Click the 3D model 202 button and place some different **3D models** in front of the camera.

3. Modeling scene illumination.

3.1 By right clicking or double clicking on the **3D Video** open the Image parameter panel 370, open the Scene 371 tab. On the **Scene** tab switch to the Night 371 tab.

On the **Night** tab:

3.1.1 Mark the Model illumination 372 box.
3.1.2 Select in the combo box Background light source 373 = Mercury high pressure.
3.1.3 Select in the combo box Background illumination (lx) 373 =0.1.

4. Modeling camera sensitivity.

4.1 Open the Sensitivity and resolution 329. box. In the box select sensitivity parameters on the Camera 331 panel:
4.1.1 Color 332 = black/white.
4.1.2 Minimum scene illumination (lx) 334 =0.04.
4.1.3 At aperture 334 =F1.2.
4.1.4 S/N (dB) 334=10.
4.1.5 IRE 334 = 30.
4.1.6 exposure (ms) 335 = 20.
4.1.7 Mark the AESC 336 (electronic shutter), AGC 336 (automatic gain control) and Gamma 337 (gamma correction) boxes.

4.2 On the Lens 339 panel choose:
4.2.1 Fixed iris 339.
4.2.2 Aperture limits 340 = F2.0.

5. In the **3D Video** we see image model and calculated values: signal amplitude **20 IRE** and signal/noise ratio **(S/N)=2.31dB.**

Visually the image is unsatisfactory. 3D models are lost in noise.

6. Select more sensitive standard design **camera** with a higher aperture lens: minimum scene illumination 0.04 lx with lens F1.2 at signal/noise ratio=17dB, 50 IRE. The lens F1.2 is mounted on the camera.

6.1 Specify its parameters in the Sensitivity and resolution 329 box and see the image model. Visually image quality at the night time is quite acceptable. Calculated parameters: S/N=17dB, 51 IRE.

It is possible to specify resolution 332 parameters, check possibility of 3D model detection and identification at known distances.

It is recommended to perform the test with 3D model 202 of a black man.
It is recommended to set the maintenance factors 481.

External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

10.10 Example 10 Measuring camera sensitivity

See before:About camera sensitivity 651.

Problem

There is a camera. It is necessary to measure its sensitivity.

The matter of measurement of sensitivity is a measurement of scene illumination with which the camera image have Signal/Noise ratio = 17dB. To measure illumination a Luxmeter is used, to measure Signal/Noise ratio the ***Image analyzer*** *or the* ***Video analyzer*** *from the* ***CCTVCAD Lab Toolkit*** *package can be used.*
The ***Video analyzer*** *reads out the Signal/noise ratio directly from the screen.*
The ***Image analyzer*** *uses the stored frames in *.bmp or *.jpg formats.*
In most cases the ***Video analyzer*** *is more convenient for measuring signal/noise ratio.*

Equipment:

To perform the measurements you need the software CCTVCAD Lab Toolkit (visit http://cctvcad.com).

- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.

If the lower limit of illumination measured by the luxmeter is more than assumed camera sensitivity, see Measuring low illumination 554.

- Any PC-based video capture system, TV-tuner with video input, etc. The System should allow to display live video on the computer screen and save images without compression or with little compression.

For measuring IP cameras' sensitivity it is enough to have possibility to display images on the screen and save images.

IP cameras sensitivity *can worsen considerably depending on compression level.*

- **Image analyzer** utility. It is a part of ***CCTVCAD Lab Toolkit*** 551.
- Compact tungsten halogen lamp 12V, 10W.
- Stabilized power supply unit for the lamp. 12V DC, without considerable ripples of output voltage.
- Lens with F1.2 aperture, parameters of which **are reliable**, focal length is 4-8mm.

If the camera allows to mount only mini-lenses

(M12), the mini-lens with a known aperture (F2.0) is needed.

- A test chart with **grey scale**, for example **EIA1956**.
- Stand. It is recommended for convenience and accuracy.

Measuring sensitivity should be carried out in a dark room.

Order of work

1. Switch off all additional options of image processing. Only AESC and AGC should be switched on. Switch maximal gain of AGC if it is possible.

For IP cameras, set the compression type - M-JPEG, the image quality - the best. While measuring the sensitivity of IP cameras you must know which exposure time is used by the testing camera, otherwise the measurement becomes meaningless.
See *Measuring exposure time of IP camera* 593.

*Sensitivity of **IP cameras** can depend on the number of pixels in image. The higher the number of pixels is, the smaller pixel size - the worse the sensitivity.*
Correctly measuring sensitivity of modern IP cameras is not an easy task. When light is decreased, IP camera automatically turns on the noise reduction, merges neighboring pixels, reduces frame rate, multiplies exposure time, disables color. The black level rises and the noise is lost in black together with dark image details. Meanwhile turning off this automation is impossible in many cases.

2. Mount lens F1.2, on the camera, mount the camera on stand, direct it towards the test chart, connect to computer, display image on the screen.

If the camera allows mounting only mini-lenses (M12), mount a mini-lens with known aperture (F2.0).

3. Direct on the test chart, in the camera field-of-view place the luxmeter sensor.

4. Defocus.the image slightly to blur possible unevenness on the chart.

5. Switch on tungsten halogen lamp. Switch off common light.

6. Changing the distance from the lamp to the test chart, get an image with visible noises on the screen.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the test chart.
Be sure, that the luxmeter sensor window and the grey scale of the test chart have visually equal illumination.

7. Save the image and record illumination according to the luxmeter reading.

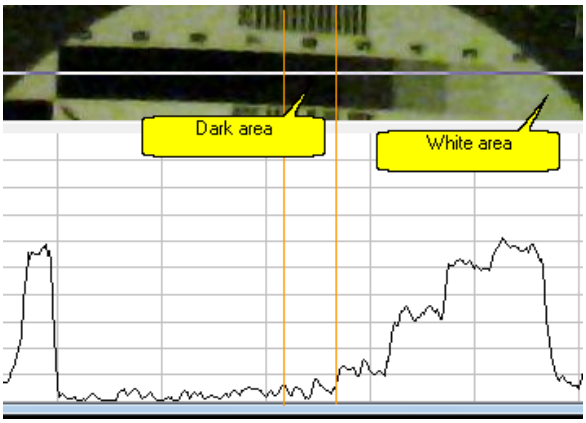
If luxmeter sensitivity is not enough, see *Measuring low illumination* 554.

8. Repeat **p.6.. 7** for different illumination.

9. Measure signal/noise ratio for saved images by means of the Image analyzer 551. As **a white area** use the white area of paper near to the luxmeter sensor window. As **a dark** area use one of rectangle of the grey scale.

About choice of the dark area in details:
The dark area must meet two requirements:
1. Noise at the area should be not be greatly restricted by the black level.
2. It should be exactly the darkest area.

With standard analog cameras it is usually enough to choose the black darkest square on the gray scale. Automation analog camera works in such a way that the black level is kept when changing the light, not cutting off the signal and noise.
Complicated analog cameras with digital processing, IP cameras can behave unpredictably. Sometimes while changing light levels some of squares in the gray scale goes for the black level or rise above the black level, black level "floats." In this case we have to choose to measure different areas, making sure that the dark area is really darkest and the noise is not cut by the black level.



10. Find image with signal/noise ratio equal **17dB**. Record **Maximum level of brightness** and illumination at which this image is obtained.

11. Value of illumination at which the image is obtained is the Minimum scene illumination 334 for the tested camera at signal/noise ratio 334 equal 17dB and lens F1.2 (F2.0 for a camera with mini-lens).
The **Maximum level of brightness** is the IRE at the minimum illumination 334.

You can insert these values into the Table of camera models 419 or in the Sensitivity and Resolution 329 box. After that it is possible to perform precise modeling of the tested camera model.
3
With complicated analog cameras and IP cameras may be a situation when we can not get the signal to noise ratio equal to 17dB because of constantly working noise reduction schemes. If the noise reduction can not be disabled, then we can not use the Signal/Noise ratio as a boundary criterion of sensitivity. In this case we have to choose another boundary criteria, for example the image resolution. Precise modeling of the sensitivity of these cameras is not possible, but an approximate simulation of images details may be sufficient for practice.

See also: About camera sensitivity 651, Measuring low illumination 554, Sensitivity and Resolution>Camera 331, Table of camera models 419.
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

10.11 Example 11 Measuring low illumination

Not expensive luxmeters which are presented on the market have the lower-range value about 0.1..0.5 lux, but minimum scene illumination for modern cameras reaches 0.04 lux. Therefore when measuring sensitivity 551 of such cameras it is necessary to attenuate sensitivity in known number of times (it is convenient to attenuate in 50-200 times).

It is possible to attenuate sensitivity in the following ways:

- By limiting exposure time of electronic shutter 554;
- By calibrated manual iris lens 554;
- By calibrated attenuation filter 555.

Setting limit of electronic shutter

If camera allows setting exposure fixed value of the electronic shutter (ES, AES, AESC, ESC) on 1/1000-1/10000s, this way will be the easiest way of sensitivity attenuation.
For example, when setting exposure time on 1/10000s, the CCIR/PAL camera sensitivity is attenuated in 10000/50=200 times. Thus, the sensitivity of 0.05 lx will correspond to scene illumination of 0.05x200=10lx.

For EIA/NTSC cameras the attenuation *will make 10000/60=167 times.*

*Although the **Reciprocity** principle is generally correct in digital photography, some cameras can have a difference between the shutter time from the settings and the actual exposure time. Additionally the **Reciprocity failure** can take place in some situation. Therefore, this method may be inaccurate.*

We recommend to check real exposure time of your camera 593.

Calibrated manual iris lens

Sensitivity measuring is made with the lens with narrowed aperture.
Camera sensitivity with such lens should be attenuated **in known number of times.** It is possible to use standard lens with manual iris after **calibration** as the lens with narrowed aperture.

Equipment:

For calibrating lens in addition to the equipment 551 listed above the following is necessary:

- Lens **with manually adjustable iris.** Focal length must be the same as in lens with aperture F1.2.

- Camera with attenuated 554 sensitivity or color camera with sensitivity 1..3lx preferably with the possibility to switch off AGC.
- The Video Analyzer 551 utility is included in ***CCTVCAD Lab Toolkit*** 551.
- Projector with halogen incandescent lamp 500-1000watt, 220V.
- Sticky tape

Order of calibration

1. Switch off all image processing and AGC in the camera.

AGC switching off increases calibration accuracy and allows working with illumination of 5..10lx, even if the camera has sensitivity of 0.2..1lx.

2. Mount lens F1.2, on the camera, mount the camera on stand, direct it towards sheet of paper, connect to computer, display image on the screen.

3. In the camera field-of-view place the luxmeter sensor.

4. Close to the sensor window directly on the sensor, fix a small piece of even white paper.

5. Run Video Analyzer 551. Mark **Cycle** box, click **Start**. After that move fast the mouse cursor to the small piece of even white paper on the screen, close to the sensor window.

6. Switch on tungsten halogen lamp. Switch off common light.

7. By changing distance from the lamp to the sheet of paper, obtain that the **Average brightness** measured by the **Video analyzer** would be equal to 0.22-0.25 after finishing measuring cycle by 100 frames.

The objects on the image should be recognized.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper. Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

8. Write down luxmeter reading and the Average brightness value according to the **Video analyzer** reading.

9. Substitute the lens F1.2 to the lens with manual iris.

10. Using the projector with halogen lamp set illumination exactly 100 times more than the illumination registered in **step 8.** Fix the projector.

11. By adjusting lens iris obtain the **Average brightness** value from the same point on the image according to the **Video analyzer** reading, equal to the value written down in **step** 8.

12. Fix the iris adjustment ring by the sticky tape.

13. Verify the **Average brightness** value.

14. Remove and mount again the lens. Make sure that the **Average brightness** value is changed only insignificantly.

The **calibrated lens**, with which the camera sensitivity is attenuated in 100 times, is obtained. With this lens the sensitivity of 0.05lx will correspond to the scene illumination 0.05x100=5lx.

It is recommended to verify lens calibration after measuring sensitivity of each camera.

Using attenuation filters

It is possible to measure sensitivity of camera with **mini-lens (M12)** using attenuation filters. Such cameras, as a rule, do not have possibility to fix electronic shutter *exposure value* 554. It is difficult

to find mini-lens with *manual iris* 554.

Spectral transmission characteristic of standard neutral density optical filters **is not standardized in sensitivity range of CCD sensors**. It is standardized only in eye sensitivity range. Therefore it is possible to use filter **only after measuring its transmission of the light produced by halogen lamp for the same CCD sensor as in the tested camera**.
When using filters for sensitivity measurement without preliminary transmission measurement, **significant errors in measurement results are possible**.
Transmission coefficient value of filters for black/white and color cameras can differ. It is necessary to make calibration separately for black/white and color cameras.

As standard filters of neutral density have unknown transmission coefficients in the sensitivity range of CCD sensors and need their measurement, with the same result it is possible to use self-made filters, made from floppy disk, with unknown transmission coefficient also.

Measuring filter transmission coefficient

Equipment:

For measuring in addition to the equipment 551 listed above the following is necessary:

- Camera with attenuated 554 sensitivity or color camera with sensitivity 1..3lx preferably with the possibility to switch off AGC.
- The Video Analyzer 551 utility is included in ***CCTVCAD Lab Toolkit*** 551.
- Projector with halogen incandescent lamp 500-1000watt, 220V.

Order of measurement

1. Switch off all image processing and AGC in the camera.

AGC switching off increases calibration accuracy and allows working with illumination of 5..10lx, even if the camera has sensitivity of 0.2..1lx.

2. Mount lens F1.2, on the camera, mount the camera on stand, direct it towards sheet of paper, connect to computer, display image on the screen.

3. In the camera field-of-view place the luxmeter sensor.

4. Close to the sensor window directly on the sensor, fix a small piece of even white paper.

5. Run **Video analyzer**. Mark **Cycle** box, click **Start**. After that move fast the mouse cursor to the small piece of even white paper on the screen, close to the sensor window.

6. Switch on tungsten halogen lamp. Switch off common light.

7. By changing distance from the lamp to the sheet of paper, obtain that the **Average brightness** measured by the **Video analyzer** would be equal to 0.22-0.25 after finishing measuring cycle by 100 frames.

The objects on the image should be recognized.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper. Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

8. Write down luxmeter reading and the **Average brightness** value according to the **Video analyzer** reading.

9. Mount measuring filter on the lens.

When using filters from a floppy disk it is convenient to use lens cover with cut out hole as a mount.

10. Switch on the projector with halogen lamp 500-1000 watt, 220V.

11. By changing the distance from the projector to the sheet of paper, obtain equal with **step 8** value of **Average brightness** after finishing measuring cycle by 100 frames.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper.

12. Write down the luxmeter reading.

13. Filter transmission coefficient = illumination without filter/illumination with filter.

Calibrated filter is obtained with which the camera sensitivity is attenuated in a known transmission coefficient. For example, if the filter transmission coefficient is 0.0125, the camera sensitivity of 0.05lx with the filter will correspond to the scene illumination 0.05/0.0125=4lx.

See also: *About camera sensitivity* 651, *Measuring camera sensitivity* 551, *Sensitivity and Resolution>Camera* 331.
External link: *"The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(*.pdf) .*

10.12 Example 12 Measuring resolution of camera (lens)

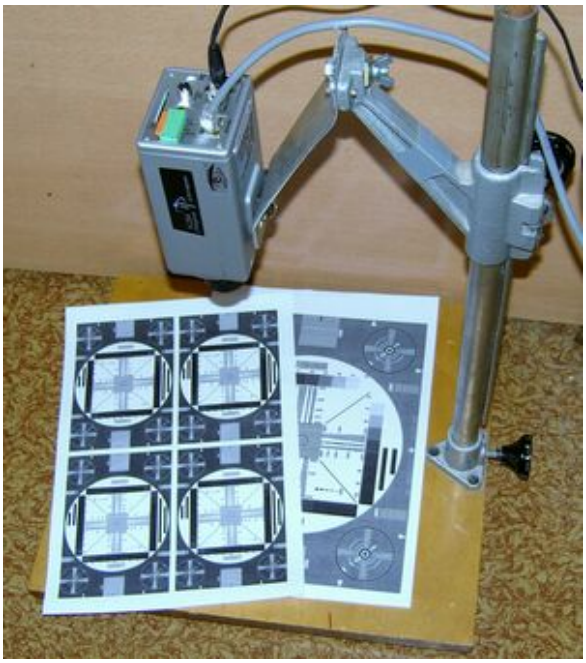
Problem

There is an image of the test chart EIA 1956, made by equipment under test (camera+lens+DVR). It is necessary to determine equipment resolution in LPH at contrast loss of 10%.

*The test chart **EIA1956** in full resolution allows to measure resolution up to 1600* LPH. To measure higher *resolution you can also use the test chart **EIA1956**, but it should not occupy the entire frame, but a part of the frame. For example, if the table will occupy by the area of a quarter of the frame (half the vertical and half of horizontal sizes), the range of measured values of resolution will be doubled.*

*By making measurements with the same camera, but with different lenses, we can compare **resolution of the lenses**. Lens resolution is very important for **megapixel cameras**.*

*We can measure **resolution with a given drop of contrast** as well as **drop the contrast at a given resolution**.*



To perform the measurements you need the software CCTVCAD Lab Toolkit (visit http://cctvcad.com).

Solution

1. Open the Image analyzer 558 from **CCTVCAD Lab Toolkit**.

2. Click **Load** in the upper left corner of **Image analyzer** and select image file.

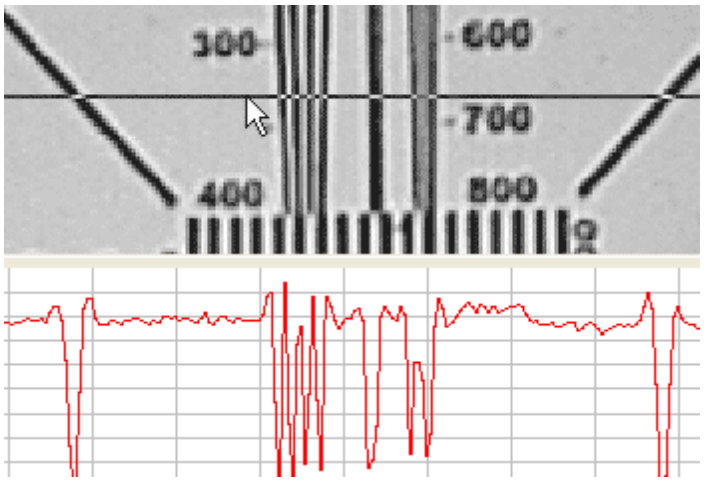
3. For conveniences it is recommended to increase image size in 2 times. To do this open the **Processing** tab, enter two times larger sizes on the **Image size** panel and click **Apply**.

4. Open the **TV lines** tab.

5. Click vertical wedge area of the test chart with lines corresponding to the minimal resolution (100-200 LPH). Record peak-to-peak amplitude of signal in the area of minimal resolution.

The peak-to-peak amplitude of signal can be seen on the oscillogram under the image.

6. Move the cursor with pressed mouse button to the side where the wedge becomes narrow up to the moment when the peak-to-peak amplitude of signal from the wedge makes 10% from the signal amplitude at minimal resolution.



7. Determine resolution according to the place of analyzing line on the test chart.

In case when resolution is close to the maximal possible one at specified image size and camera aperture corrector works, determining the point of the contrast loss of 10% could be difficult. Image pixel beating and chart lines beating as well as image digitization hinder from it. This problem refers equally to all ways of resolution measurement.

*Using **CCTVCAD Lab Toolkit** we can measure resolution of separate colors.*

10.13 Example 13 Measuring maximum scene illumination for a camera

Problem

There is a camera. It is required to measure maximum scene illumination, at which this camera produces image without brightness limitation.

Equipment:

- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.
- Monitor.
- Projector with tungsten halogen lamp 220V, 1000W or more.

Such projector can create illumination up to 150000lx, what exceeds illumination in bright sunny day on mid-latitudes (100000-120000lx).

Work carefully with the projector. There is danger of overheating and inflammation of fire hazardous materials next to the projector.

- Lens with F1.2 aperture, parameters of which **are reliable**, focal length is 4-8mm.

If the camera allows to mount only mini-lenses (M12), the mini-lens with a known aperture (F2.0) is needed.

- A sheet of crumpled white paper.
- Stand. It is recommended for convenience and accuracy.

Order of work

1. Switch off all additional options of image processing. Only AESC and AGC should be switched on.

2. Mount lens F1.2, on the camera, mount the camera on stand, direct it towards sheet of paper, connect to computer, display image on the screen.

If the camera allows mounting only mini-lenses (M12), mount a mini-lens with known aperture (F2.0).

3. Reduce contrast of the monitor to 50-70% of maximum.

4. Close to the sensor window directly on the sensor, fix a small piece of crumpled white paper.

5. Switch ON the projector.

6. By changing the distance from the projector to the luxmeter sensor, obtain the image on the screen with a little bleeding whites on the bends of the rumpled sheet of paper.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper. Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

7. Record the maximum illumination according to the luxmeter reading.

Maximum illumination for black/white cameras with 1/3" CCD image sensor with exposure range of the electronic shutter up to 1/100000s and lens with the aperture F1.2 make approximately 20000..30000lx. It allows using these cameras indoor with any lenses or outdoor with auto iris lenses or lenses with maximal aperture no more than F2.5.
Maximum illumination for high-quality color cameras or day/night cameras exceeds 100000lx. For mini-cameras with image sensor format of 1/4" the maximum illumination can be considerably lower.

*As in cameras' specification there is no the **Maximum illumination** parameter, in VideoCAD the maximum illumination is not specified separately and is calculated inside the program. For accurate modeling maximum illumination, first specify all other camera parameters and then choose the* *Maximum signal/noise ratio* 335 *for obtaining a little bleeding whites at the measured maximum illumination.*

10.14 Example 14 Examples of luminaire calculation

See before: Illuminator calculation 461

Problem

There is a illuminator. It is necessary to create its model in VideoCAD.

Solution

To create new illuminator click the Illuminator 206 button on the Tool bar 169.

To edit existing illuminator double click on its icon on the layout.

To edit just created illuminator click the **Edit** button on the Current construction parameter panel 282.

To open the Illuminator calculation 461 box click the Illuminator calculation button on the Current construction parameter panel 282.

The calculation may be **approximate** or **more precise**, depending on that parameters are known.

Example 14.1. Approximate calculation of visible light luminaire

It is known:

- Lamp type, power consumption of one lamp and number of the lamps;
- Angle of radiation (degree).

Order of calculation:

1. Choose **lamp type** in the Lamp type 463 combo box.
2. Enter **power consumption of one lamp** in the Lamp power (watt) 464 combo box.
3. Choose **number of lamps in the luminaire** in the Lamp quantity 465 combo box.
4. Choose **Efficiency factor=0.6** in the Efficiency factor 466 combo box.

For projectors with angle of radiation less than 50 degrees select efficiency factor=0.3.

If efficiency factor is known from specification, this known factor should be entered.

*If a **lamp without reflector** is being modeled, 0.8 should be entered in the efficiency factor box and the Omnidirectional light source 466 panel should be selected. After that jump to the **step 7**.*

5. Enter Angle of radiation 467.
6. Enter **0.5** to the Concentration 467 combo box.

At concentration=0.5 light intensity on the edges of the light cone makes a half of axial light intensity.

7. Click **OK**.

Example 14.2. More precise calculation of visible light luminaire

It is known:

- Lamp type, total light flux of one lamp and number of the lamps;
- Light intensity curve with lamp with full light flux of 1000 lumen.

You can find the Total light flux of lamp in the lamp specification. You can find the the Light intensity curves with lamp with full light flux of 1000 lumen in the luminaire specification.

Order of calculation:

1. Choose **Lamp type** in the Lamp type 463 combo box.

2. Enter **Full light flux of one lamp** to the Light flux emitted by lamp (lm) 464 combo box.

3. Choose **number of lamps in the luminaire** in the Lamp quantity 465 combo box.

4. Using the **Light intensity curve with lamp with full light flux of 1000 lumen** determine the **angle of radiation (degree)** and the **axial light intensity (candle)**.

5. Enter **Angle of radiation** to the Angle of radiation 467 combo box.

6. By choosing **concentration** value in the Concentration 467 box or by moving grips when editing illuminator (holding **Ctrl**), try to obtain **light intensity curve,** close to light intensity curve from the specification.

Light intensity distribution curve *is displayed by orange line during drawing or editing illuminator. Light intensity distribution curve represents relative light intensity distribution. The curve does not depend on absolute values.*

7. Recalculate the **axial light intensity of the luminaire** in proportion to the total light flux of the lamps 464.

For example: The total light flux of all lamps is F=3000 lumen. In this case an ***axial light intensity*** *value obtained from the* light intensity curves *(with the lamp of 1000 lumen) has to be multiplied by 3.*

8. By choosing **Efficiency factor** in the Efficiency factor 466 combo box, obtain the **axial light intensity** in the Axial light intensity (cd) 467 box which is equal to the **axial light intensity calculated in step 7.**

9. Click **OK**.

Example 14.3. Approximate calculation of IR illuminator

It is known:

- Consumed electrical power and wavelength of radiation maximum;
- Angle of radiation.

Order of calculation:

1. Choose **LED of known wavelength** in the Lamp type 463 combo box.

2. Choose **consumed electrical power** of the IR illuminator in the Lamp power (watt) 464 combo box.

Consumed power of the illuminator is equal to the product of supply voltage (volt) multiplied by

consumed current (ampere). These parameters are given in the illuminator's specification.

3. Choose **'1'** in the LED quantity 465 combo box.

4. Choose in the Efficiency factor 466 combo box:

Efficiency factor=0.3 for narrow angle illuminator (angle of radiation is 20-50 degrees);
Efficiency factor=0.5 for wide angle illuminator (angle of radiation is 60-120 degrees).

For hot climate select efficiency factor=0.2-0.3.

5. Enter **Angle of radiation** to the Angle of radiation 467 combo box..

6. Enter **0.5** to the Concentration 467 combo box.

At concentration=0.5 light intensity on the edges of the light cone makes a half of axial light intensity.

7. Click **OK**.

Example 14.4. More precise calculation of IR illuminator

It is known:

- Wavelength and number of LEDs in the illuminator;
- Axial radiant intensity (watt/steradian) of one LED and angle of radiation of one LED (degree);
- Radiant intensity curve in dependence of angle for one LED (not obligatory).

Wavelength, axial radiant intensity and radiant intensity curves could be found in the LED specification. For this it is necessary to know LED model.
Radiant intensity in operating mode is changed in direct proportion to current through the LED.

Order of calculation:

1. Choose **LED of known wavelength** in the Lamp type 463 combo box.

2. Choose **number of LEDs in the illuminator** in the LED quantity 465 combo box.

3. Enter **Angle of radiation** to the Angle of radiation 467 combo box.

4. By choosing **concentration** in the Concentration 467 box or by moving grips when editing illuminator (holding **Ctrl**), try to obtain the **radiant intensity curve,** close to radiant intensity curve of one LED.

Light intensity distribution curve *is displayed by orange line during drawing or editing illuminator. The Light intensity distribution curve represents relative light intensity distribution. The curve does not depend on absolute values.*
In case of the ***Light intensity distribution curve*** *is not available, - enter* ***0.5*** *to the Concentration 467 combo box.*

5. Choose **0.9** in the Efficiency factor 466 combo box (temporarily).

6. By choosing radiant power in the Radiant power (watt) 470, obtain the **axial radiant intensity** in the Axial radiant intensity (watt/Sr) 471 box which is equal to **the product of axial radiant intensity of one LED multiplied by the number of LEDs in the illuminator**.

7. Choose **0.5** in the Efficiency factor 466 combo box for considering power lost in internal circuits.

For hot climate and for illuminators which are get hot select efficiency factor=0.3.

8. Click **OK**.

The created illuminator model with specified parameters will be the calculation result.

For information in the box the following values are displayed:

- Axial light intensity 467;
- Illumination 468 produced by the illuminator at specified distance 468 an axis of radiation.

*Using a **luxmeter** you can check illumination value on specified distance from the real illuminator, then choose parameters to achieve full identity of the model and the real illuminator.*

You can change location of created illuminator model in horizontal projection by moving 192 and rotating 192 similarly to other constructions 193.
You can specify installation height 285, vertical inclination angle 285, dispersion 286, switch 286 illuminator ON/ OFF on the Current construction parameter panel 282. Illuminators can be copied 191.

*To allow for lamp aging, supply voltage deviation, as well as luminaire dirt depreciation in operation it is necessary to set **Maintenance factor of illuminators** on the 3D modeling 481 tab of the Options box 474 according to **CIE 97.***

See also: Illuminator calculation 461, Lamp parameters 463, Luminaire parameters 465, IR illuminators 469, Illuminator 206, Current construction parameter panel>Illuminator 284, 3D Video>Image parameter panel>Scene 371, Measuring parameters of IR illuminator 570.
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

10.15 Example 15 Choice of luminaire power and location

See before: Illuminator calculation 461, *Examples of illuminator calculations* 562.

Problem

As a result of camera model selection 549 according to the known scene illumination it is determined that the illumination is insufficient for obtaining image with required quality. Additional illumination is necessary.

Solution

1. Create illuminator by clicking the Illuminator 206 button.

2. In the Illuminator calculation 461 box specify illuminator parameters 562 according to the parameters of available illuminator model.

See. Examples of luminaire calculation 562.

3. Place the illuminator on the scene. On the Current construction parameter panel 284 specify height of illuminator installation and inclination angle.

4. Switch on the illumination modeling 372 and illuminators 373 on the **Scene** tab of the **Image parameter panel**. Then control image from the camera in the 3D Video 357.

For accurate image modeling the camera parameters 329 should be specified.

5. If necessary create, adjust and place additional illuminators.

For one camera no more than 7 illuminators could be switched on 286 simultaneously. Switched on illuminators are saved in camera parameters, therefore it is possible to switch on and switch off different illuminators for each camera.
You can switch on/off all selected 189 illuminators simultaneously using the Main menu or the menu appeared by right clicking. If there are selected illuminators, in the menu the following items appear: Switch on illuminators 268 and Switch off illuminators 269.

It is recommended to carry out verification with 3D model 202 of a black man.

It is recommended to set maintenance factor 481.

External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

10.16 Example 16 Determining spectral efficiency of light source

See before: What is spectral efficiency 464.

Problem

There is a lamp and a camera. It is necessary to measure spectral efficiency of this lamp for this camera in relation to the halogen incandescent lamp.

Equipment:

To perform the measurements you need the software CCTVCAD Lab Toolkit (visit http://cctvcad.com).

- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.
- Any PC-based video capture system, TV-tuner with video input, etc. The System should allow to display live video on the computer screen.
- Video Analyzer 567 utility. It is a part of ***CCTVCAD Lab Toolkit*** 551.
- Tungsten halogen lamp of approximately the same power consumption, as testing lamp.
- Manual iris lens, focal length 4-8mm.
- Stand. It is recommended for convenience and accuracy.

Measuring should be performed in a dark room.

Order of work

1. Switch off all image processing options and AGC in the camera.
AGC switching off increases accuracy and allows working with illumination of 5..10lx, even if the camera has sensitivity of 0.2..1lx.

2. Mount the manual iris lens on the camera, mount the camera on stand, direct it towards sheet of paper, connect to computer, display image on the screen.

3. On the sheet of paper, in the camera field-of-view place the luxmeter sensor.

4. Close to the sensor window directly on the sensor, fix a small piece of even white paper.

5. Run Video Analyzer 567. Mark **Cycle** box, click **Start**. After that move fast the mouse cursor to the small piece of even white paper on the screen, close to the sensor window.

6. Switch off common light. Switch on the testing lamp and fix it at a middle distance from luxmeter sensor.

There should be a possibility to approach and move away the lamp.

Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

7. By adjusting aperture, obtain that the **Average brightness** measured by the **Video analyzer** would be equal to 0.22-0.25 after finishing measuring cycle by 100 frames.

The objects on the image should be recognized.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper.

8. Write down luxmeter reading and the **Average brightness** value according to the **Video analyzer**

reading.

9. Switch off the testing lamp. Switch on the halogen lamp.

10. By changing the distance from the lamp to the sheet of paper, obtain equal with **step 8** value of **Average brightness** after finishing measuring cycle by 100 frames.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper. Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

11. Write down the luxmeter reading.

12. Spectral efficiency factor of the tested lamp=illumination from tungsten halogen lamp (step11)/illumination from the tested lamp (step 8).

You can insert the obtained factor in the Illuminator calculation 464 *box.*

See also: What is spectral efficiency 472

10.17 Example 17 Measuring projector parameters

See before: Illuminator calculation 461

Problem

There is a visible light projector with close to round symmetrical light intensity distribution. It is necessary to create the model of this projector in VideoCAD.

Equipment:

- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.
- Measure by the luxmeter and write down the **projector illumination on an axis of radiation** at the distance not less than in 20 times more than the geometrical size of the radiant window.

Order of work

1. Install the projector, supply it by nominal voltage.

2. Measure by the luxmeter and write down the **projector illumination on an axis of radiation** at the distance not less than in 20 times more than the geometrical size of the radiant window.

If the environment reflects the projector's light significantly, using small nontransparent object create shadow on the luxmeter sensor from the projector. Measure illumination created by the light reflected from the environment, and then deduct this illumination from the illumination on projector axis of radiation.

3. Open Illuminator calculation 461 box . Enter:

- Lamp type 463 - type of lamp in the projector;
- Lamp power 464 - consumed electric power of the lamp;
- Lamp quantity 465 - number of lamps in the projector;
- Projector 466 - mark;
- Angle of radiation 467 - radiation angle of the projector (0.5 light intencity);
- Concentration 467 - 0.5;

*If there is a specification with the **light intensity curves**, by choosing **Concentration** try to obtain close light intensity distribution.*

- Distance 468 - the distance on which the illumination has been measured in step 2.

4. Choose the value in the efficiency factor 466 box for obtaining value in the Illumination 468 box, which is equal to the one measured in the step 2.

5. In this way we have obtained **the model of the projector we have**. Using obtained model we can get image models from different cameras at illumination produced by this projector with sufficient accuracy for the practice.

See also: Measuring camera sensitivity 551, *IR illuminators* 469.
External link: "The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(.pdf) .*

10.18 Example 18 Measuring parameters of IR illuminator

See before: IR illuminators 469

Problem

There is an **IR illuminator**. It is necessary to measure efficiency of this illuminator for a black/white camera in relation to the halogen incandescent lamp and create model of this illuminator in VideoCAD.

Equipment:

To perform the measurements you need the software CCTVCAD Lab Toolkit (visit http://cctvcad.com).

- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.
- Any PC-based video capture system, TV-tuner with video input, etc. The System should allow to display live video on the computer screen.
- **Video analyzer** utility. It is a part of ***CCTVCAD Lab Toolkit*** 570.
- Compact tungsten halogen lamp 12V, 10W.
- Stabilized power supply unit for the lamp. 12V DC, without considerable ripples of output voltage.
- **Manual Iris Lens**, focal length is 4-8mm.
- Stand. It is recommended for convenience and accuracy.
- Measuring should be carried out in a dark room.

Order of work

1. Switch off all image processing options and AGC in the camera.
AGC switching off increases accuracy and allows working with illumination of 5..10lx, even if the camera has sensitivity of 0.2..1lx.

2. Mount the manual iris lens on the camera, mount the camera on stand, direct it towards sheet of paper, connect to computer, display image on the screen.

3. On the sheet of paper, in the camera field-of-view place the luxmeter sensor.

4. Close to the sensor window directly on the sensor, fix a small piece of even white paper.

5. Fix the testing IR illuminator at the distance of 1-2 meter from the luxmeter sensor (not closer than 20-times size of the illuminator radiant window), direct illuminator axis of radiation on the sheet of paper on the sensor perpendicularly to the sheet of paper.

6. Run the **Video analyzer**. Mark **Cycle** box, click **Start**. After that move fast the mouse cursor to the small piece of even white paper on the screen, close to the sensor window.

7. Switch of common light. supply the illuminator by nominal voltage. If a LED IR illuminator is being tested, warm up the illuminator not less than 1 hour.

During warming up the power of the LED IR illuminator decreases by 15-20% and more in dependence of heatsink construction.

8. By adjusting aperture, obtain that the **Average brightness** measured by the **Video analyzer** would be equal to 0.22-0.25 after finishing measuring cycle by 100 frames.

The objects on the image should be recognized.

9. Switch OF the IR illuminator. Switch ON the tungsten halogen lamp.

10. By changing the distance from the lamp to the sheet of paper, obtain equal with **step 8** value of **Average brightness** after finishing measuring cycle by 100 frames.

You must not change the lamp supply voltage. It should be equal to nominal lamp supply voltage. Change Illumination only be means of distance variation between the lamp and the sheet of paper. Be sure, that the luxmeter sensor window and the small piece of paper on the sensor have visually equal illumination.

11. Record the luxmeter reading.

The luxmeter shows illumination Eeq., which is equivalent to IR illumination (irradiance) created by the IR illuminator for this camera.

12. Calculate the **irradiance** Eir (watt/m2), created by the illuminator according to the formula:

Eir=Eeq/Kse;
where:
Eeq - *equivalent illumination*, measured in step **11**;
Kse - relative spectral efficiency factor 469 of IR radiation (lumen/watt) for white paper and black/ white CCD sensor.

The **Kse** values for illuminators with different wavelengths of radiation maximum and for different image sensors you can see in the Illuminator calculation 469 box.
The **Kse** values are obtained by practical measurements in the laboratory of CCTVCAD Software http://cctvcad.com with IR illuminators calibrated in radiometric laboratory of Micrel.Ltd http://micrel.spb.ru.

The **Kse** values are correct for **white paper.** Closer **Kse** values are obtained for a **human body.** For **green grass Kse** have **2.2 times** more values..

Green grass reflects IR radiation better than the visible light. Paper and human body reflect IR radiation worse than the visible light.

Theoretical calculation gives average result. The theoretical result did not take into account difference in reflection power in visible and IR lights.

During designing, it is necessary to use **Kse** value for paper and human body.

Switching the **Kse** *values for day/night cameras in VideoCAD is performed automatically in dependence on camera type* 332.

13. Open the Illuminator calculation 461 box . Enter:

- Lamp type 463 - IR LED of known wavelength;
- Lamp power 464 - consumed electric power of the IR illuminator;
- LED quantity 465 - 1;
- Projector 466 - mark;
- Angle of radiation 467 - radiation angle of the IR illuminator (0.5 radiation intencity);
- Concentration 467 - 0.5;

If there is a specification with the ***light intensity curves****, by choosing* ***Concentration*** *try to obtain close rediant intensity distribution.*

- Distance 468 - the distance between the IR illuminator and the small piece of even white paper on the sensor window (meter).

14. Choose value in the Efficiency factor 466 box to obtain in the Irradiance (watt/m2) 471 box the value, which is equal to **Eir** calculated in **step 12**

The Efficiency factor values obtained by measuring some real IR illuminators:

- *Efficiency factor=0.3 for narrow angle illuminator (angle of radiation is 20-50 degrees);*
- *Efficiency factor=0.5 for wide angle illuminator (angle of radiation is 60-120 degrees).*

Total efficiency factor of the IR* illuminator *is a product of efficiency factor of IR LED 469 ***(0..5..0.15) multiplied by the chosen efficiency factor of the illuminator.***

15. Thus, we have obtained the model of available LED IR illuminator. Using obtained model we can get image models from different cameras at illumination produced by this illuminator with sufficient accuracy for practice.

See also: *Measuring camera sensitivity* 551, *IR illuminators* 469.
External link: *"The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(*.pdf)* .

10.19 Example 19 Modeling megapixel images

Problem

Because of the **Open GL** limitation, we can not create three-dimensional image with number of pixels more than the **screen number of pixels in Windows**. However, modern megapixel cameras already have a much higher number of pixels.
Even when the camera number of pixels is less than the screen number of pixels, it is inconvenient to work with images that occupy a large area on the screen and require a lot of time for regeneration.

In most cases, we need only to see how an object on the scene will look on image from a camera with the specified number of pixels.
VideoCAD offers 2 ways of solving this problem:

- with the help of **PiP** technology (Picture in Picture);
- with the help of pixel multiplication.

Order of work with PIP

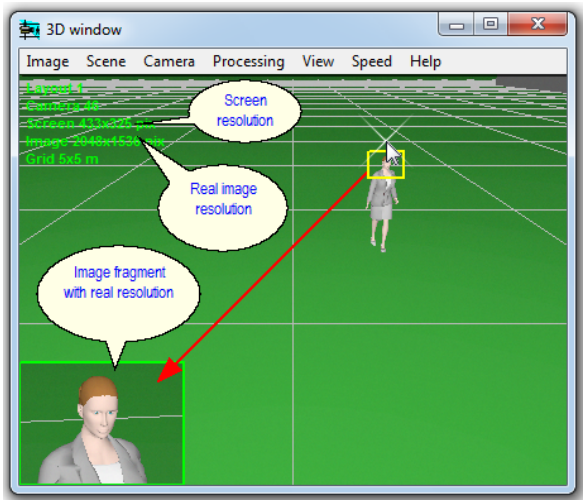
1. Construct 3D model of the scene, place **3D models**. See Example 529 and Example 531.

2. Create 171 camera and place it in the appropriate position.

3. Open the Sensitivity and resolution 186 box and set horizontal and vertical numders of pixels 332, for example: 2048x1536. Close the box and save changes.

4. Open the 3D Video 357. Stretch the 3D Video if necessary.

If the PiP 391 mode is enabled (by default) in the 3D Video a yellow rectangle will be displayed. And in the corner of the 3D Video, inside a green rectangle, a image fragment from the yellow rectangle will be displayed.
Pay attention that the entire frame is shown with a resolution lower than specified 2048x1536 and only the fragment from the yellow rectangle is shown with the actual resolution 2048x1536.



Place the yellow rectangle on the image area which should be seen with the real resolution, by clicking the middle mouse button (wheel).

The **PiP** mode offers flexible setting. You can specify which image will appear in the whole frame, but which in the small picture, you can adjust the position and size of the small picture, you can additionally magnify the fragment in the small picture.

5. To change **PiP** setting:

- By right click on the 3D Video open the Image parameter panel 370.

- Chose PiP 375 tab. Clear the According to camera parameters 375 box if it is checked.

See PiP 391 for details.

Order of work with pixel multiplication

1. Construct 3D model of the scene, place **3D models**. See Example 529 and Example 531.

2. Create 171 camera and place it in the appropriate position.

3. Open the Sensitivity and resolution 186 box and set horizontal and vertical numders of pixels 332, for example: 2048x1536. Close the box and save changes.

4. Open the 3D Video 357. Stretch the 3D Video if necessary.

5. In the main menu of the **3D Video** mark Image>Real frame size 359.

6. In the main menu of the **3D Video** choose Image>Save as 360 and save the image to file in any format. Obtained file will have number of pixels and resolution equal to set number of pixels in the **Sensitivity and resolution** box, even if the number of pixels of Windows screen is less.

The pixel multiplication doesn't work with animated images 360.

10.20 Example 20 Selecting frame rate on the basis of known target's positions and velocities

*The **frame rate** greatly affects the required bandwidth of communication channels, the capacity of the archives, computing power, and hence the total cost of video surveillance systems.*
At the same time, choosing optimal frame rate - not an easy task and criteria for selection are not always unambiguous. When the frame rate is too low, omission of important events are possible, too high frame rate leads to an unjustified rise in price of video surveillance systems.

*VideoCAD offers a tool for choosing frame rates based on the **desired frequency of getting in the frame objects with the known positions and velocity**. Additionally, you can create **animated images with the specified frame rate.***

Problem

Place of camera installation, the probable locations and velocity of moving objects are known. We should choose an optimal frame rate to ensure that any moving object gets into the frame at least twice.

Order of work

1. Construct 3D model of the scene, place the camera. See Example 529 and Example 531.

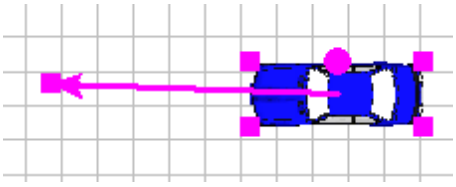
You can use the Shadow 178 tool to take into account camera control area with shadows from obstacles.

2. Place the 3D models 202 at the expected locations of moving objects.

3. Specify velocity vectors 203 for the 3D models according to expected speeds and directions of moving objects.

- double click on the model to switch it to editing state 164;
- on the appeared **Current construction parameter panel** type a nonzero velocity value (in meter (foot) per second) into the Speed 283 box.

You can edit the **velocity vector** of 3D model in **editing state** by moving its terminus.



Bring the cursor to the terminus of the velocity vector, click the left mouse button and drag the terminus. At the same time the speed value and direction of movement is being edited simultaneously. Click for the second time to specify new velocity and finish editing.

4. Remove selections from the 3D models if there are selected ones.

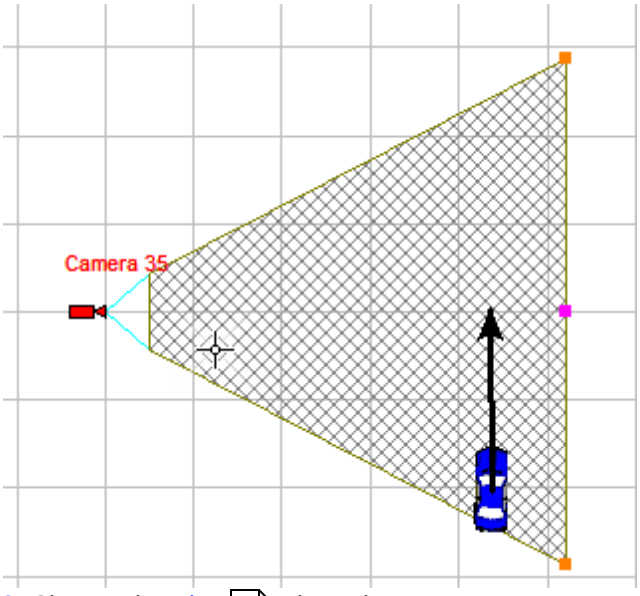
5. Open the 3D Video 357. By right clicking open the Image parameters panel 370. Chose Camera 375 tab.

6. Try to change Frame rate 375 value, watching the **velocity vectors** of 3D models in the **Graphics window**.

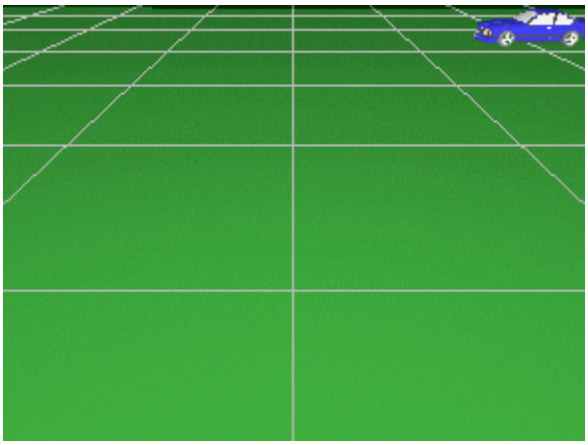
*If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the active camera.***

7. Select the **Frame rate** in order that all **velocity vectors** fit in the view area (control area)

projection **at least twice**.



8. Choose the View 385 tab on the **Image parameters panel**. Check Animation 386 box. Set the **Number of frames** =3 or more.
In several seconds **animated image** with **specified frame rate** will appear in the **3D Video**. In the image there will be **3D models** with specified velocity.



External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

10.21 Example 21 Creating animated model of monitor

*This example shows how to create an animated model of monitor as *.html file. This model may contain up to 100 animated images from different cameras. Each image has its own settings (frame rate, resolution, etc.). Obtained html file can be viewed by any Internet browser, edited with any text editor, etc.*

See an example of animated monitor (file size about 4 Mb).

Order of work

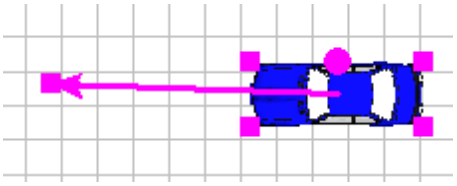
1. Construct 3D model of the scene, place and adjust cameras

Place the 3D models 202 at the expected locations of moving objects. See Example 529 and Example 531.

2. Specify velocity vectors for the moving 3D models according to expected speeds and directions of moving objects

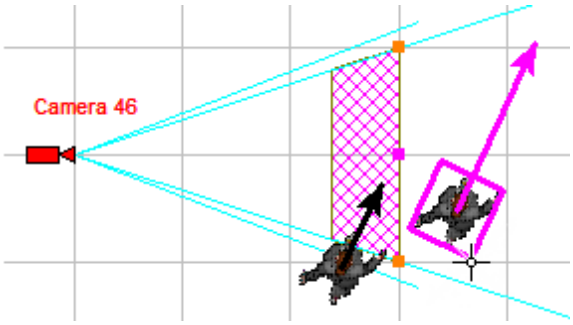
- double click on the 3D model to switch it to editing state 164;
- on the appeared **Current construction parameter panel** type a nonzero velocity value (in meter(foot) per second) into the Speed 283 box.

You can edit the velocity vector 203 of 3D model in **editing state** by moving its terminus.



Bring the cursor to the terminus of the velocity vector, click the left mouse button and drag the terminus. At the same time the speed value and direction of movement is being edited simultaneously. Click for the second time to specify new velocity and finish editing.

If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model passes per second (crimson arrow)**.
If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the active camera** 166 **(black arrow).**

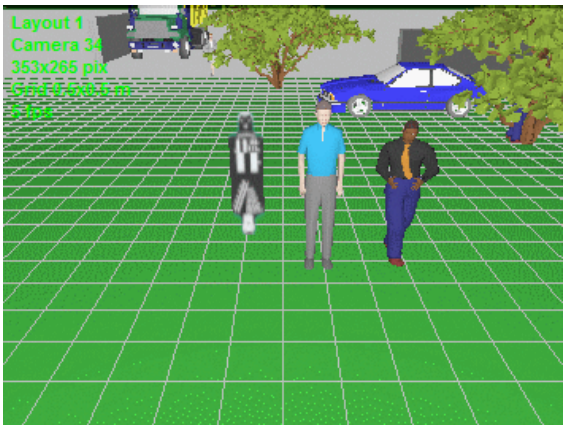


3. Adjust animation of the cameras which should have animated images

3.1 Activate 166 one of those cameras, which should have animated images.
3.2 Open the **3D Video** by clicking on the 3D Video 187 button on the Tool bar 169 of the **Graphics window**. Right click on the **3D Video** to open the Image parameter panel 370.
3.3 Choose the Camera 375 tab. Uncheck the According to the camera parameters 375 box if it is checked. Adjust the Frame rate 375.
3.4 Select 189 all cameras, which should have animated images. Check the To selected cameras

380 box. Click on the Save 380 button.
3.5 Switch to the View 385 tab. Check the Animation 386 box. Set the **Number of frames** = 3 or more.
3.6 Select all cameras, which should have animated images. Check the **Save to selected cameras** box. Click on the **Save** button.

After several seconds in the 3D Video the animated image will be shown. The image with the specified frame rate will contain moving with the specified velocities 3D models.



*We have set the same **number of frames** in the animated images and the **frame rate** for all selected cameras simultaneously. You can set individual values for each camera, not checking the **To selected cameras** box before clicking the **Save** button and repeat adjusting for each camera separately.*

*To save animated image on this step, see: Save as animated *.gif* 360

4. Connect the cameras to the Monitor

4.1 Open the Monitor window 407 by clicking on the Monitor window 187 button on the Tool bar 169 of the **Graphics window**.
4.2 Click on the Edit 410 button on the Tool bar 408 of the opened **Monitor window**.
4.3 Select 189 on the layout cameras which should be displayed on the Monitor.

You can select cameras with static and animated images mixed.

4.4 Then click on a cell of the **Monitor** starting from which these cameras should be displayed on the **Monitor**.

After some time the 3D Video will appear, in which static images from these cameras will be simulated. Then these images will appear in the cells of the Monitor, starting from the clicked cell.

See more details of work with Monitor: Work with Monitors 417

5. Switch Monitor window to the animation mode

Click the **Animation** 409 button on the **Tool bar** of the **Monitor window**.

*The **3D Video** will appear again, but this time it will generate **animated** images for your monitor.*

Generation of animated images takes much longer, it is a complex multi-threaded resource-intensive operation. Be patient, do not touch the mouse and keyboard, do not interfere the program, otherwise an errors are possible.

6. Save the animated Monitor to HTML file

For this click on the monitor window **Main menu> Image> Export to *.html.**

*It is recommended to save the *.html file to a separate directory. The resulting "file" includes the actual HTML file with links to images and the image files in animated GIF and PNG formats. The images are stored with the resolution and other parameters of the corresponding cameras.*

See an example of animated monitor (file size about 4 Mb).

See also: PDF Report 216
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

10.22 Example 22 Visualization of cameras' control area projections and spatial resolution inside them

Read before: *Shadow* 178, *Spatial resolution* 186, *Spatial resolution box* 316

Problem

We have a three-dimensional model of a complex environment.
We need to determine the areas controlled by cameras taking into account shadows arising from obstacles of the environment (camera control areas). Within the control areas, the **spatial resolution** of cameras must be visualized.

We should be able to estimate directly on the 2D site plan how people will look into the camera image at each point of the camera control area.

Order of work

1. Construct three-dimensional model of the environment using the tools of 3D modeling 193.

The constructions must be drawn by line types 475 with marked Shadow 475 box.

You can import the environment or its fragments in the form of one or several 3D models 202 imported from other graphics formats using Autodesk 3ds Max or SketchUp 599.

If the environment contains 3D models, shadows from which must be taken into account, you must:
- *enable calculation of shadows from 3D models 491 in the **Options box**;*
- *individually switch these 3D models into the editing state by double-clicking, then mark the Shadow 283 box on the Current construction parameter panel 282.*

2. Place a camera. Activate it.

3. Choose **Filling** in the drop-down menu of the Fill projection 175 button on the **Tool bar**.

View area projection will be filled by blend color.

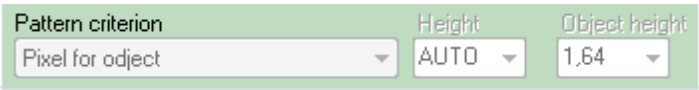
The color of filling is determined by the line type 175 of the camera.

4. Choose **Discrete color** in the drop-down menu of the Spatial resolution 186 button on the **Tool bar**.

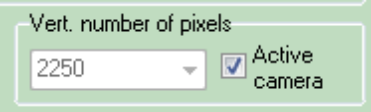
*View area projection will be divided into the **regions**. The regions will be colored according to values of the criterion 316 within the regions.*

5. Open the Spatial resolution 186 box.

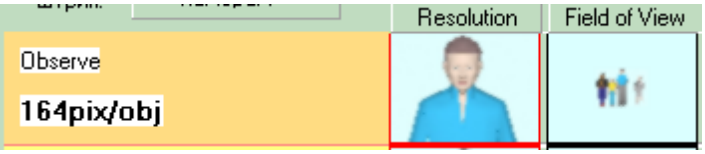
In the Pattern criterion 319 combo box you can see which criterion is chosen in the pattern assigned to the active camera.



In calculation of spatial resolution, the Vert.(Horiz.) number of pixel 321 is taken into account.



In the Table of regions 322 you can see what color corresponds to each range of the criterion value.
On the images in the Resolution 323 column, you can see with which resolution people at the far bound of each region will be visible.
On the images in the Field of view 323 column, you can see which part of the **field of view** people at the far bound of each region will cover.



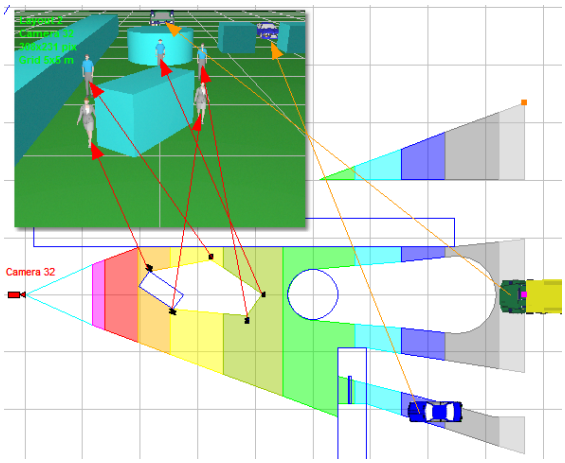
Sample images are correct for the cameras with vertical resolution specified in the Vert.(Horiz.) number of pixel 321 *combo box.*

See details: Spatial resolution box 316.

Don't close the **Spatial resolution box**.

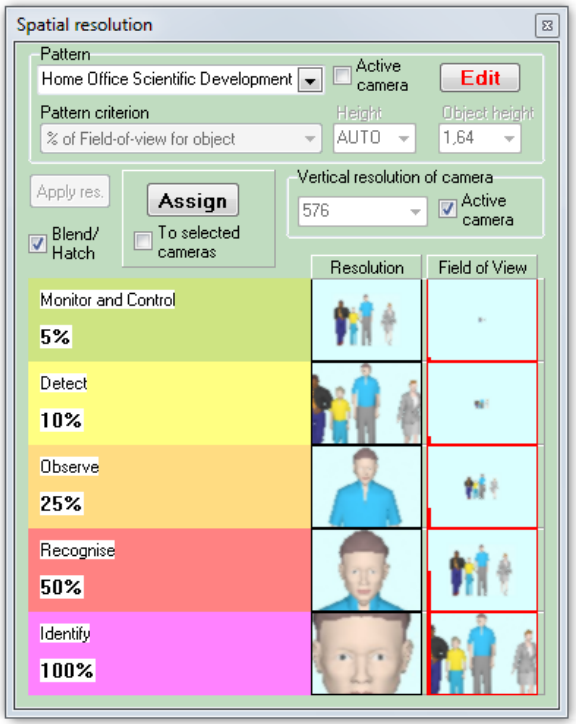
6. Choose **Within projection** in the drop-down menu of the Shadow 178 button on the **Tool bar**.

After a while VideoCAD calculates the control area projection, taking into account shadowing from obstacles in environment.



7. Keep the **Spatial resolution box** opened.

It is convenient to keep the Spatial resolution box opened during the analysis of spatial resolution in the Graphics window. Comparing color of regions on the layout with colors in the Table of regions 322 in the **Spatial resolution box**, on the images in the Resolution 323 and Field of view 323 columns you can immediately see the expected resolution and field of view size at every point of view area of each camera.



See also:Shadows 178, Main menu>View>Calculate shadows for active camera 239, Main Menu>View>Recalculate shadows 239, Line type>Shadow 475, Layers>Shadow 277, Options box>Miscellaneous>Shadow 490, Options box>Calculate shadows from 3D models 491, Current construction parameter panel>3D model>Shadows 283, 3D Models window>Shadows 402, Choosing the best place for PTZ (dome) camera 583, Visualization of the camera control area projections and spatial resolution within them 580

10.23 Example 23 Choosing install location for PTZ camera

Problem

We have a three-dimensional model of a complex environment. We should choose the best install location for PTZ (dome) camera so that the areas you want to monitor, should be not shaded by objects of the environment.

Order of work

1. Construct three-dimensional model of the environment using the tools of 3D modeling 193.

The constructions must be drawn by line types 475 with marked Shadow 475 box.

*You can import the environment or its fragments in the form of one or several 3D models 202 imported from other graphics formats using **Autodesk 3ds Max** or **SketchUp**.*
See: Importing 3D models from SketchUp and Autodesk 3ds Max 599

If the environment contains 3D models, shadows from which must be taken into account, you must:
- *enable calculation of shadows from 3D models 491 in the **Options box**;*
- *individually switch these 3D models into the editing state by double-clicking, then mark the Shadow 283 box on the Current construction parameter panel 282.*

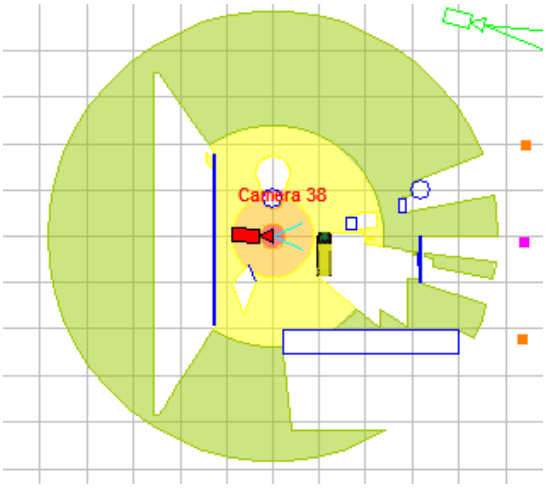
2. Place the PTZ camera preliminary. Activate it.

3. Choose **Dome** in the drop-down menu of the Shadow 178 button on the **Tool bar**.

After a while VideoCAD calculates the control area projection, taking into account shadowing from all obstacles in environment.

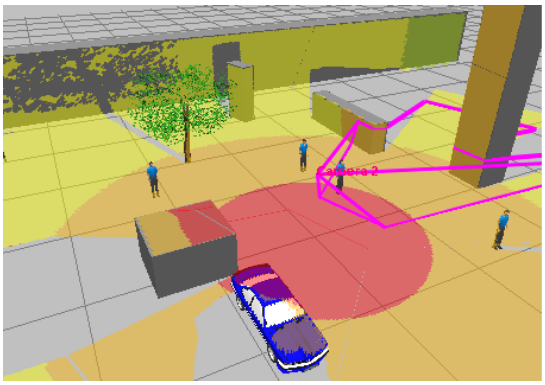
*In the **Dome** mode all shaded areas from the specified camera position become visible.*

*The **Dome** mode is also useful for choosing the best installation place for fixed cameras to make required areas reachable for the cameras.*



In the 3D World 342 in the **Dome** mode the territory controlled by the active 166 camera is displayed as coverage 348 on the environment. *The coverage in the 3D World is displayed for the **active camera** only.*

*Coverage calculations in the **Dome** mode requires a lot of computing resources. To increase speed of image refresh, reduce the Resolution 350 of calculating the coverage.*



4. By moving the camera between the possible installation locations, choose the best location in terms of control required areas.

You can add several cameras and instead of moving, to *hide* 267 and show different cameras.

See also:Shadows 178, *Main menu>View>Calculate shadows for active camera* 239, *Main Menu>View>Recalculate shadows* 239, *Line type>Shadow* 475, *Layers>Shadow* 277, *Options box>Miscellaneous>Shadow* 490, *Options box>Calculate shadows from 3D models* 491, *Current construction parameter panel>3D model>Shadows* 283, *3D Models window>Shadows* 402, *Choosing the best place for PTZ (dome) camera* 583, *Visualization of the camera control area projections and spatial resolution within them* 580

10.24 Example 24 Simulating distortions of moving objects arising from Exposure time, Interlace scan and Rolling shutter

Problem

There are three cameras:
- Three-megapixel (3MP) (2048x1536) IP camera with CMOS sensor and Rolling shutter;
- 1.3 megapixel (1280x960) IP camera with CCD sensor and Global shutter;
- 0.4MP (768x576) analog camera with interlace scan.

We know camera exposure time at the scene light conditions.
- 3MP IP Camera - 100ms;
- 1.2MP IP camera - 50ms;
- analog camera - 20ms (PAL).

3MP camera employs Rolling shutter, the period between start reading successive rows (Row time) 378 = 50 microseconds.
All cameras have the same sensor size 1 / 3 "and a lens with a focal length = 4mm.
We know camera position, location and speed of moving objects on the scene.

We need to get the model images of moving objects from each camera at the same position and compare them.

See also: Measuring exposure time of IP camera 593, *Measuring rolling shutter row time of IP camera* 596

Order of work

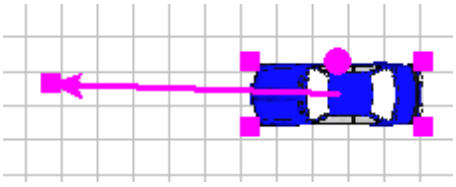
1. Construct 3D model of the scene, place and adjust cameras

Place the 3D models 202 at the expected locations of moving objects. See Example 529 and Example 531.

2. Specify velocity vectors for the moving 3D models according to expected speeds and directions of moving objects

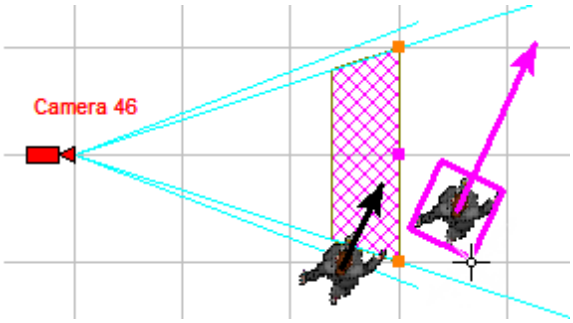
- double click on the 3D model to switch it to editing state 164;
- on the appeared **Current construction parameter panel** type a nonzero velocity value (in meter(foot) per second) into the Speed 283 box.

You can edit the velocity vector 203 of 3D model in **editing state** by moving its terminus.



Bring the cursor to the terminus of the velocity vector, click the left mouse button and drag the terminus. At the same time the speed value and direction of movement is being edited simultaneously. Click for the second time to specify new velocity and finish editing.

If 3D model **is selected** then length of the **velocity vector** equals to the **distance in meters (feet) which the 3D model passes per second (crimson arrow)**.
If 3D model is in the **normal state**, the length of the **velocity vector** equals to the **distance which the 3D model passes for the period between successive frames of the active camera (black arrow).**



3. Modeling image from three-megapixel (3MP) IP camera

3.1 Create 171 and place a camera at the appropriate position.
3.2 Open the Camera Geometry 186 box and specify: image sensor format 293 - 1/3", lens focal lehgth 294 - 4mm, aspect ratio 295 - 4:3. Then close the box.
3.3 Open the Sensitivity and resolution 186 box and specify numbers of pixels 332 horizontal - 2048 , vertical - 1536. Close the box and save changes.
3.4 Open the 3D Video 357 . Stretch the 3D Video for better resolution if needed.

If the PiP 391 mode is enabled (by default) in the 3D Video a yellow rectangle will be displayed. And in the corner of the 3D Video, inside a green rectangle, a image fragment from the yellow rectangle will be displayed.
Pay attention that the entire frame is shown with a resolution lower than specified 2048x1536 and only the fragment from the yellow rectangle is shown with the actual resolution 2048x1536.

Place the yellow rectangle on the moving 3D model, by clicking the middle mouse button (wheel).

For detail about PiP, see: PiP 391.

3.5 By right clicking on the **3D Video**, open the Image parameter panel 370.
3.6 Choose the Camera 375 tab. Uncheck the According to the camera parameters 375 box if it is checked.
Choose '100' in the Exposure (ms) 377 combo box. Check **Model perm.** on the **Exposure (ms)** panel.
Choose '50' in the Rolling shutter 378 combo box. Check **Model perm.** on the **Rolling shutter** panel.

During the image generation in the 3D Video on the 3D Video 187 button red frame flashes .. Simultaneous modeling exposure and rolling shutter can take several minutes. After a while you will see the image model.

*You can adjust realism 482 of modeling **exposure** and **rolling shutter** on the **3D tab** of the Options box 474. The more realistic simulation is, the more time required to generate the images in the 3D Video.*

3.7 Save the image in the **3D Video:** 3D Video>Main menu>Save as *.png 360

4. Modeling image from 1.3MP IP camera

4.1 Open the Sensitivity and resolution 186 box and specify numbers of pixels 332 horizontal - 1280 , vertical - 960. Close the box and save changes..
4.2 Open the 3D Video 357 . Place the yellow rectangle on the moving 3D model, by clicking the middle mouse button (wheel).
4.3 By right clicking on the **3D Video**, open the Image parameter panel 370.
4.4 Choose the Camera 375 tab. Uncheck the According to the camera parameters 375 box if it is

checked.
Choose '50' in the Exposure (ms) 377 combo box. Check **Model perm.** on the **Exposure (ms)** panel.
Choose '0' in the Rolling shutter 378 combo box. Clear **Model perm.** on the **Rolling shutter** panel.

After a while you will see the image model.

4.5 Save the image in the **3D Video:** 3D Video>Main menu>Save as *.png 360

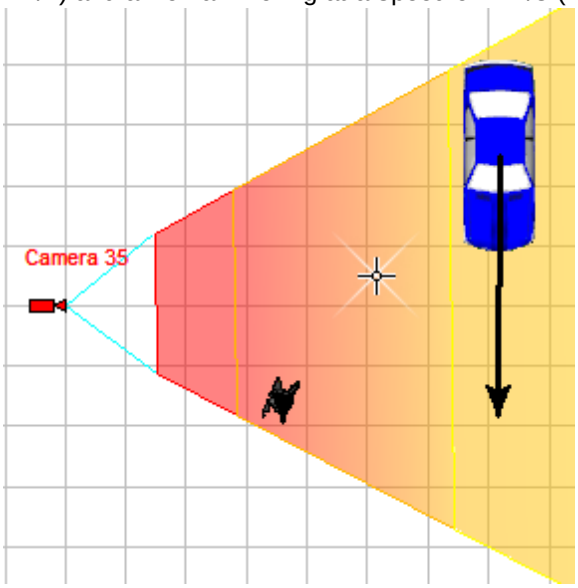
5. Modeling image from 0.4MP analog camera

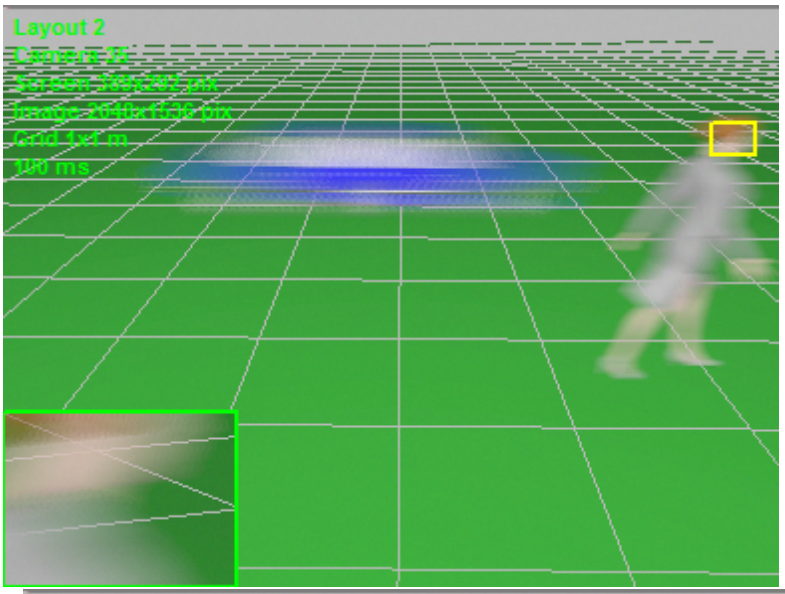
5.1 Open the Sensitivity and resolution 186 box and specify numbers of pixels 332 horizontal - 768 , vertical - 576. Close the box and save changes..
5.2 Open the 3D Video 357 . Place the yellow rectangle on the moving 3D model, by clicking the middle mouse button (wheel). .
5.3 By right clicking on the **3D Video**, open the Image parameter panel 370.
5.4 Choose the Camera 375 tab. Uncheck the According to the camera parameters 375 box if it is checked.
Choose '20' in the Interlace 376 .combo box. Check **Model** on the **Interlace**.panel.
Choose '20' in the Exposure (ms) 377 combo box. Check **Model perm.** on the **Exposure (ms)** panel.
Choose '0' in the Rolling shutter 378 combo box. Clear **Model perm.** on the **Rolling shutter** panel.

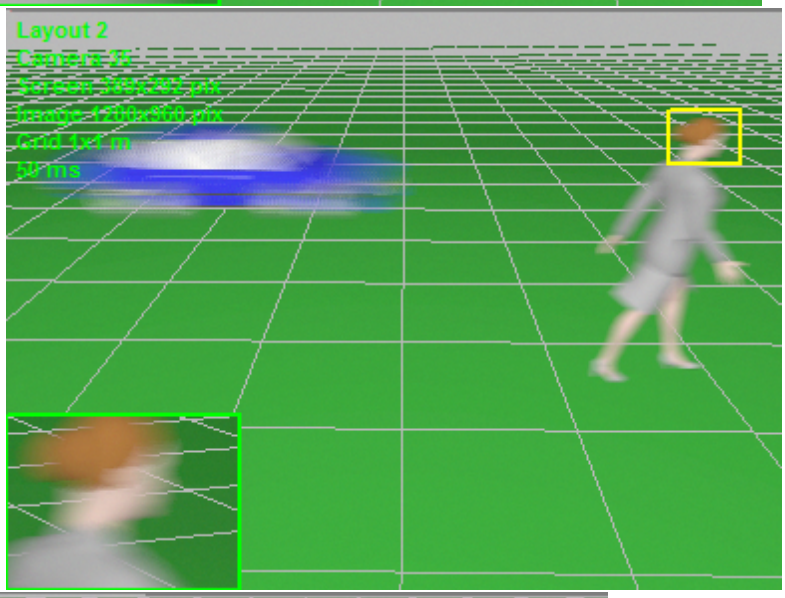
After a while you will see the image model.

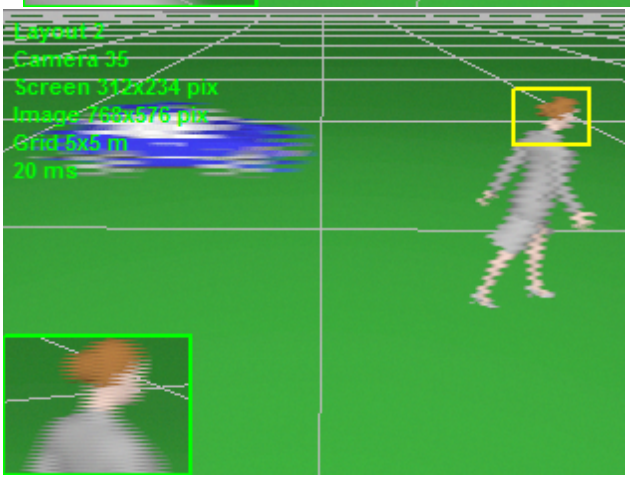
5.5 Save the image in the **3D Video:** 3D Video>Main menu>Save as *.png 360

6. Here are the obtained images below. In the frame there is a car moving at a speed of 20 m/s (72 km/h) and a woman moving at a speed of 2 m/s (7,2 km/h)/









See also: Measuring exposure time of IP camera 593, Measuring rolling shutter row time of IP camera

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External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

10.25 Example 25 Calculating lengths of cables and getting Cable report

Problem

There is a layout with the placed cameras. We need to determine the required cable length separately for each brand of cable.

Order of work

1. Configure a separate line type for each brand of cables used in the project

1.1 Open the Options box 474, switch to Lines 475 tab.
1.2 In the **Number** box, select any unused number of **line type**.

Do not select line types, used as system lines 476.

1.3 In the **Name** box, type a name of a cable brand, which will correspond to the selected line type.
1.4 Check the Cable 475 box. Clear the Shadow 475 box.
1.5 When necessary, adjust the line **Style**, **Color** and **Width** on the screen and at printing.
1.6 To make lines of this type invisible on the **3D Video**, set equal the **maximum** and **minimum** heights on the **3D** panel.
1.7 Repeat steps **1.2 .. 1.6** for all brands of cables used.
1.8 Click **OK** in the **Options box**.

2. Assign brands to cables of cameras

2.1 Activate any of cameras.

2.2 Assign brand to the signal cable
2.2.1 Click the menu item **Main menu>Cables>Signal cable>Calculate**.
2.2.2 In the appeared Signal cable length calculation box 514 choose Cable brand 514 from the adjusted at **p.1** 590 line types.
2.2.3 When necessary, adjust reserve for cable laying and connection.
2.2.4 Click OK in the **Signal cable length calculation box**.

2.3 Assign brand to the power cable
2.3.1 Click the menu item **Main menu>Cables>Power cable>Calculate**.
2.3.2 In the appeared Power cable electrical parameters and length calculation box 514 choose Cable brand 514 from the adjusted at **p.1** 590 line types.
2.3.3 When necessary, adjust reserve for cable laying and connection. Specify electrical parameters.
2.3.4 Click OK in the **Power cable electrical parameters and length calculation box**.

2.4 Repeat steps **2.1 .. 2.3** for all cameras, cables of which must be taken into account.

You can control a correct cable parameters of cameras in the Table of cameras 452.

3. Draw cables of cameras in horizontal and vertical projection

3.1 Activate any of cameras.
3.2 Choose Main menu>Signal cable 269 and draw the signal cable of this camera.
3.3 Choose Main menu>Power cable 270 and draw the power cable of this camera. .

*When this item chosen, you can draw the **signal cable** of the **active camera** by successive clicks in the **graphics area**. The end of each segment is the start of the next one. To stop drawing cable, press **ESC.***

The status bar 275 displays the segment length and its projection to distance and height.

*Both clicks are to be made in the **same projection**. If the projections are different the measured values are incorrect, therefore when constructing a segment with its ends in different projections the values are not displayed in the **status bar**. In this case when changing the drawing the segment is attached to the projection with its **initial point**.*

*A cable consists of **segments**, allowing to draw it in different projections and layouts, representing an actual scheme of laying accurately.*

*When copying 191 the **cable segments** between **cameras** and layouts a process of cable drawing is accelerated considerably even in complex CCTV systems.*

When drawing a cable the menu item Cable laying 271 might be used. When choosing it a float panel of the same name appears enabling to choose a shift of segment ends for a level parallel cable drawing along the walls, columns etc.

*If the **Main menu>View>**All cameras' cables 242 item is checked, **cables of all cameras** will be visible, but only **cables of the active camera** can be edited. If this item is not checked, **cables of the active camera** will be visible only.*

4. Draw the Main cables (which is not associated with cameras)

4.1 Draw the **Main cables** with the help of tools Line segment 195 and Polyline 195, using the adjusted at **p.1** 590 line types.

***Line type can be assigned before drawing lines or during editing lines on the** Line type panel 280. To change Line type of several selected 189 lines at once, use the Change line type 268 tool.*

5. Get the Cable report

Choose Main menu>Cables>Cable report 271. The Cable report includes lengths of the cables attached to cameras and the **main cables** as well. Cable lengths is calculated for each brand (line type) separately.

See also: *Active camera's cables 242, All cameras' cables 242, Line segment 248, Polyline 249, Signal cable 269, Power cable 270, Cable laying 271, Length calculation of line segments 271, Cable report 271, PDF Report 216.*

10.26 Example 26 Checking Depth of Field in horizontal projection

Read before: Depth of Field 454

Problem

We need to check that a camera has enough Depth of Field.

Order of work

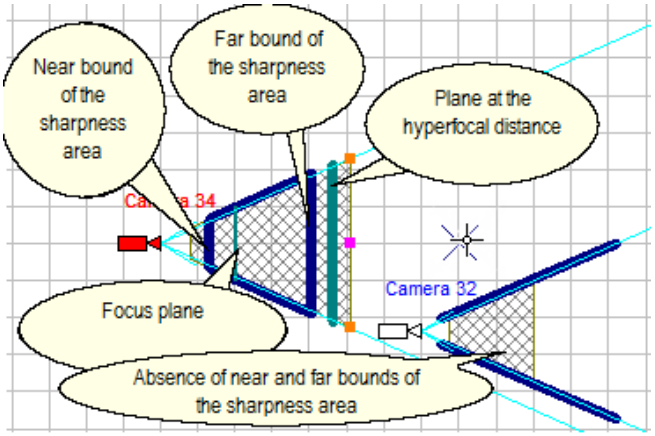
1. Activate the camera.
2. Open the Depth of Field 186 box by clicking on the Depth of Field 186 button on the **Toolbar**.
3. In the **Depth of Field** box: Specify Aperture (f-number) 457 of the active camera. Click the Default 460 button.

4. **Check the sharpness area bounds in the horizontal projection**.

When the depth of field box is visible, next to all cameras in the horizontal projection the following lines are displayed:

- sharpness area bounds 457;
- focus plane 458;
- plane at the hyperfocal distance 458.

These lines are calculated according to the depth of field parameters 457 of each camera at the height of depth of field measurement 458.



If the **focus plane** or the **plane at the hyperfocal distance** not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then the **focus plane** or the **plane at the hyperfocal distance** are not displayed.

If the near or the far bound of the sharpness area 457 not intersect the horizontal plane at the **height of depth of field measurement** within the **view area projection**, then this bound is not displayed.

The absence of near and far bounds of the sharpness area indicates that the sharpness area completely covers projection of view area, thus the depth of field does not reduce the resolution of the camera.

5. If the displayed **sharpness area** is not enough:

- Click the **Specify the focus plane** 458 button in the **Depth of field calculation box**.
- Try to change **focus distance** by clicking on the **view area projection** until you get the desired **sharpness area**.

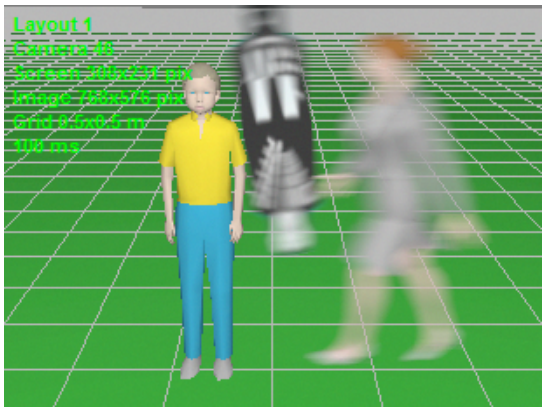
If you can get the desired sharpness area, then the desired depth of field is achievable for the active camera.

10.27 Example 27 Measuring exposure time of IP camera

The sensitivity of cameras depends on the exposure time. Within the validity of the **Reciprocity principle**, the camera sensitivity is **directly proportional to the exposure time**.

However, increasing exposure time leads to blurring of moving objects that is often unexpected. Usually, when measuring sensitivity of cameras and while accepting built CCTV system a customer looks only at static images, but moving targets are of interest.

The greater the exposure time and the greater the velocity of an object on the screen, the more the blur.



Automation of camera (AESC) constantly adjusts the exposure time (shutter speed) depending on the illumination on the image sensor. The more light is, the less exposure time is set. But from a certain threshold light AESC sets the maximum exposure time and further reducing light doesn't increase the exposure time. Knowing the maximum exposure time and the threshold illumination is very useful in designing CCTV systems.

VideoCAD offers a tool 377 for modeling blur of moving objects in dependence of the exposure time. But to use this tool, you need to know the exposure time.

Knowing the maximum exposure time is also needed correct interpretation of results of measuring sensitivity and sensitivity values in the camera specification. With a minimum illumination the camera sets the maximum exposure time. Unless otherwise indicated, the sensitivity value in the camera specification can be achieved at the maximum exposure time.

The maximum exposure time of standard analog cameras without light accumulation is 20ms for PAL and 16,5 ms for NTSC. IP cameras and analog cameras with accumulation of light can use exposure time up to 200ms and more. With latent increasing the maximum exposure time, many manufacturers increase the certified sensitivity of their cameras.
Many cameras allow to modify the maximum exposure time, switching the "night", "supersensitive" modes, etc. But these settings don't report the real value of the exposure time. If the camera has several "night" modes, for their proper use it is necessary to know the maximum exposure time for each of them.

Problem

There is a camera. It is necessary to measure its **maximum exposure time** and the **threshold illumination** at which the camera switches to the **maximum exposure time**.

Equipment:

- Oscilloscope. Any analog oscilloscope will suit.
- Luxmeter (a device for measuring illumination). Almost any kind of such a device with standard CIE spectral response will suit.

- In case of testing analog cameras, we need any PC-based video capture system, TV-tuner with video input, etc. The System should allow to display live video on the computer screen and separate frames. *For testing IP cameras it is enough to have possibility to display video on the screen and* separate frames.
- Compact tungsten halogen lamp 12V, 10W.
- Stabilized power supply unit for the lamp. 12V DC, without considerable ripples of output voltage.
- Lens with F1.2 aperture, parameters of which **are reliable**, focal length is 4-8mm. *If the camera allows to mount only mini-lenses (M12), the mini-lens with a known aperture (F2.0) is needed.*
- Stand. It is recommended for convenience and accuracy.

*If you want to measure only the **maximum exposure time**, and measuring the **threshold illumination** is not required, then luxmeter, incandescent lamp and power supply are not needed. Instead, it is required a manual iris lens.*

Order of work

1. Set the lens on the camera, install the camera on the stand, point the camera at the screen of the oscilloscope, connect camera to computer, display image from the camera on the computer screen.

2. Place the luxmeter sensor near to the oscilloscope screen.

3. Enable a "night" mode in the camera setting.

4. Set the oscilloscope sweep time - **50ms/div**. Scan - automatic (If your oscilloscope has such settings).
On the oscilloscope screen a flying spot must be visible. On the computer screen instead of the spot, flickering segments will be seen.

5. Turn on the incandescent lamp. Turn off the ambient light.

If you need only to measure the maximum exposure time, then instead of changing light simple close iris on the lens.

6. Set the minimum brightness of the oscilloscope spot, to make the segments on the computer screen barely visible. Light of the spot should not affect operation of camera's automatics.

7. By moving the lamp away, reducing the illumination of the oscilloscope screen, detect a moment

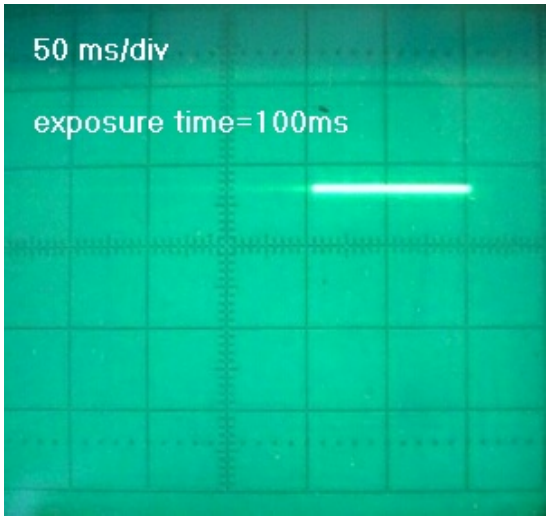
when the length of the segments on the computer screen becomes the maximum and no longer increases with further decreasing light until the appearance of strong noise on the screen.

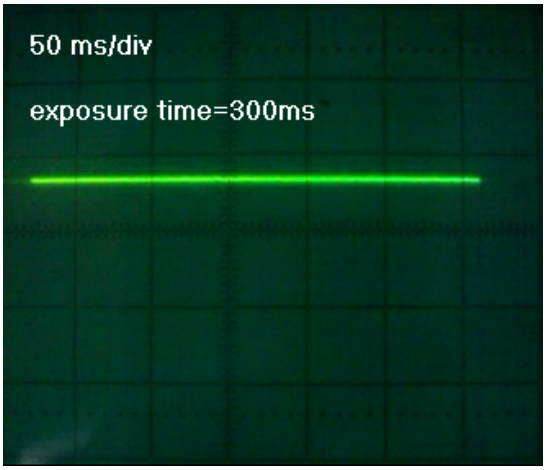
At the moment when the length of the segments becomes maximum, luxmeter shows the threshold illumination.

As a result of our measurements, the threshold illumination was about 50lux. That is, when light is less than 50lux, the testing IP camera with 2 megapixel 1/3" CMOS sensor began to use the maximum exposure time.

8. Save and view a frame in which a segment of the maximum length gets wholly. If you can not get such frame, increase the oscilloscope sweep to 100ms/div.

The length of the segment in the frame in the scale of oscilloscope screen equals to the camera's exposure time.



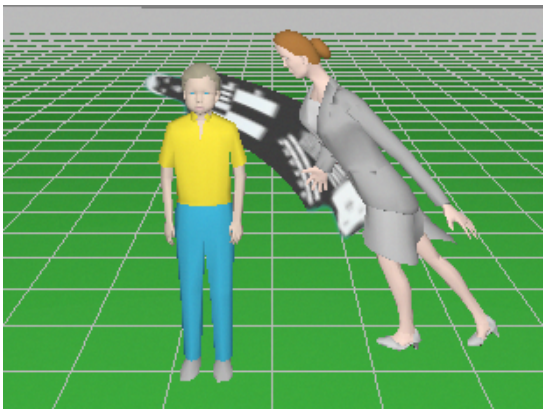


9. If necessary, by the method described above you can take a function of the exposure time in dependance of the light.

See also: *Image parameter panel>Camera>Exposure* 377
External link: *"The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(*.pdf)*

10.28 Example 28 Measuring rolling shutter row time of IP camera

*As a result of Rolling Shutter work, exposure of different rows of the image sensor begins and ends sequentially at different times, which causes a horizontal shift of moving objects. This effect occurs with many **IP cameras** with **CMOS** image sensor and usually doesn't occur with cameras with CCD image sensor.*



An important parameter of the rolling shutter is the **Row time** - the difference in time between the beginning exposure of neighboring rows. The less the **row time** is, the smaller the camera distorts moving objects. Unfortunately this parameter is not given in the camera specification. But it is not difficult to measure the row time in practice.

The **row time** may vary with different settings of the same camera.

VideoCAD offers a tool 378 for modeling distortions of moving objects depending on the row time. But to use this tool, you need to know the row time.

Problem

There is a IP camera with Rolling shutter. It is necessary to measure its **row time** - the difference in time between the beginning exposure of neighboring rows.

Equipment:

- Oscilloscope. Any analog oscilloscope will suit.
- Low-frequency oscillator. Use any sine wave signal generator of any frequency in the range from 200 Hz to the upper limit of the oscilloscope bandwidth. You can use any homemade generator, software generator for a computer, etc.
- *For testing IP cameras it is enough to have possibility to display video on the screen and* separate frames.
- A Lens, focal length is 4-8mm.
- Stand. It is recommended for convenience and accuracy.

Order of work

1. Set the maximum image size in pixels in the camera setting.

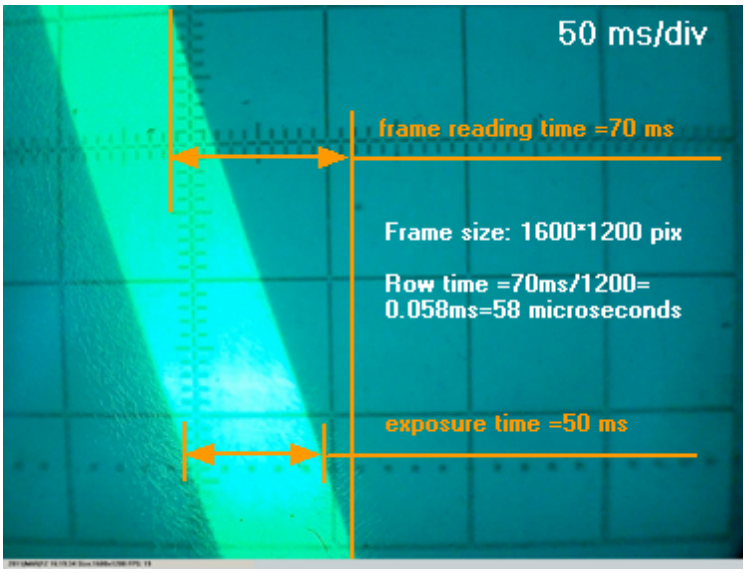
2. Set the lens on the camera, install the camera on the stand, point the camera at the screen of the oscilloscope, connect camera to computer, display image from the camera on the computer screen. *The oscilloscope screen must completely cover the field of view in vertical. But it is not necessarily that the oscilloscope screen placed in the frame entirely. It is important that between the oscilloscope screen and the field of view of the camera must not be skew. On the computer screen,*

lines of the oscilloscope scale should be strictly parallel to the sides of the frame.

3. Set the oscilloscope sweep time - **50ms/div**. Scan - automatic (If your oscilloscope has such settings). Connect the Low-frequency oscillator to the oscilloscope.
On the oscilloscope screen a flying thin vertical line must be visible. On the computer screen instead of the thin vertical line, thick inclined line will be seen. **The thickness of the line in the scale of oscilloscope screen equals to the camera's exposure time. The inclination of the line is determined by the row time of camera's rolling shutter.**

4. Save and view a frame in which the inclined line gets wholly. If you can not get such frame, increase the oscilloscope sweep to 100ms/div. If inclination is not enough, decrease the oscilloscope sweep to 20ms/div.

5. To calculate the **row time**, first read a difference between the edge of the line on the top and on the bottom of the frame in the scale of the oscilloscope screen - frame reading time = 70ms. And then divide the resulting time by the number of rows in the image (1200) and get the **row time = 58 microseconds**.



6. Repeat measurements for other frame sizes of the same camera.

*In the tested by us IP camera the frame reading time wasn't changed when changing the frame size from 640*480 to 1600*1200, and was about 70ms. Thus, the row time was from 58 to 146*

microseconds depending on the number of rows in the frame.
Perhaps the opposite situation, when the row time is stable, but the frame reading time depends on the number of rows in the frame.

See also: Image parameter panel>Camera>Rolling shutter 378
External link: "The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects"(.pdf)*

10.29 Example 29 Import of 3D models from SketchUp and Autodesk 3dsMax

VideoCAD has an opportunity of 3D modeling video surveillance scenes using constructions and 3D models 202 distributed with the program.

The distribution kit of VideoCAD includes several most relevant **3D models** for CCTV design. Though the standard package tends to be enough for accomplishing most of tasks, there may appear a need for library supplement.

Any 3D models and scenes which can be opened in **SketchUp** or **Autodesk 3ds Max** can be added to the VideoCAD library.

For exporting 3D models to VideoCAD the **Free SketchUp** version is suitable. http://sketchup.com/

Lots of 3D models can be downloaded from Internet for free https://3dwarehouse.sketchup.com/
You can also create models and scenes in **Google SketchUp** or **Autodesk 3ds Max** independently.

Import 3D models is supported by VideoCAD Starter II 45, VideoCAD Lite 31 and VideoCAD Professional 3 versions. It is not supported by VideoCAD Starter 49 version.

We offer two special packages for importing 3D models into VideoCAD.

These packages contain:

- Plugin file;
- User Manual with step-by-step description how to insert a new 3D model into the VideoCAD library;
- Example of ready 3D model files.

The first package for importing 3D models and scenes from **Autodesk 3ds Max** is free. You can download it here: Import of 3D models and scenes from 3ds max to VideoCAD

The second package for importing 3D models and scenes from **SketchUp** is paid. Here is the User manual. Click here to order the package.

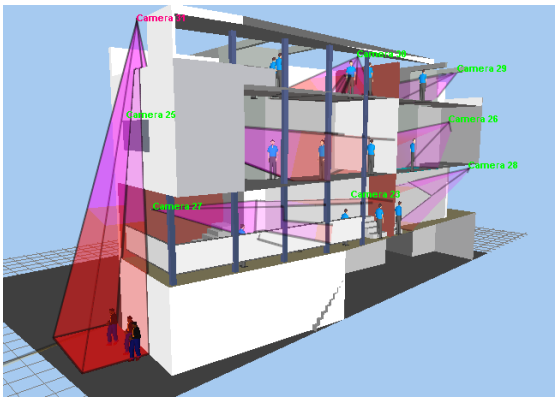
** This package is included in the VideoCAD Starter II Kit 45.*
** * Plugin for SketchUP has several advanced features: export textures, transparent textures, semi-transparent polygons and scale adjusting.*

See also: 3D model 202, Drawing>Import DXF/DWG background 224, Work with 3D models-territories 602, Work with layers and multi-levels projects 600, Export 3D view areas to general 3D design software 611

10.30 Example 30 Work with layers and multi-level projects

It is convenient when the project can be divided into horizontal layers, unrelated, such as the floors of building.

But there are problems with complex organization on vertical when one camera should work on several levels. In these cases, the levels are interconnected and 2D planning is not enough. In such cases, 3D modeling can be indispensable.

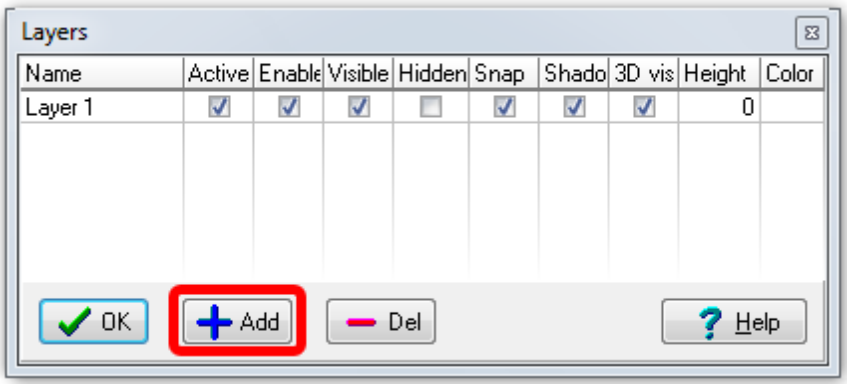


Problem

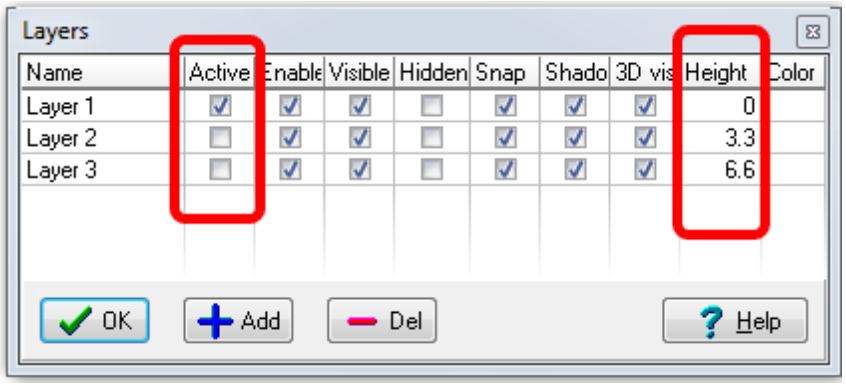
There is a project, divided into floor plans. We need to make CCTV project in which some cameras are located between floors.

Order of work

1. Open Layers 276 box. **Main menu>Drawing>Layers**.



2. Click **Add** and add number of new layers equals to the number of levels in the project.
3. For each layer adjust Height 277, equals to the height of corresponded level.

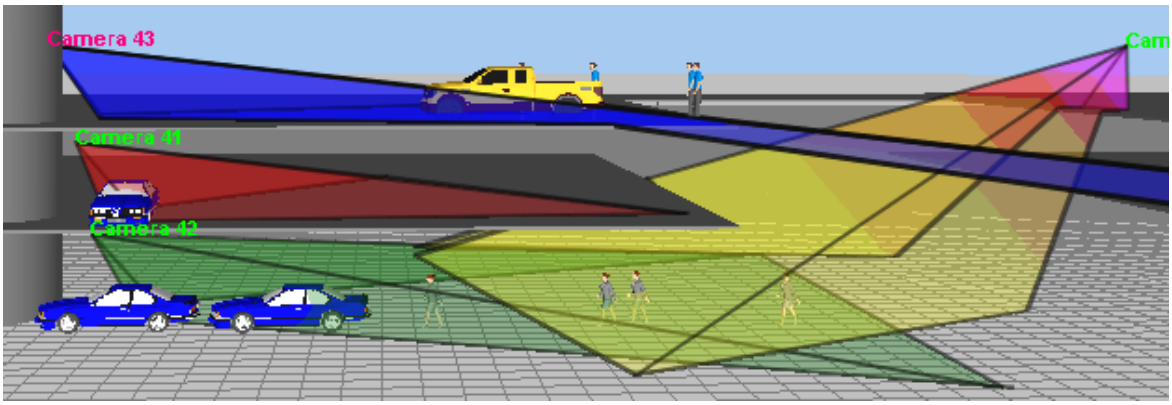


4. Make active 276 one of the layers and then place cameras and constructions on it in the usual

way. Cameras and construction will be placed relative to the **height of the layer**.
Other layers can be hidden 277, gray colored, make insensitive to snap 277 and selection 276 or visualize by specified color 278.

5. Similarly, place the cameras and constructions on other layers (levels, floors), tentatively making **active** the corresponding layer. It is convenient to keep the **Layers** box visible to switch between the layers quickly..

6. In the 3D World 342 we can see full 3D model of our multi-level building.



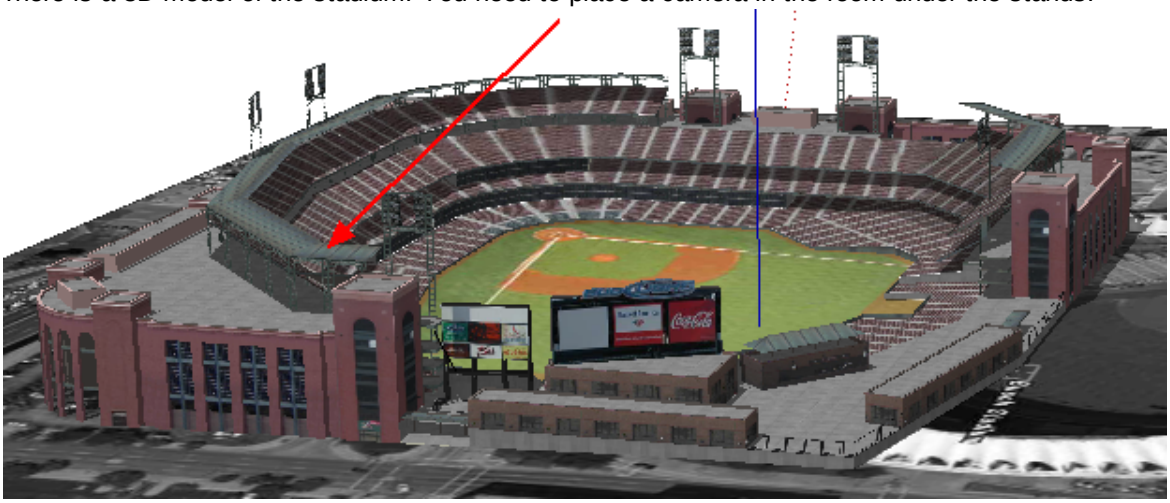
See also: *Drawing>Import DXF/DWG background* 224, *Import of 3D models from SketchUp and Autodesk 3dsMax* 599, *Work with 3D models-territories* 602, *Layers* 276

10.31 Example 31 Work with 3D models-territories

VideoCAD can use not only 3D models of individual objects (people, cars, etc.), but also 3D models-territories (buildings, stadiums, airports, towns, etc.).
Within the 3D models-territories cameras and other 3D models can be placed.

Problem

There is a 3D model of the stadium. You need to place a camera in the room under the stands.



Order of work

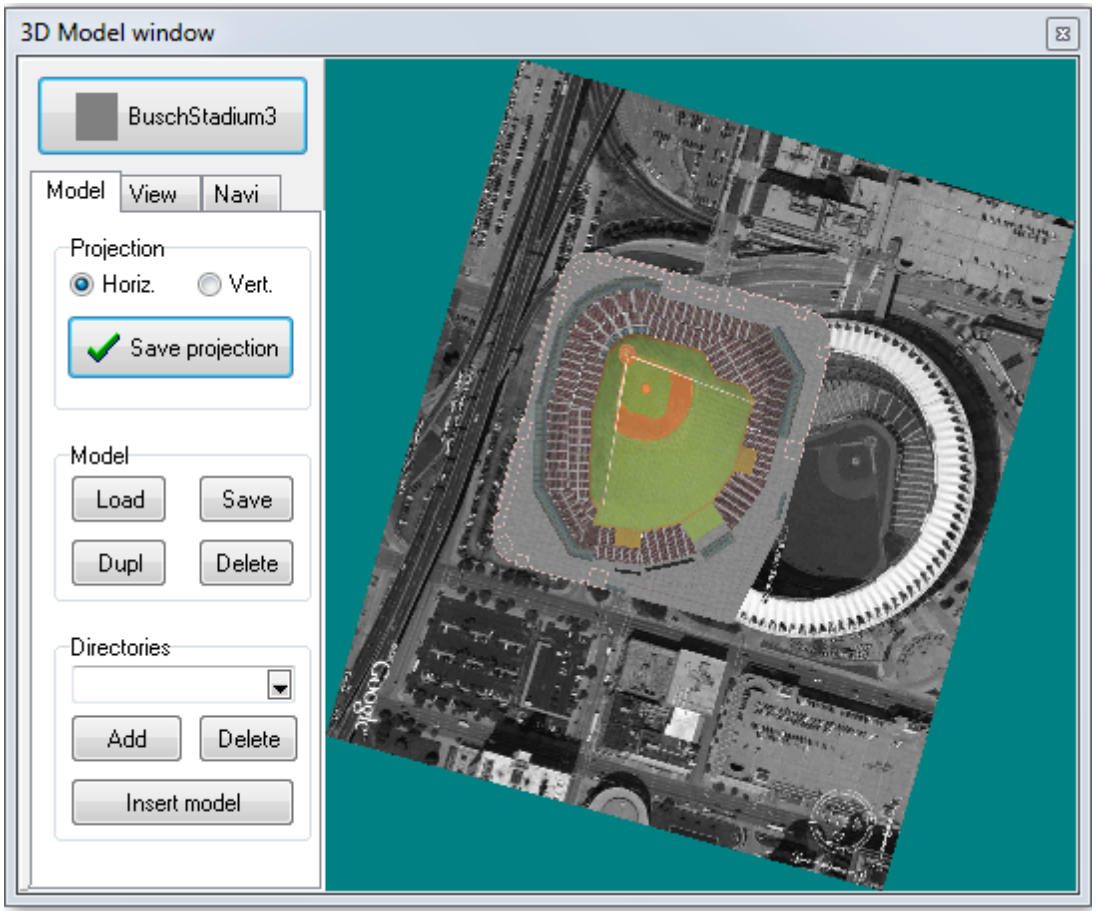
1. Getting a file of the 3D model in *.vcm format

Export 3D model into a file is performed from SketchUP using special VideoCAD plugin 599. Steps of the export are described in the instructions included with the plugin. Acting in accordance with the instructions you will get the 3D model file in ***.vcm** format.

It is recommended to simplify the 3D model before export, removing all unnecessary polygons. It will increase the speed and usability of the 3D model in VideoCAD.

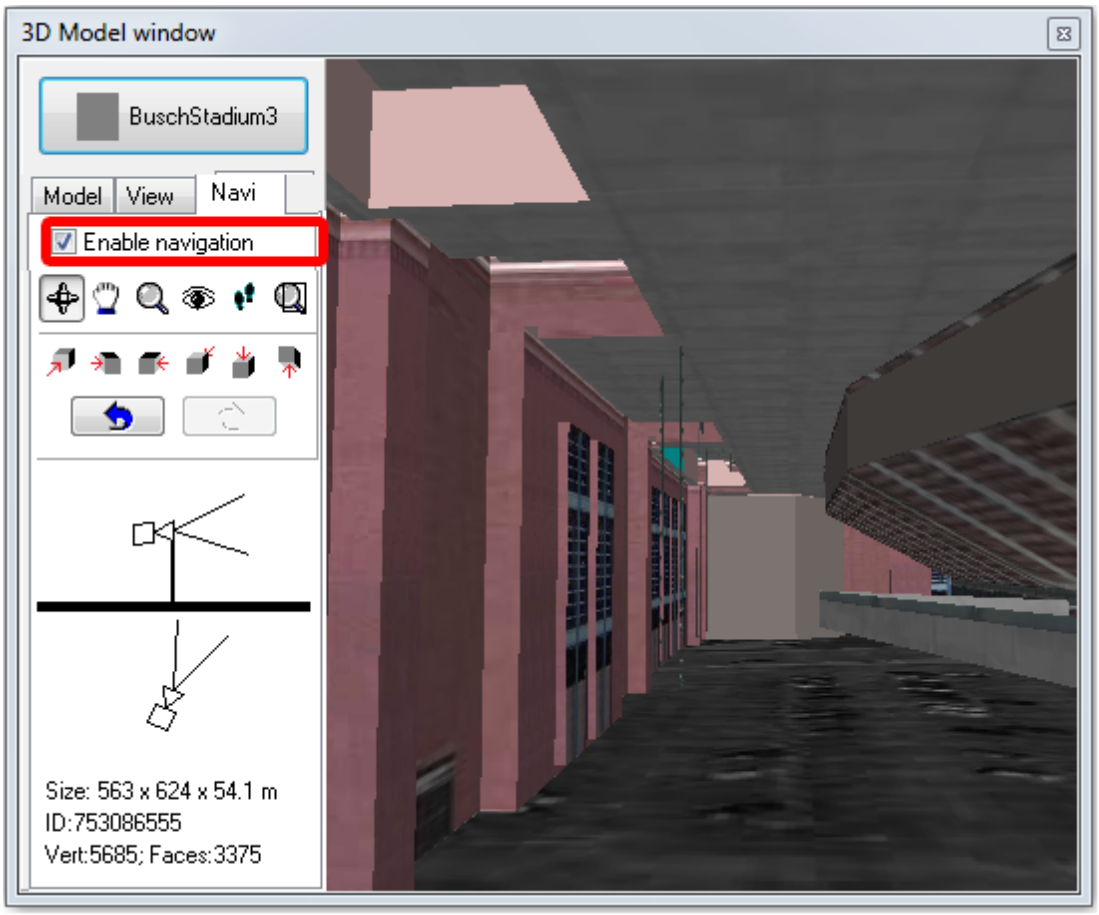
2. Loading the 3D model to VideoCAD

2.1 Choose Main menu>3D models>Add 3D model 262. Open the ***.vcm**. file
2.2 After opening the file, the 3D Models 397 window will appear, the 3D model will be loaded in the window. Projection of the 3D model will be displayed in the 3D Models window.
2.3 Stretch the 3D Models window to increase resolution of the projection.

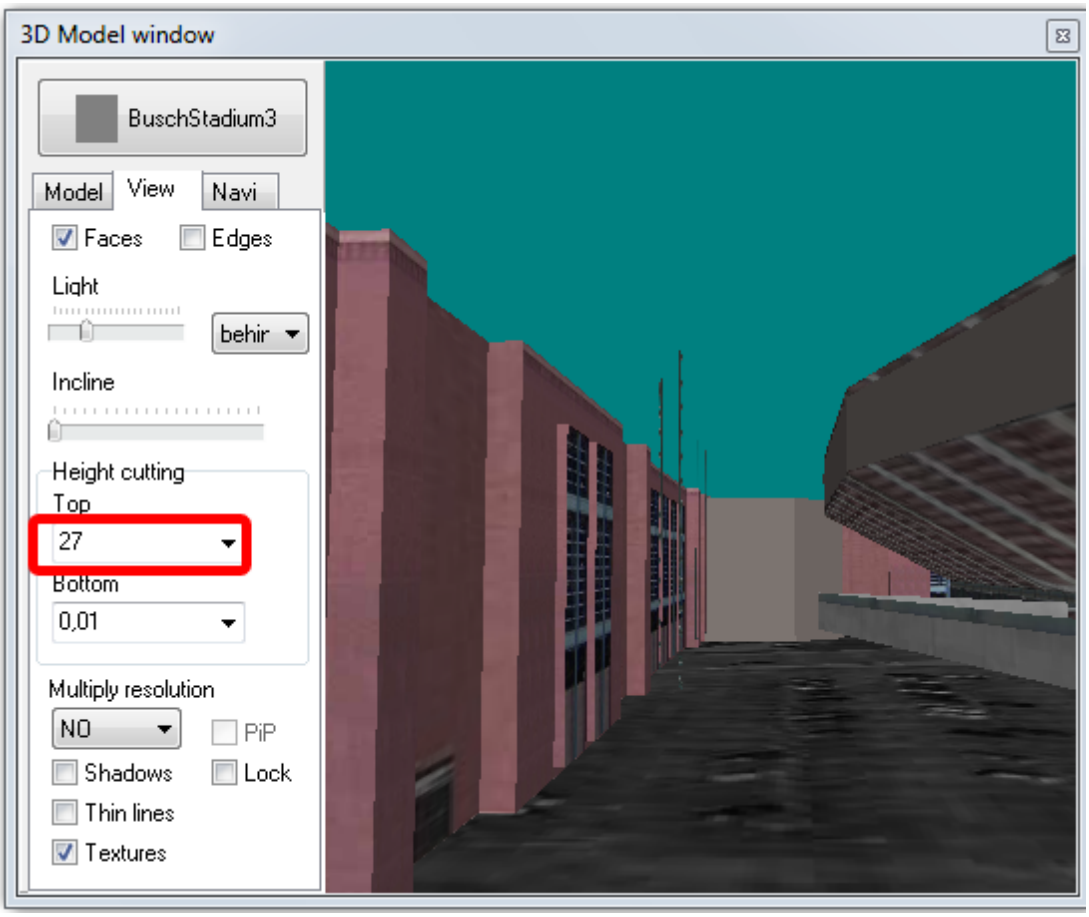


3. Making projection of the 3D model to display in the Graphics window

3.1 Switch to the Navi 404. tab and mark the **Enable navigation** checkbox.
3.2 With the help of the mouse and tools 404 of 3D navigation reach the room under the stands, where a camera should be installed. You can examine the 3D model in details.

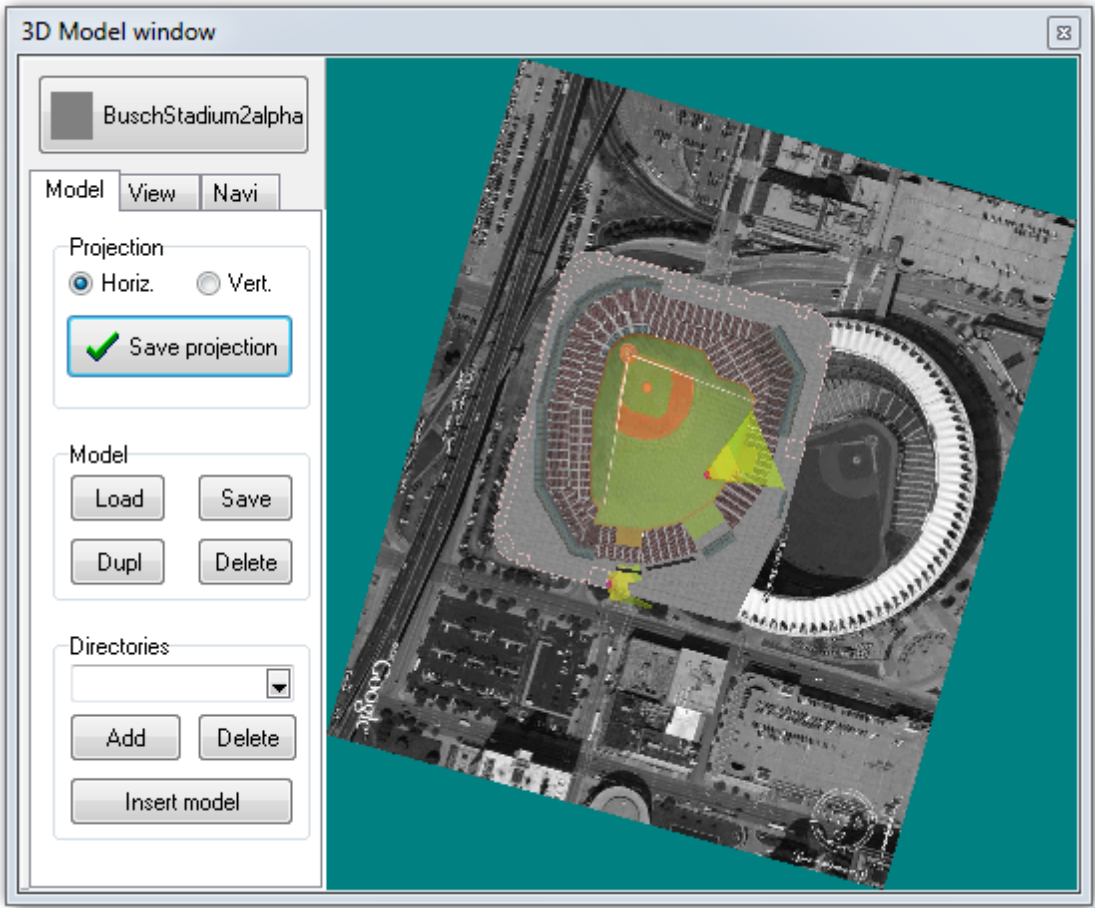


3.3 Switch to the View[401] tab, then by changing value in the **Height cutting>Top**, cut a part of the model above the room, to make the room opened from above.



3.4 Switch to the Navi 404. tab and clear the **Enable navigation** checkbox. As a result you will see horizontal section of the 3D model with the room under the stands opened.

3.5 Switch to the View 401 tab then using the tools on the tab achieve legibility of the room on the section. You can change direction and intensity of light 401, incline the projection a little, visualize edges 401, increase resolution 401, disable texture 403 and use PiP 402 to increase resolution of small area on big projection.
Mark the Shadows 402 and Lock 402 checkboxes.

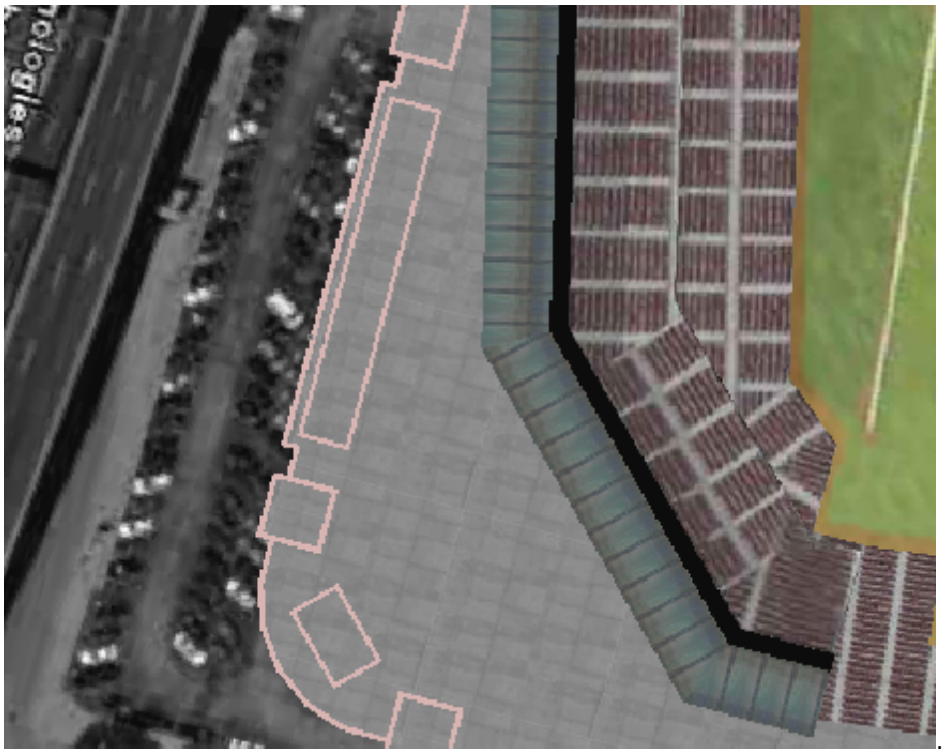


3.6 Switch to the Model 399 tab and click Save Projection 399. Close the **3D Models** window.

In the future, you can change the projection of already placed 3D models many times, with cutting, highlighting the desired heights or areas of the 3D model.

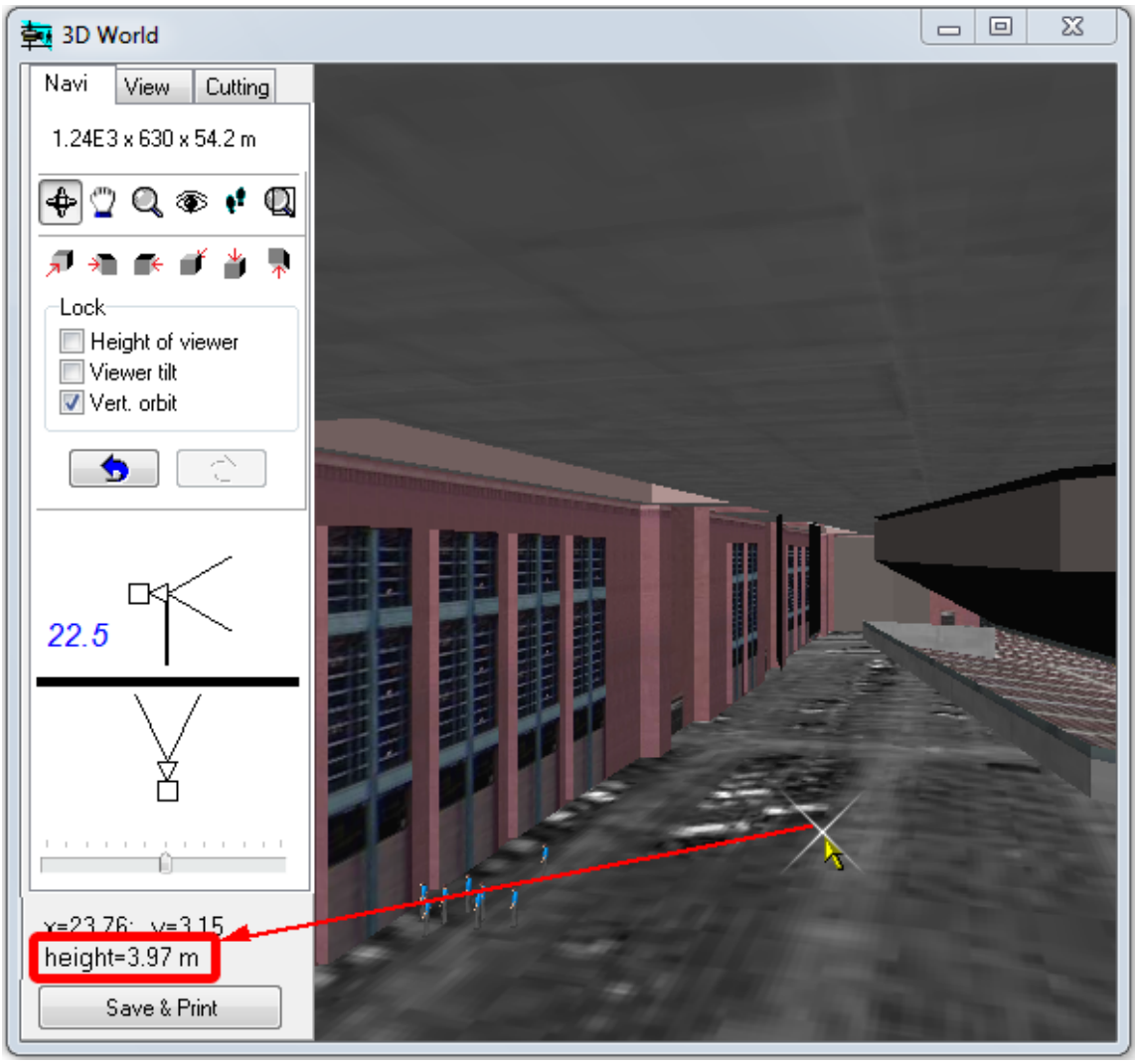
4. Placing the 3D model on the layout

4.1 Select the new 3D model 202 in the menu on the Toolbar and place it by clicking in the Graphics area of the Graphics window. If necessary, scale the model on the Current construction parameter panel 283.
4.2 Zoom in and see on the projection location place for the camera. If the boundaries are not visible, modify the projection in the **3D Models** window.

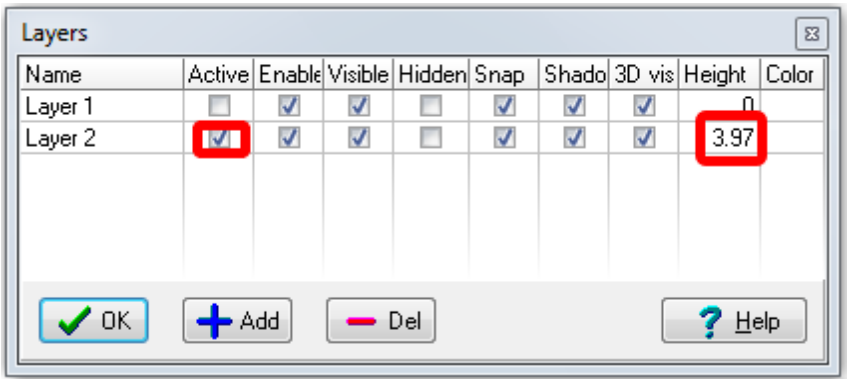


5. Creating a layout on the height of floor of the room

5.1 Open the 3D World 342. With the help of the mouse and tools 404 of 3D navigation on Navi 343 tab reach the room under the stands, where a camera should be installed.
5.2 Put the mouse cursor on the floor and memorize floor height (see image below).



5.3 Go to Main Menu> Drawing> Layers 276. In the Layers box, click Add. Set the height of the new layer 277 equals to the height of the floor and make the layer active 276.



5.4 Click **OK.**

6. Placing cameras and 3D models on the created layer

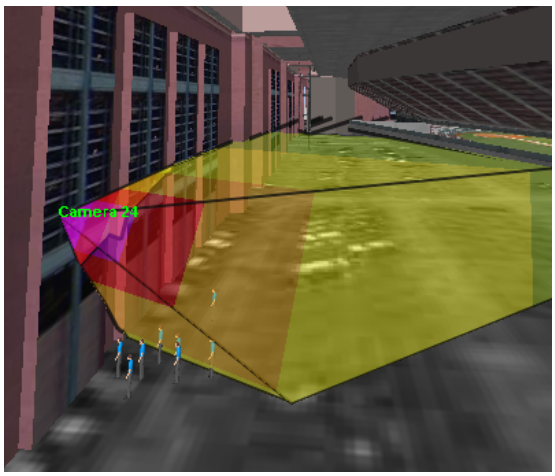
Place cameras and 3D models 202 in the Graphics window in the usual way, using the acquired projection as background.

To make 3D models don't shield cameras , mark the Graphics window>Main Menu > View>Cameras over constructions 242.

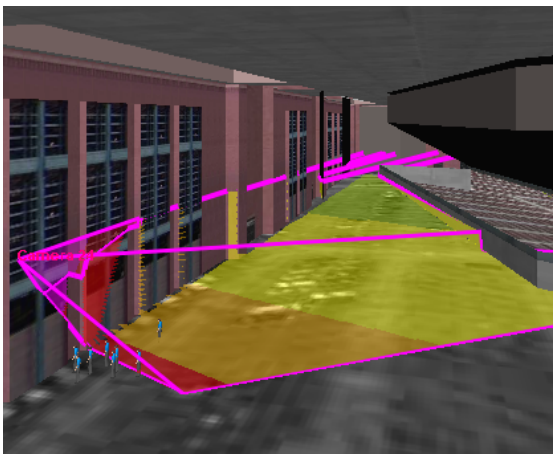
Cameras and construction will be placed on the active layer 276 with the set height of the floor 277. Height of cameras and constructions will be counted from the height of the layer. Shadows 178 from the stadium walls will be taken into account.

You can simultaneously monitor the results in the form of projections in the Graphics window 161 and 3D form in the 3D World 342.

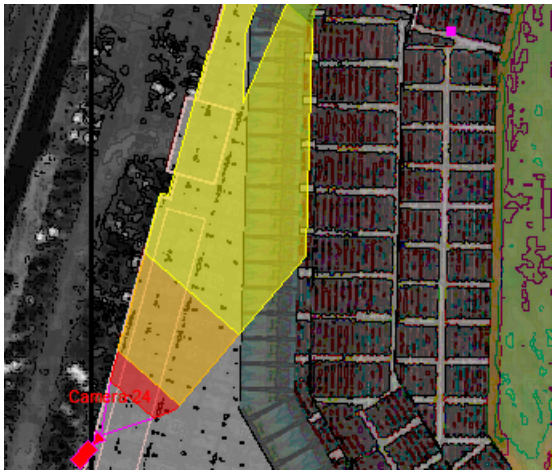
If the 3D model is complicated, do not use shadows 178 in the Graphics window when the 3D World 342 is opened, close all unnecessary windows.



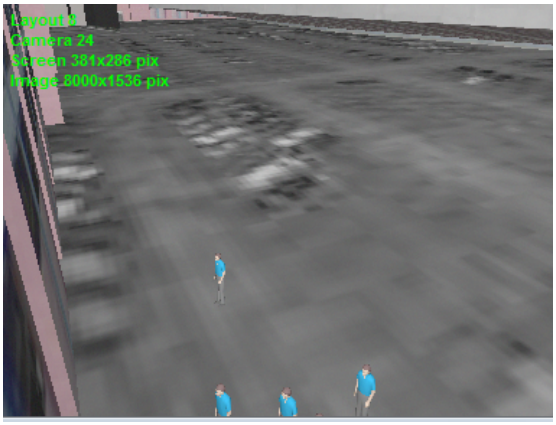
View area faces inside the 3D model in the 3D World



Active camera coverage inside the 3D model in the 3D World



View area projection in the Graphics window

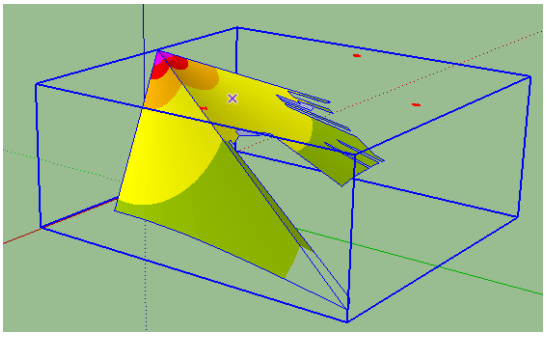


Camera image model in the 3D Video

See also: *Drawing>Import DXF/DWG background* 224, *Import of 3D models from SketchUp and Autodesk 3dsMax* 599, *Work with layers and multi-levels projects* 600, *Export 3D view areas to general*

3D design software 611, *Layers* 276

10.32 Example 32 Export 3D view areas to general 3D design software



In many enterprises, projects of all building systems are executed in a single software environment of 3D design.
However, despite the enormous number of tools of modern 3D design software, a lot of CCTV design problems are outside of their opportunities.
For example, creation of image models from cameras with known parameters in certain conditions , modeling camera view areas with the spatial resolution , lens distortion and shadowing from obstacles etc.

These and other useful in CCTV design opportunities are available in VideoCAD. Furthermore , VideoCAD has means of import and export , which allows to use VideoCAD as addition to other 2D/3D design software.

Means of import and export in 2D are described in the Example 631. Saving images of individual cameras is easy 360. Saving monitors is discussed here 577. In this example we consider import of 3D project from SketchUP and export of 3D models of the view areas to DXF format and import them into SketchUP.

Free version of SketchUP does not support importing DXF format. To import DXF you need SketchUP paid version or you can search an appropriate plugin for importing DXF format for the free version of SketchUP.

Problem

There is a project of a building in 3D. The project must be supplemented by view areas of CCTV cameras, made with visualization of spatial resolution, taking into account lens distortion and shadowing from obstacles.

Order of work

1. Import of a project into VideoCAD

The import is performed via SketchUP and special VideoCAD plugin. The SketchUP can open files of the most of 3D formats.
See more: Work with 3D models-territories 602.

2. Choosing and placing cameras

Choosing and placing cameras, generation of image models of cameras are performed in the usual way on the special layers 276 with set heights and using projection and sections of the 3D model-territory as a background.

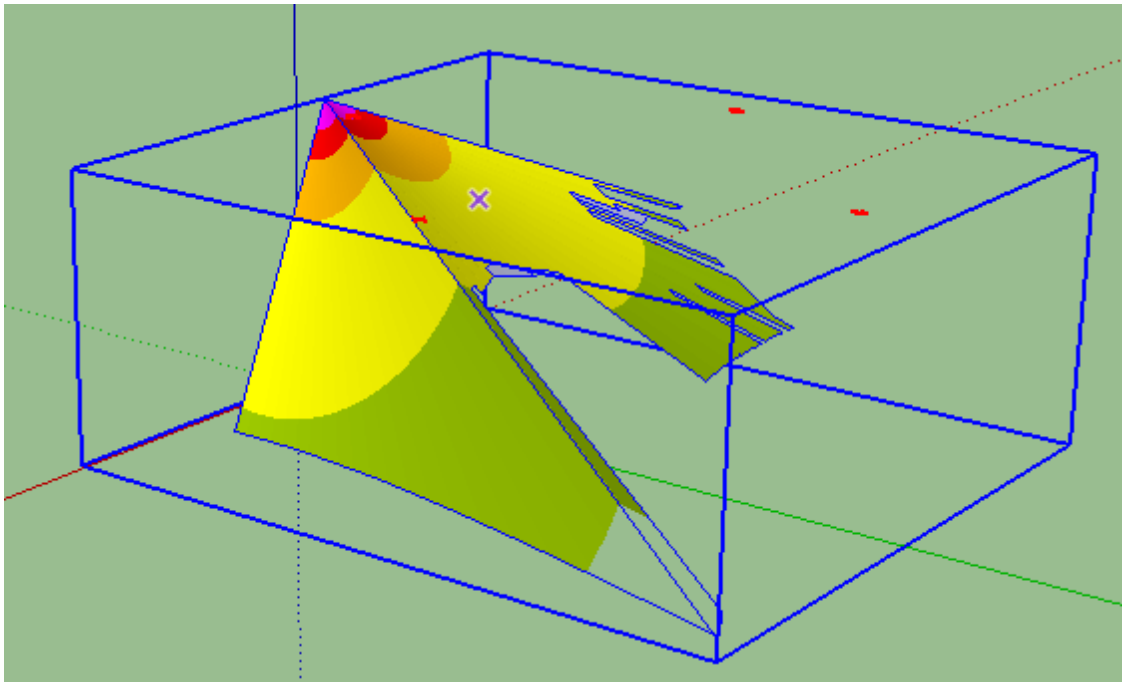
See more: Work with 3D models-territories 602.

3. Saving obtained view areas

3.1 When all cameras were placed, open the 3D World 342.
3.2 Activate 166 all the cameras are displayed alternately with the 3D World opened to calculate all shadows completely.
3.3 Hide 267 the cameras whose view areas are not necessary to export.
3.4 Click on the Save & Print 354 button, in the pop-up menu select Export 3D view areas to DXF 354 and save the *. dxf file.

4. Import of 3D view areas to the main 3D design software (for example SketchUP)

4.1 Open your project in **SketchUP**.
4.2 Choose **File>Import**
4.3 In the appeared dialog click **Options**
4.4 In the appeared dialog choose unit of measure in imported file according to unit set in VideoCAD (meters or feet) then click **OK**.
4.5 Choose just saved *.dxf file and click **Open**.
4.6 Depending on the number of view areas and their complexity, the import may take some time.
4.7 During import, a box with the results of the import will appear. Click **Close**.
4.8 When the import is ended, you will see the imported view areas in the **SketchUP**.

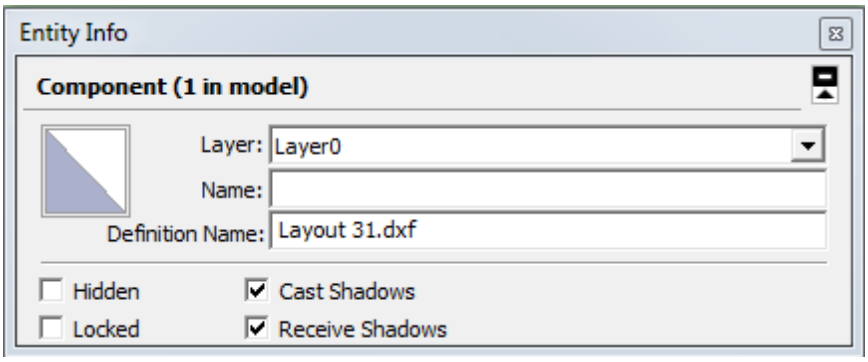


4.9 Align the view area with constructions in your project and you will get 3D project with exactly calculated view areas.

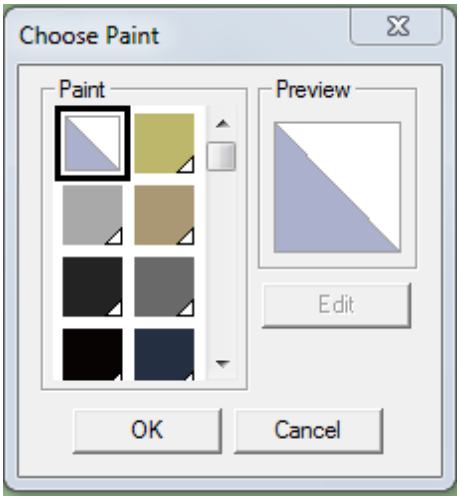
5. How to make view areas semi-transparent in SketchUP

You can make view areas semi-transparent. For this purpose:

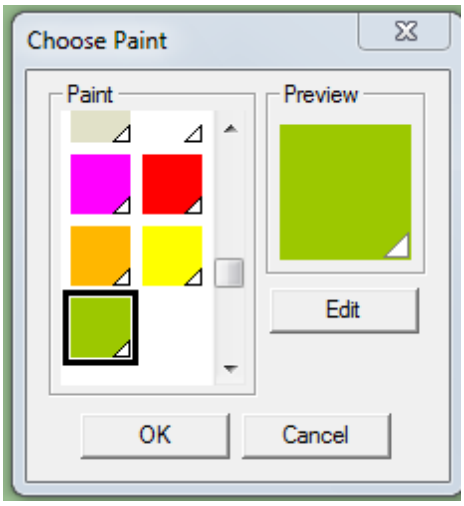
5.1 Select view areas, right click then choose **Entity info** in the pop-up menu.



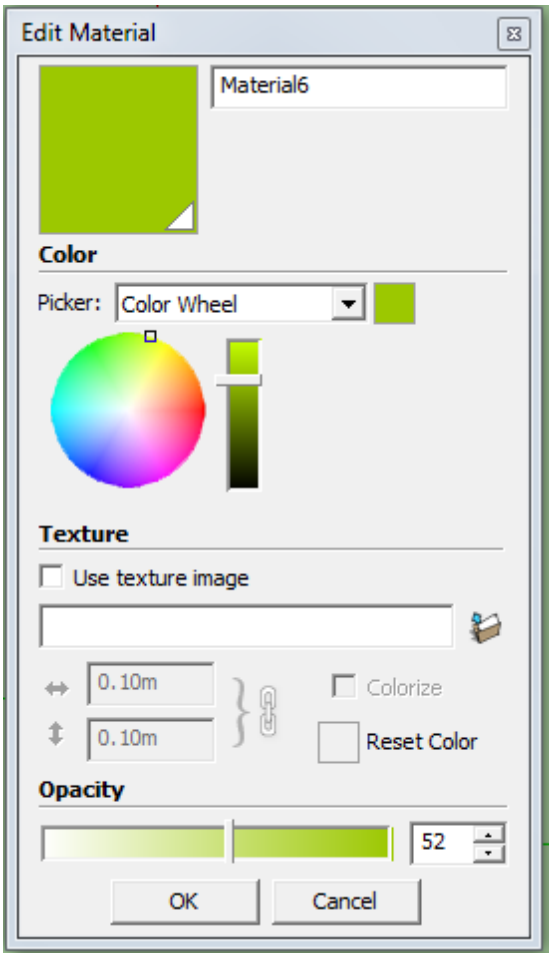
5.2 In the appeared dialog click on the square in the left-top corner - the **Choose Paint** dialog will appear.



5.3 Shift the list of materials down and choose a material with color used for view area coloring.

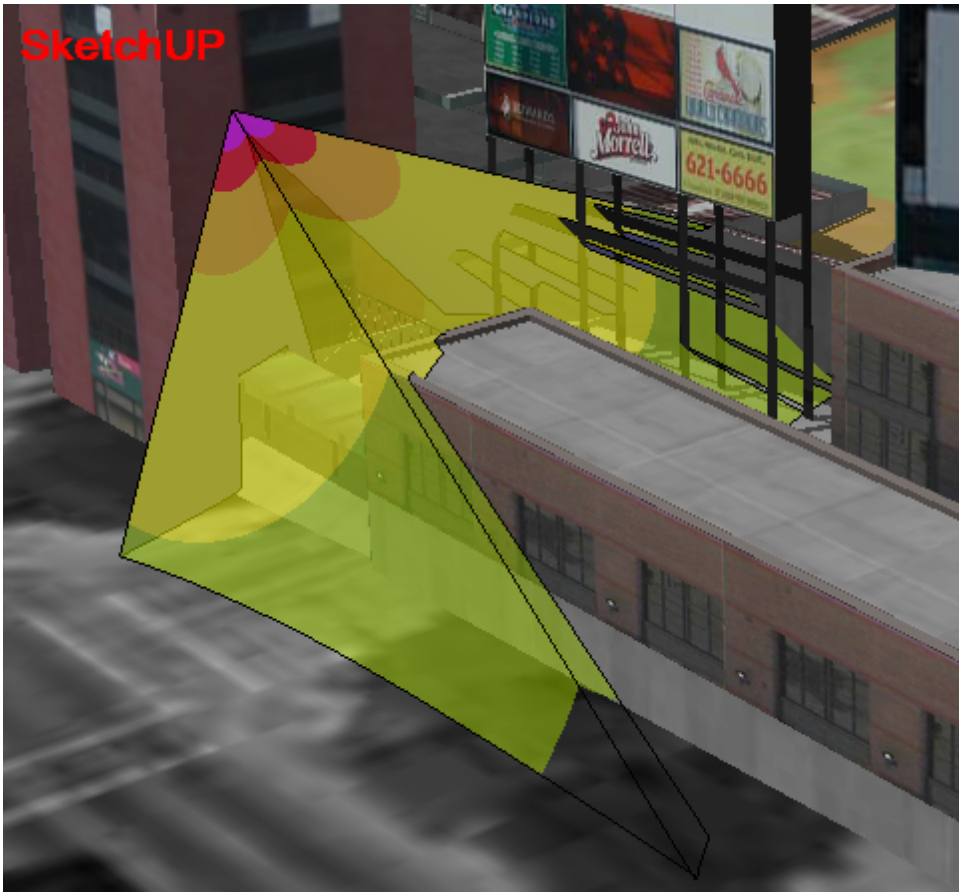


5.4 Click **Edit** - The **Edit Material** box will appear.



5.5 Set the transparency of the material using the **Opacity** slider. Click **OK**.
5.6 Click **OK** in the **Choose Paint** dialog.
5.7 Click again on the square in the **Entity info** dialog and set the opacity of other colors used in the view areas.

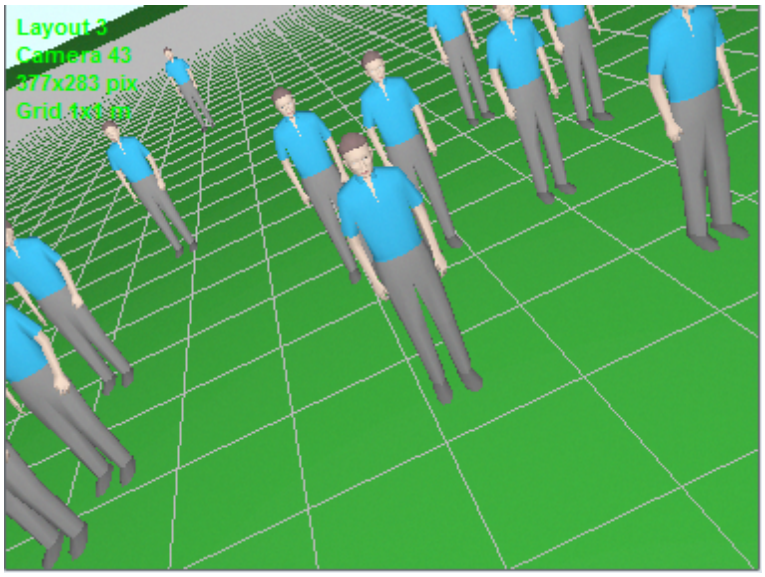
The result can look like this:



See also: *Drawing>Save as* 219, *Drawing>Import DXF/DWG background* 224, *Options box>Export* 485, *Work with background in AutoCAD format* 631, *Work with 3D models-territories* 602, *Import of 3D models from SketchUp and Autodesk 3dsMax* 599

10.33 Example 33 Using camera rotation around its own axis

Rotation of camera around its own axis allows the change the shape of the view area projection. This feature can be useful in CCTV design.
By turning a camera you can exclude from the view area unnecessary objects or vice versa expand the view area in the needed direction, without replacing the lens to a short-focus one, so without sacrificing the spatial resolution.
At this a little rotation doesn't worsen readability of camera image for an operator.



Problem

Study the effect of camera rotation around its axis on the form of the view area projection.

Order of work

1. Create new camera 171 by the same way as in the previous examples.

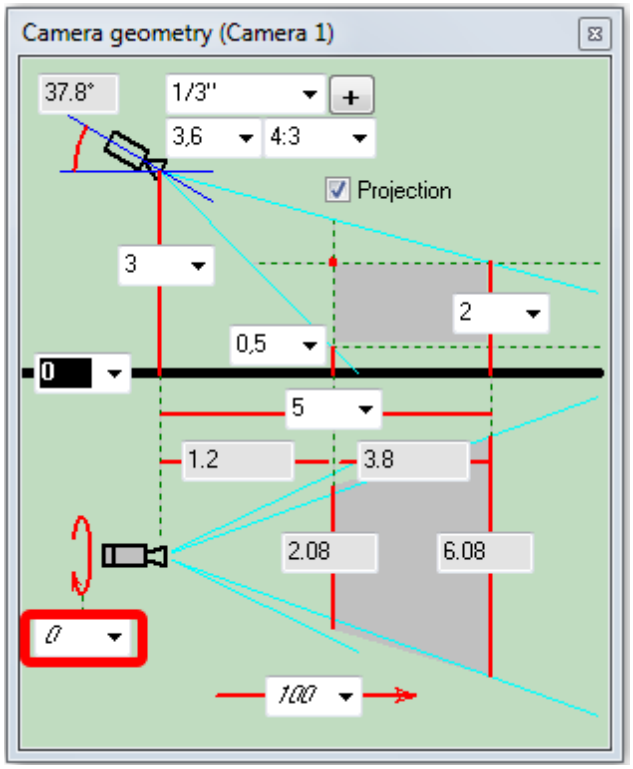
2. Place several 3D models 202 within the camera's view area.

3. For better clearness choose View area projections bounds 229 >2 Levels, Fill projections 175 >Filling**.**

4. Open the 3D Video 357.

5. Open the Camera geometry 289 box and try to change value in the Axial rotation angle 297, watching on the form of the view area projection in the **3D Video**.

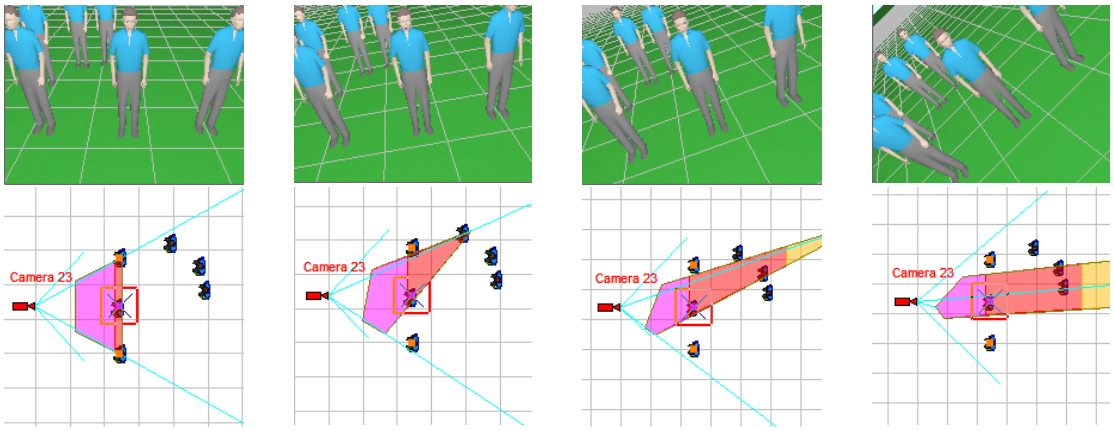
The parameters in the **Camera geometry box** can not reflect the shape of view area *rotated around its main optical axis*. So the rotation around the axis within + -45 degrees does not affect the parameters. The parameters of the Camera geometry box continue to show values as if the camera is not rotated.



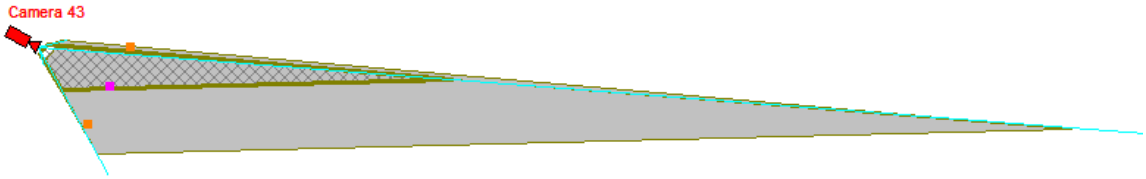
When the rotation angle is more than 45 degrees, the parameters abruptly change their values to ones corresponded to the camera rotated on 90 degrees.

In this position the lateral faces of the view area will become the upper and lower faces, and upper and lower faces will become lateral ones.

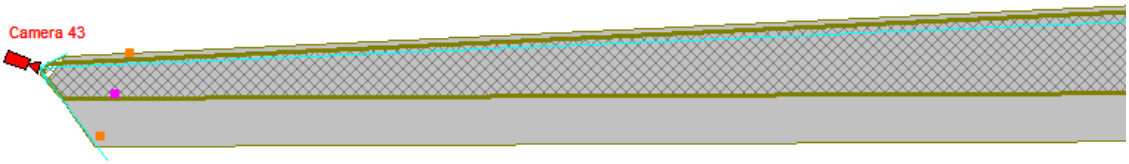
When the rotation angle is more than 135 degrees, the parameters will reflect the initial position of the camera.



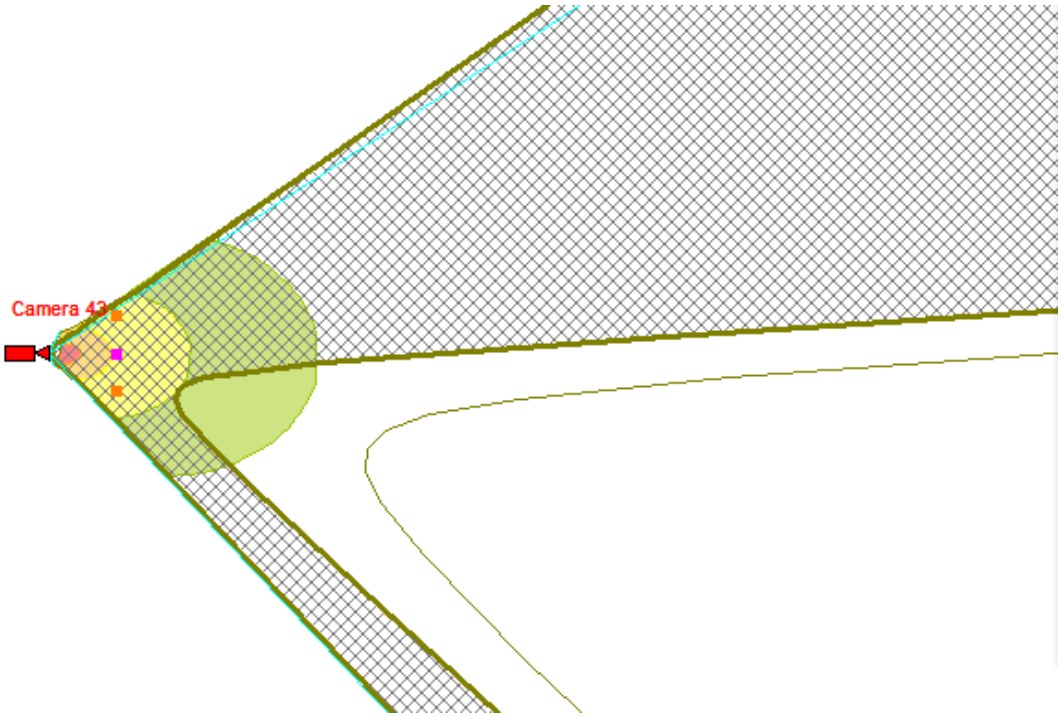
When reducing the camera tilt angle, the axial rotation transforms the projection of view area to a narrow beam. **This is not the vertical projection, but the horizontal projection on the ground!**



The beam can be endless.



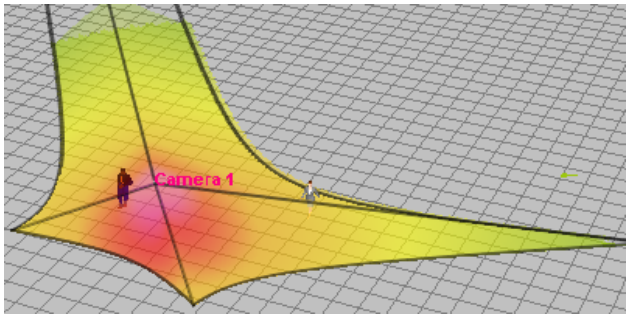
The view area projection takes on even more unusual form when it is build taking into account the rotation around camera's axis and lens distortion 619 at the same time. Below there is one of possible example.



See also: *Axial rotation angle* 297, *Sensor and Lens>Distortion* 310, *About lens distortion* 654

10.34 Example 34 Modeling lens distortion

There is a difference between the actual values of view angles given in the specification of cameras(lenses) and angle values obtained by calculation. The reason for the difference is the lens distortion. Distortion can lead to a significant deviation of the view area form from a regular pyramid and warping of the spatial resolution distribution.
See more: About lens distortion 654



Accounting distortion when designing CCTV provides models of the view areas and images more close to reality, and thus more fully use cameras in the project.

Problem

There is a camera **AXIS M1004–W/M1014/M1034-W.** It is required to obtain a model of the view area, the distribution of the spatial resolution and image from this camera with taking into account lens distortion.

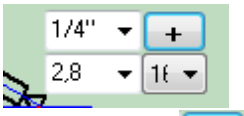
Camera parameters according to manufacturer's specification:
- Sensor format - 1/4";
- Lens focal length - 2,8mm;
- Real horizontal view angle - 80 degrees.
- Number of pixels 1280x800 (max)

It is recommended to measure real view angles practically 622.

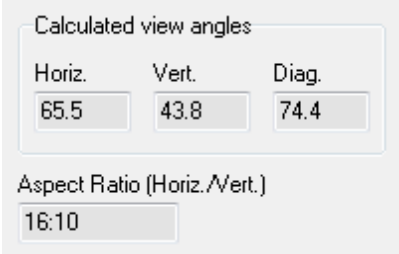
Order of work

1. Create a camera by clicking the New camera 171 button and place it on the layout.

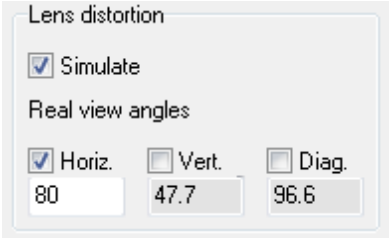
2. Open the Camera geometry 289 box and specify camera parameters:
- Sensor format 293 - 1/4";
- Lens focal length 294 - 2,8mm;
- Aspect ratio 295: 16/10 (1280/800=16/10).



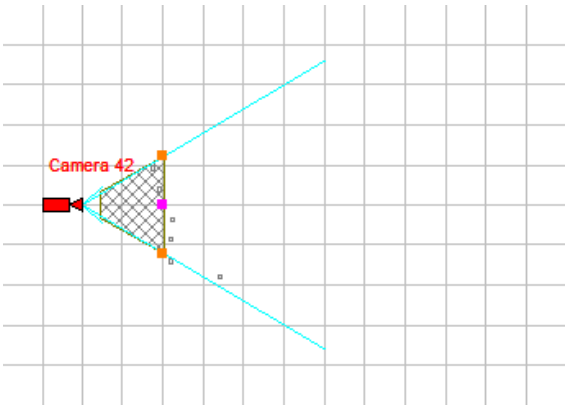
3. Click on the button to open the Sensor and Lens 308 box.
In the box, pay attention to the difference between the calculated horizontal view angle - 65.5 degrees and the actual view angle from the manufacturer's specification - 80 degrees. The difference indicates that the lens distortion is present.



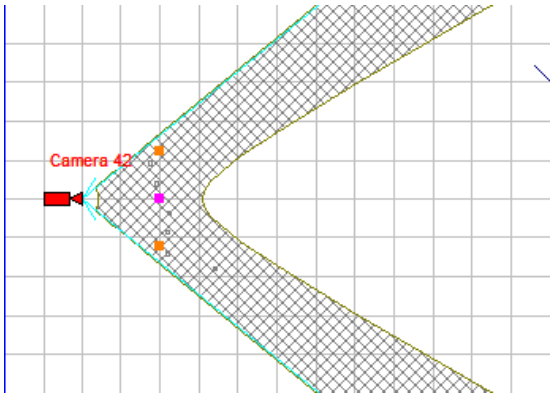
4. On the **Lens distortion** panel check the **Horiz.** checkbox and enter **80** to the field under it. Clear the **Vert.** and **Diag**. checkboxes, because of the vertical and horizontal view angles are unknown.



5. Turn on modeling distortion, by checking the **Simulate** checkbox. After that we will see significant change of view area in the **Graphics window**.

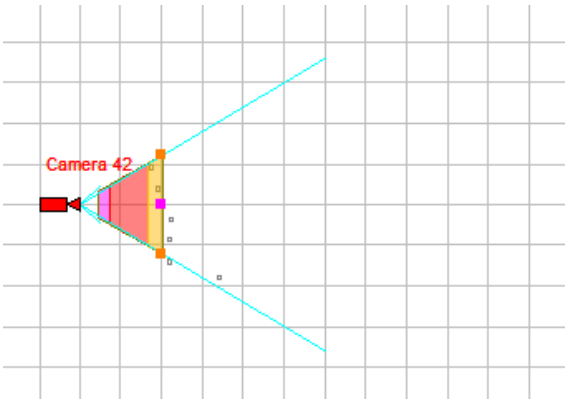


Without simulating distortion

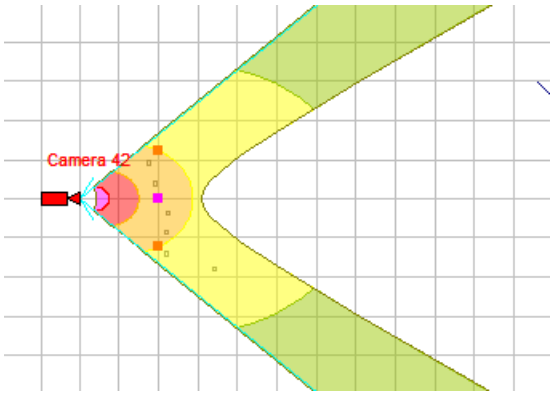


With simulating distortion

6. To observe influence of the distortion on the distribution of spatial resolution you should enter the number of pixels of the camera (1280x800) in the Sensitivity and resolution 186 and turn on modeling spatial resolution 186. See Visualization of cameras' control area projections and spatial resolution inside them 580.

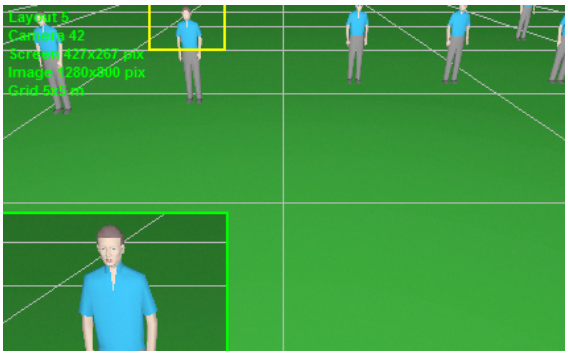


Without simulating distortion

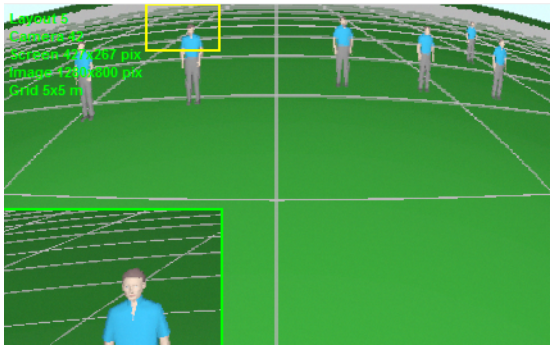


With simulating distortion

7. To observe influence of the distortion on the image from the camera, open the 3D Video 187 and place several 3D models 202 within camera's view area.

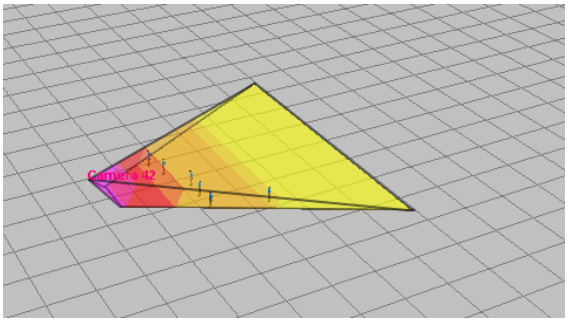


Without simulating distortion

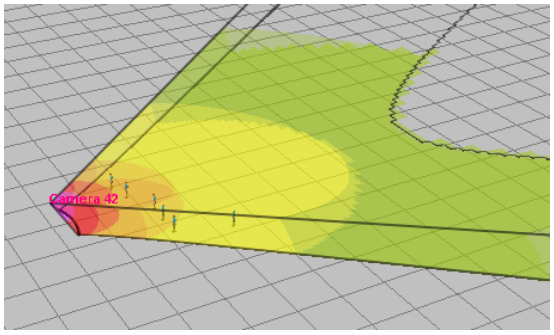


With simulating distortion

8. To observe influence of the distortion on the form of the view area in 3D, open the 3D World 187.



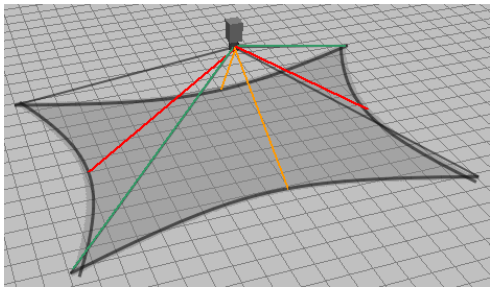
Without simulating distortion



With simulating distortion

See also: *Sensor and Lens>Lens distortion* 310, *About lens distortion* 654, *Measuring real view angles* 622, *Specifying active area size of the image sensor* 636

10.35 Example 35 Measuring real view angles



Starting from the eighth version of VideoCAD, the simulation accuracy of view areas of cameras in VideoCAD is greatly improved because of the possibility of simulating lens distortion 654.

Three view angles (horizontal, vertical, diagonal) are computed inside VideoCAD from the lens focal length 294 and image sensor size 293 without accounting distortion. For most long-focus lenses distortion can be ignored, but in case of short-focus lenses the distortion introduces significant error in the calculation. To simulate distortion we need to know the lens focal length, image sensor size and at least one of the real angles.

The value of the real angle can be taken from the manufacturer's specifications, as in the Example 619. But not all manufacturers measure the real view angles of their cameras.

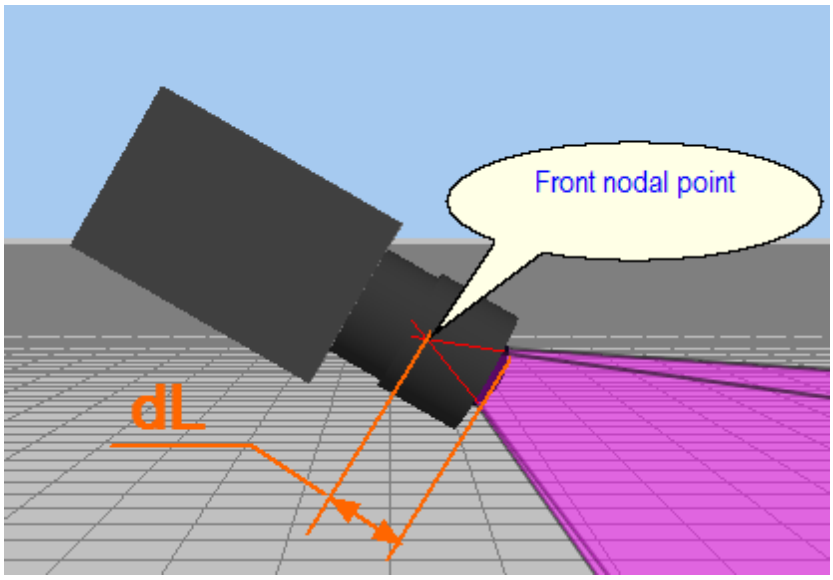
Lets consider a simple technique of practical measurement of camera view angles. Many variants of the technique are possible depending on the conditions.

Problem

There is a camera with a lens. It is necessary to measure the real angles: horizontal, vertical and diagonal. To accurately modeling the view area, taking into account lens distortion.

The front nodal point of a lens and measurement inaccuracy

If the camera view area is in the form of a pyramid, the top of the pyramid will be in the **front nodal point of the lens**. The front nodal point of the lens is located on the front principal plane within the length of the lens on the main optical axis, but its exact position is unknown to us.



If we assume that the front nodal point of the lens is in the middle, the possible error of measuring the dimensions of the view area will be the ratio of half of the length of the lens by the distance from the middle of the lens to the screen.
For example, if the physical length of the lens = 40mm, and the distance from the middle of the lens to the screen = 1 meter, then the inaccuracy of measuring the size of the field of view = 40/2/1000 = 0.02, ie + -2%.
The inaccuracy of measurement of an angle will be less depending on the angle. For example, if the angle is 90 degrees, the inaccuracy will be+ -1.3%.

If this accuracy is not sufficient, you should use more distance from the camera to the screen, but it will require a larger screen, that is not always convenient.

Another way of reducing the inaccuracy is locating the front nodal point of the lens within the length.
To do this, perform 2 measurements at different distances between the front edge of the lens and the screen, for example 0.5 and 0.25 meters. Then, assuming that the view angles are constant, solve the system of equations, where the unknown is the distance from the front edge of the lens to the front nodal point.

Omitting the course of the solution, we present the resulting formula for the calculation.

dL=(S2 * L1 - S1 * L2) / (S1 - S2);

where:
- **dL** - unknown distance from the front edge of the lens to the front nodal point;
- **L1** - distances between the front edge of the lens and the screen at the first measurement;
- **L2** - distances between the front edge of the lens and the screen at the second measurement;
- **S1** - width (at measuring horizontal angle) of the field of view at the first measurement;
- **S2** - width (at measuring horizontal angle) of the field of view at the second measurement.

Order of work

1. Fully open the lens aperture, if possible.
2. Focus the lens on the camera working distance.

You should focus not on the distance to the screen but on a distance that will work the camera on. In most cases, this distance is the hyperfocal distance 458 *at maximum aperture. Focusing on the*

working distance is performed for a case, if the angles of view or the position of the front nodal point will depend on the focus distance.

3. Secure the camera in front of a flat screen.

4. Close the aperture as possible to obtain a sharp image from the camera.

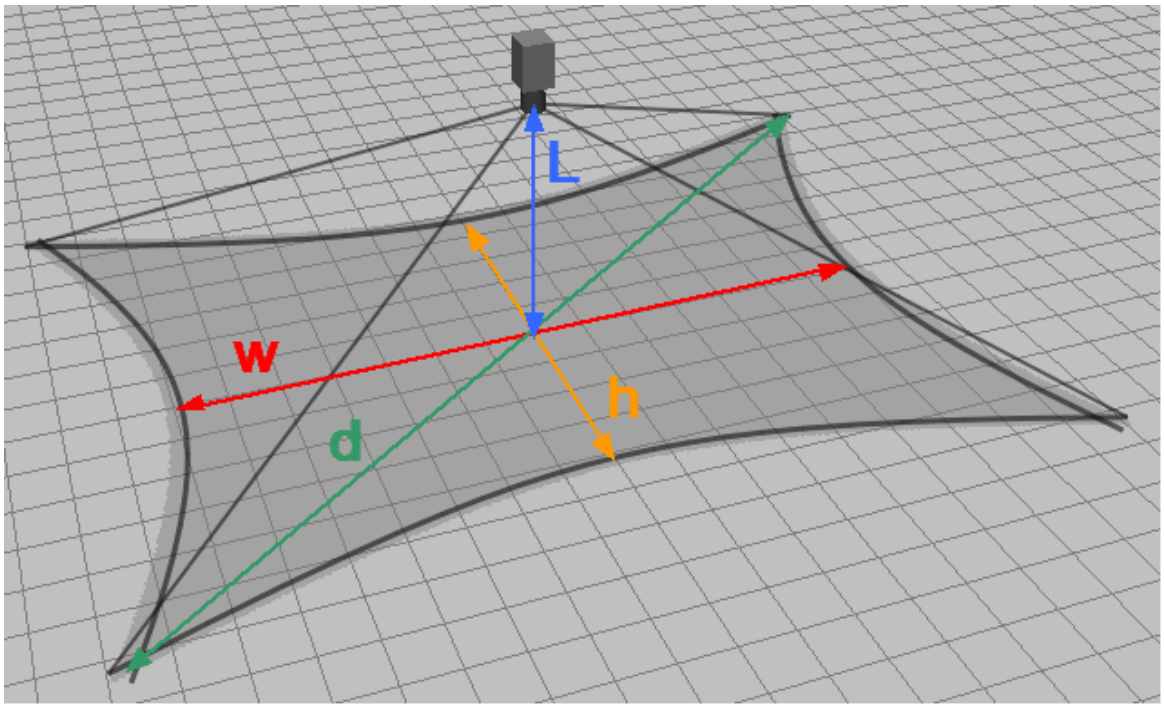
5. Adjust the camera position so that the main optical axis of the camera will be strictly perpendicular to the screen. Mark the center of the image on the screen.

6. Watching the image, mark the extreme points on the screen width, height, and diagonal field of view.

7. Measure the distances on the screen between the points on the boundaries and the marked center of the image. Boundary points must be strictly symmetrical relative the center. If it is not the case, then adjust the position of the camera and go back to **step 5**

8. Measure the distances between the points (field of view size in width, height and diagonal).

9. Measure the distance from the front nodal point of the lens 622 to the screen.



10. Calculate the view angles using the formulas:

Ah=2 * ARCTAN(h / (2 * L));
Aw=2 * ARCTAN(w / (2 * L));
Ad=2 * ARCTAN(d / (2 * L));

where (see image):

- **ARCTAN** - arc tangent, inverse tangent function**;**
- **Ah,Aw,Ad** - obtained real view angles in height, width and diagonal respectively;
- **h** - distance between extreme points on height of the field of view;
- **w** - distance between extreme points on width of the field of view;
- **d** - distance between extreme points on diagonal of the field of view;
- **L** - distance between lens front nodal point and the screen.

You can use the obtained angles in the Sensor and Lens 310 box for precise modeling view area of

this camera.

It is possible to make very simplified test on a camera already installed.
1. Firstly measure sized and distances of real objects in cameras view area.
2. Then construct 3D model in VideoCAD, place a camera.
3. Then choose angles of view to obtain image model equal to real image from the camera.

See also: Sensor and Lens>Lens distortion 310, *About lens distortion* 654, , *Modeling lens distortion* 619

10.36 Example 36 Modeling panoramic cameras (Fisheye, 360°/180°)

Panoramic cameras are useful for monitoring small spaces.
The view area of such cameras is a hemisphere. Field of view is projected on the image sensor in the form of a circle.
Therefore, the original image produced by the image sensor is a circle in which the image of the scene subjected to a strong barrel distortion. Then, in the original image a target area is cut out, distortion is corrected in this area and in result an usual frame is obtained.
Users are interested in the output frame. The original image in the form of a circle is used as an intermediate.

VideoCAD allows to:
- Simulate the output frames without distortion with calculated pixel density;
- Simulate camera field of view and distribution of the spatial resolution in the Graphics window and the 3D World 342.

See more Panoramic 312

Problem

There is a camera **AXIS M3007-PV.** The camera is mounted on a bracket at 3m height at a distance of 10 meters from a wall of 10 meters height. Camera is pointed down.
It is required to obtain a model of the control area, the distribution of the spatial resolution 316 and image 357 from this camera.

Camera parameters according to manufacturer's specification, crucial for modeling:
- Number of pixels 2592x1944 (5 MP)

Order of work

1. Create a camera by clicking the New camera 171 button. In the **New camera** box, in the **Camera icon** combobox choose an icon for the new camera with panoramic, for example **indoor/ panoramic**.

A special icon is not obligatory. In the future it will be possible to change the icon in the Camera list 172 box.

2. Place the camera on the layout. At a distance of 10 meters from the camera create a wall of 10 m height using the Rectangle 196 tool.

3. Open the Sensitivity and resolution 186 box and specify number of pixels 332 on Horizontal - 2592 and on Vertical - 1944. Close the box and save changes.

*The most important parameter that determines the image resolution of panoramic cameras, is the **number of pixels of the image sensor**.*

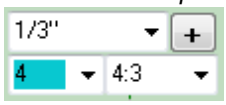
Since the image sensor is rectangular in shape and view area of the camera is projected into a circle, not all pixels are involved in image formation.
*In VideoCAD the **number of physical pixels** on the sensor horizontally and vertically are required. The number of pixels involved in the formation of the image (active pixels) will be calculated by VideoCAD.*
*High precision of specifying the number of pixels is not required. So for a 2-megapixel camera, you can enter 1200 * 900, for 3MP -1600 * 1200, for 5MP -2500 * 2000. Standard aspect ratio should be supported.*

Lens focal length 294 and Image size at image processing 381 have no affect on the image resolution of a panoramic camera.

4. Open the Camera geometry 289 box and specify camera installation height 296 of 3 meters.

5. Click on the button to open the Sensor and Lens 308 box.
On the **Panoramic** panel mark the checkbox and specify angles of installation of the panoramic camera. To point the camera down, choose:
Pan angle = 0; (this value is not important when the camera is pointed down);
Tilt angle=90.

The lens focal length boxes in the Graphics window and the Camera Geometry box will be colored by aqua-green.



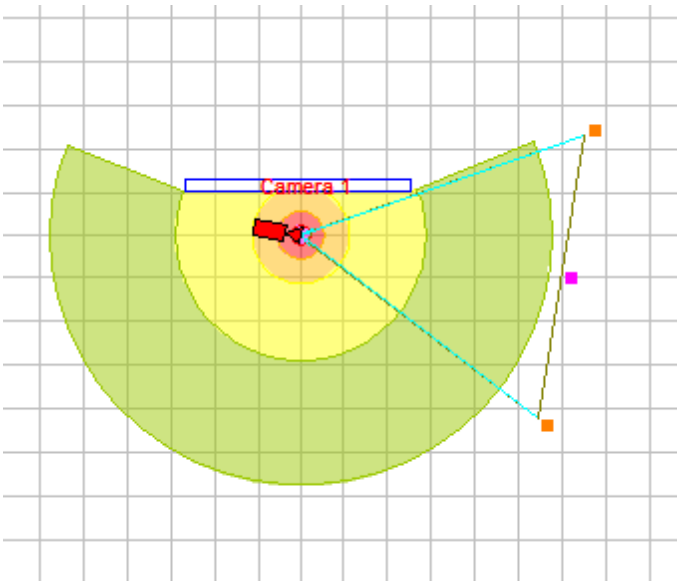
To limit too big size of the view area projection use the Maximum distance of drawing view area 307 box in the Camera geometry 289 box .

6. Assign to the camera a Spatial resolution pattern 318 to visualize the spatial resolution (pixel density distribution). For this purpose open the Spatial resolution box 186. Clear the Active camera 318 checkbox, then choose the pattern "*Home Office Scientific Development Branch 2009 (arbitrary resolutions)*" in the Pattern 318 list. Then click Assign 321 to assign the chosen pattern to the active camera.

*Pattern criterion of spatial resolution 319 for panoramic cameras must be based on the spatial resolution (**Pixel per meter (Pixel per foot), Pixel for object**), but not on the field of view size. Criterion **Field-of-view height**, **% of Field-of-view for object** are not suitable to panoramic cameras, because of panoramic cameras have not a stable field of view.*

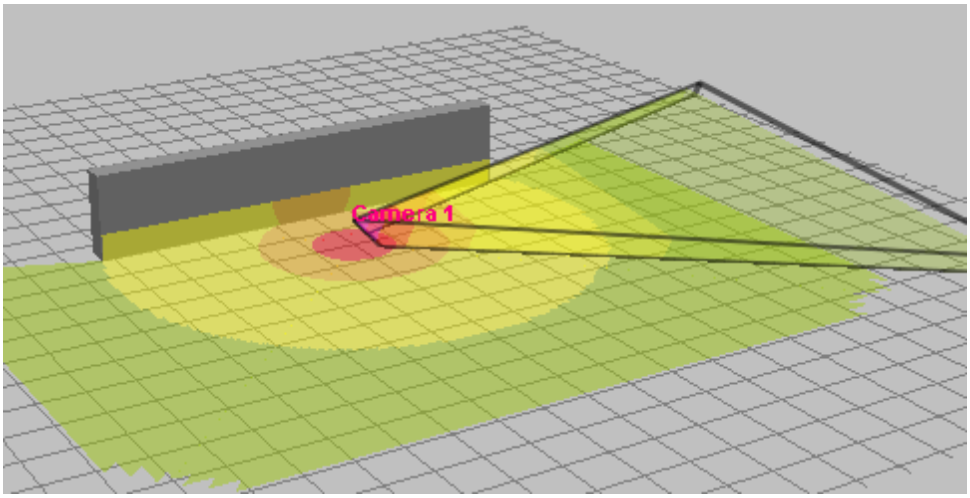
7. Enable and adjust the spatial resolution visualization in the Graphics window.
In the popup menu of the Shadow 178 button on the Toolbar 169 of the Graphics window choose **Within projection**.
In the popup menu of the Fill projection 175 button choose **Filling**
In the popup menu of the Spatial resolution 186 button choose **Discrete color**.

As a result we will see in the Graphics windows the spatial resolution distribution of the camera **AXIS M3007-PV** on the height 320 specified in the Spatial resolution pattern 318 assigned to the camera.



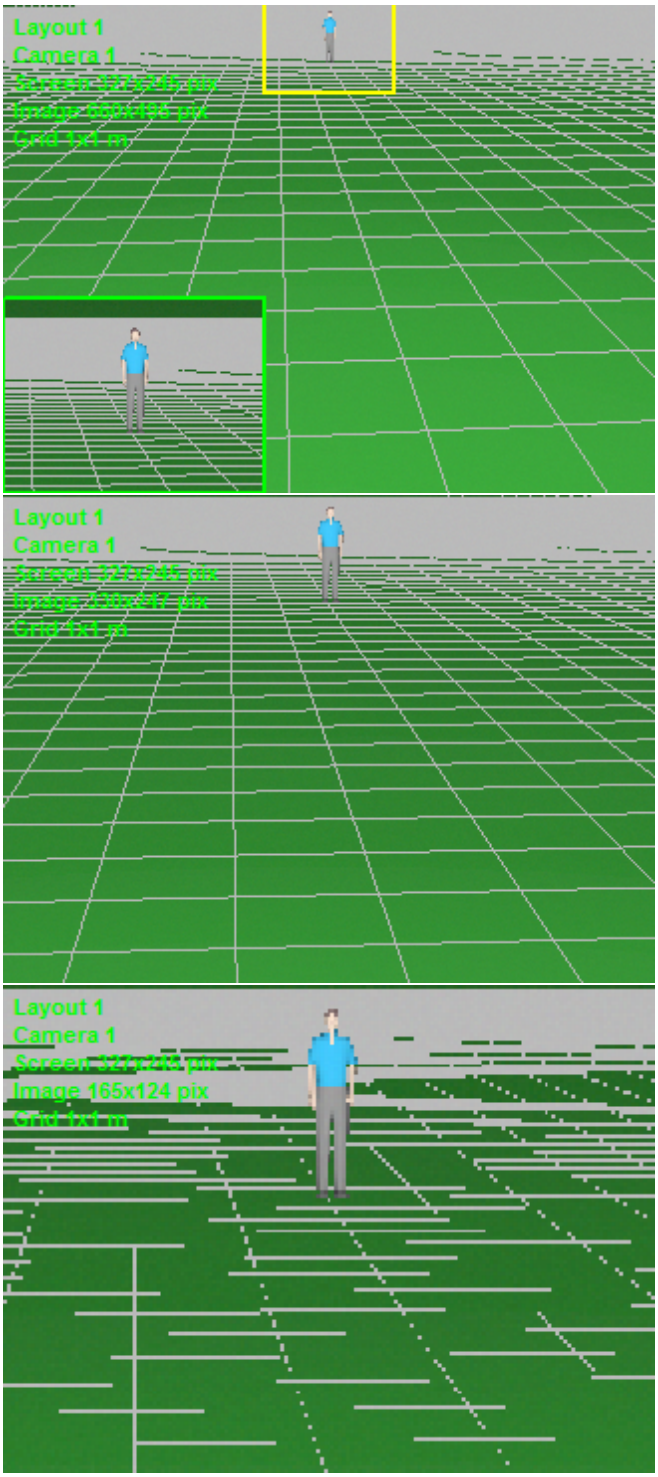
Considering the projection can be said, for example, that at a distance of **28 meters** from the camera at a height of (2 + 0.5) / 2 = 1.25m the yellow region ends, and hence the pixel density, according to the selected pattern, equals 39 pixels per object of 1,64m height or 39 / 1.64 = **24 pixels/meter**.

8. Open the 3D World 187 window. In the window we can see the distribution of spatial resolution in the form of coverage on the surrounding objects.
Using the navigation in the 3D space 343, we can see spatial resolution at any point on the surfaces around the camera 348, as well as we can detect invisible areas shaded by other objects.



9. Open the 3D Video 187 window. By directing the camera on regions of interest on the scene, we can see with what resolution these regions will be displayed by our camera.

10. Place 3D model 202 of a man on the far border of yellow region, that is, where the pixel density is 24 pixels / meter. And direct the camera on the 3D model.
Let's try to change the lens focal length 294 and make sure that only the size of the field of view is changed. Resolution of the image will remain constant.



Pan, tilt and rotation of the camera around its own axis, made in the usual way does not affect the position of the panoramic camera. By rotation the camera in the usual way, you can view images from the panoramic camera in different directions in the 3D Video 357. In this case, the view area will be limited at 180 degrees from the main optical axis of the lens. Beyond this limit the image is cut

You can change the **Lens focal length**, thereby changing the field of view size, but the image resolution in the 3D Video will always be maintained equal to the calculated resolution of the

panoramic camera.
If the calculated resolution is worse, the resolution of the **3D Video** will be artificially reduced. If the calculated resolution is better, then the PiP 391 mode will be launched in the **3D Video**.
The **Image** line in the Titles 365 displays a virtual number of pixels for correct simulation of the resolution.

Distortion of a panoramic camera images in the **3D Video** is not modeled.
The simulated resolution is exact only at the center of the frame. Towards the edges of the frame the actual resolution is slightly worse than simulated, but this error is negligible. The smaller the view angle, the more accuracy of simulating resolution on the edges of the frame.
For a more realistic model of the image, turn on modeling of compression 383 and smoothing 383, or set the actual resolution of the lens 341 (for accurate simulation the lens resolution you also need to specify the correct size of the image sensor 293).

See also: Panoramic 312

10.37 Example 37 Work with background in AutoCAD formats

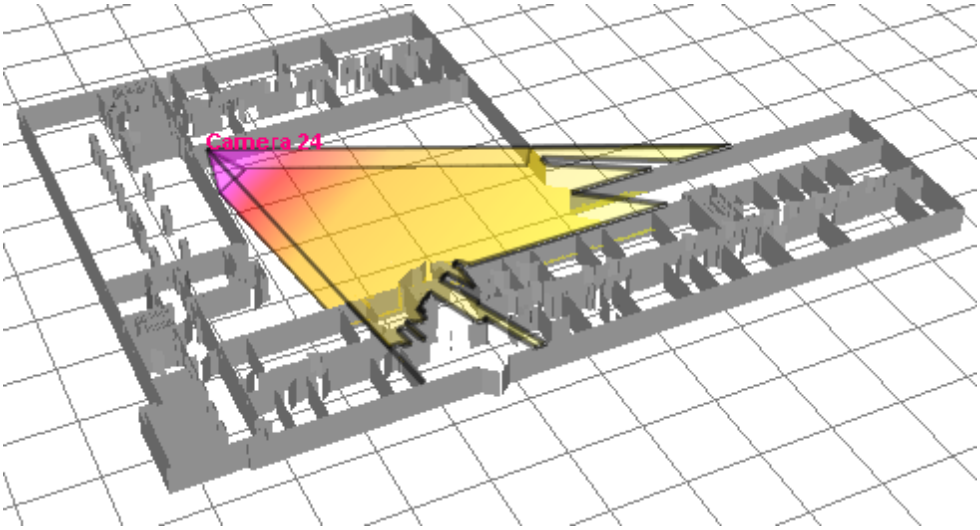
Normal sequence of actions at work in VideoCAD is:

1. Loading a background
2. Placing cameras, constructions, 3D models on the baclground.
3. Printing or exporting result of the work.

See more: Choice of cameras' quantity and location on the original layout 533

When the background is in AutoCAD format (DXF or DWG), the additional possibilities are offered:

- Adjusting visibility of layers of the background, chosing layout, hiding texts .
- Import constructions 224 from a 2D background in AutoCAD formats to 3D VideoCAD constructions automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions.
- Adding cameras and constructions of VideoCAD to the background in AutoCAD format on additional layers and then save the background to a file to work with it in AutoCAD.



Problem

There is a floor plan in DXF format. We need to place cameras on it and save the file with the cameras and their view area projections in the same format - DXF.

Order of work

1. Loading, scaling and adjusting visibulity of layers of the background

Loading and scaling the background is performed by the same way as in the previous examples 527 :

1.1 Choose Main menu**>**Load background>In horizontal projection 222.

1.2 In the appeared dialog choose background file in **dxf or dwg** format then click **Open**.

1.3 In the appeared dialog **Adjust background** 223 click **Ruler**.

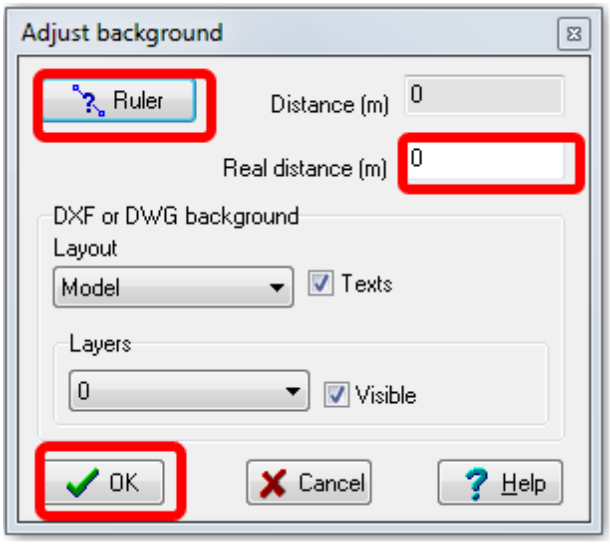
1.4 Specify by clicking **2 points on the background image**, the distance between which is known to you (e.g., the length of a building, a wall, etc.). In the **Distance** box the measured distance at the current scale will appear.

1.5 Enter the known distance into the **Real distance** box.

1.3 If the loaded background is in DXF or DWG format, the dialog includes tools to select a layout and to control visibility of layers of the background, as well as a checkbox to hide texts.

To enable/disable layers: choose layers name in the **Layers** list, then mark or clear the **Visible** checkbox.

1.7 Click **OK** in the Adjust background dialog.



2. Import of 2D constructions from the background to 3D constructions of VideoCAD

It is convenient to import 2D constructions from a background in AutoCAD formats to VideoCAD 3D constructions 193 automatically. Use of this tool allows to reduce efforts of outlining background to convert it to 3D constructions. Specially prepared background file is not required, but if a background is pre-prepared in AutoCAD, then the efficiency of import will be higher.

Order of work:

2.1 Load 222 and adjust (scale) 223 the background, show it on the screen.

2.2 Choose Main menu>Drawing>Import DXF/DWG background

2.3 In the appeared box adjust the **Filter of constructions**, in order to make visible only constructions you want to import. You can filter constructions by layout, layer, line type, color, line weight, name.

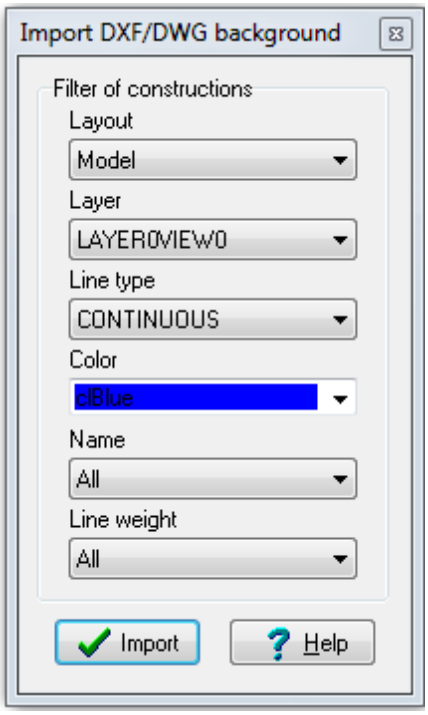
2.4 Make **active** a layer 276 of VideoCAD, to which you want to import.

2.5 On the Toolbar 169 choose a type of VideoCAD construction to which you want to import filtered constructions from the background. You can import to Line segment 248, Polyline 249, Inclined rectangle 250, Double line 197, Wall 198, Aperture in wall 199.

While importing to the Aperture in wall 199, you can cut gaps in existing walls. While importing to the Inclined rectangle 250, you can make it semitransparent.

2.6 On the Current construction parameter panel 282 set parameters of the chosen VideoCAD construction (line type 280, Heights, Thickness of walls etc.).

2.7 Click **Import**. The result will be the same, as if you have outlined selected constructions manually.



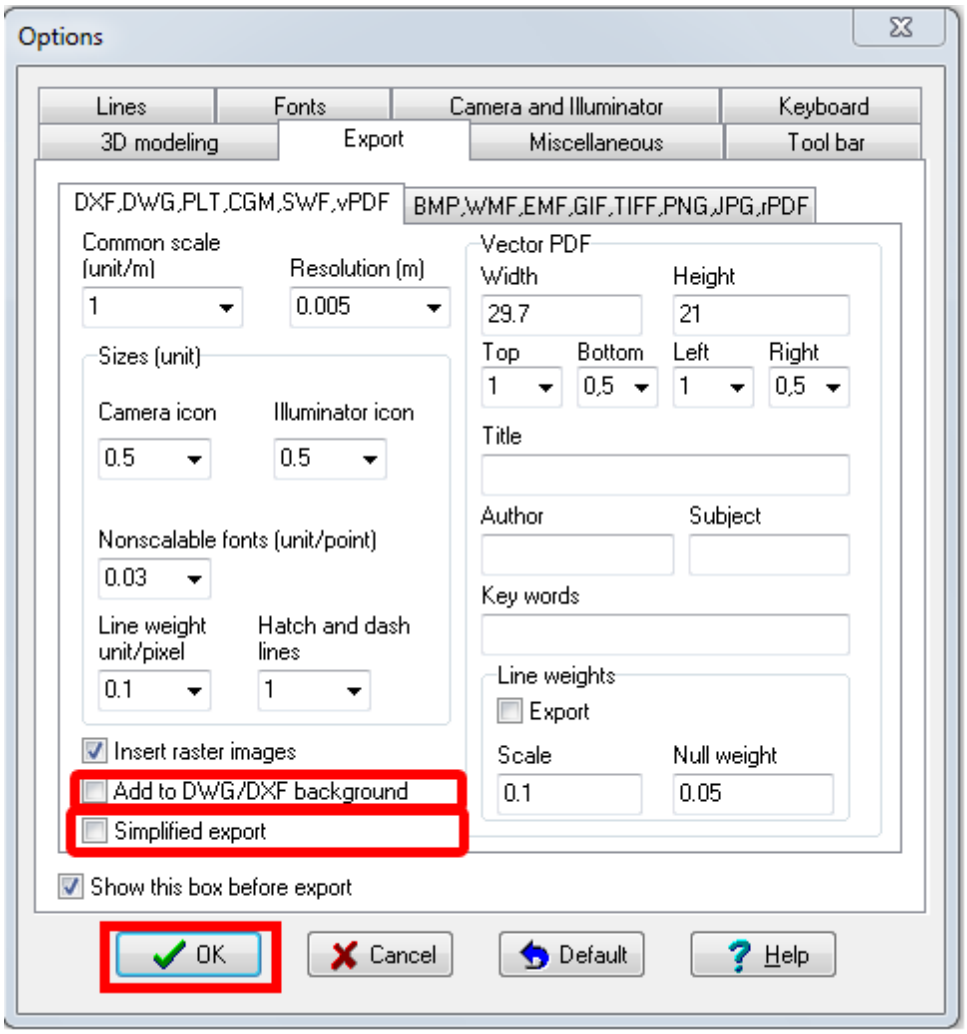
Imported constructions are usual VideoCAD constructions, you can edit them.
*You can repeat steps **3..7 many times**, to import different constructions from the background to different construction types of VideoCAD, on different heights, to different layers, by different colors etc.*
*Not all types of background constructions can be imported. In VideoCAD8 you can import **lines** and **polylines** on the layout or in blocks.*

3. Placing cameras

Place cameras on the background by the same way as in the previous examples 527. If lines on the background was transformed to VideoCAD's constructions, you can use shadows 178. You can see your project in 2D in the Graphics window 161 and in 3D in the 3D World 342.

See previous examples 527.

4. Adding cameras and constructions of VideoCAD to the background file



4.1 Move and scale working layout so that the background with cameras will be fully visible on the screen and activate 166 one of the visible on screen cameras.
4.2 Make invisible the layers 276 which you do not want to export.
4.3 Go to Main Menu> Drawing>Save As 219> *. dxf or Main menu> Drawing> Save As> *.dwg.
4.4 In the appeared Options box 485
4.4.1 Mark the Add to DXF/DWG background 486 to add cameras and constructions of VideoCAD to the file of the background on separate layers.
4.4.2 Clear the Simplified export 487, because of during the simplified export adding to background is not supported.
4.4.3 Adjust Sizes 486 of cameras, illuminators, non scalable fonts, hatching and dash lines if necessary.

*On the **Export** tab only sizes of **non scalable** camera icons, illuminators and fonts is specified. If scaling 483 of cameras, illuminators or a font 477 is enabled, then the size of cameras, illuminators or fonts respectively will be exactly as displayed on the screen.*

4.4.4 If raster images (projections of 3D models) must be inserted into the exported file, mark the Insert raster images 486.

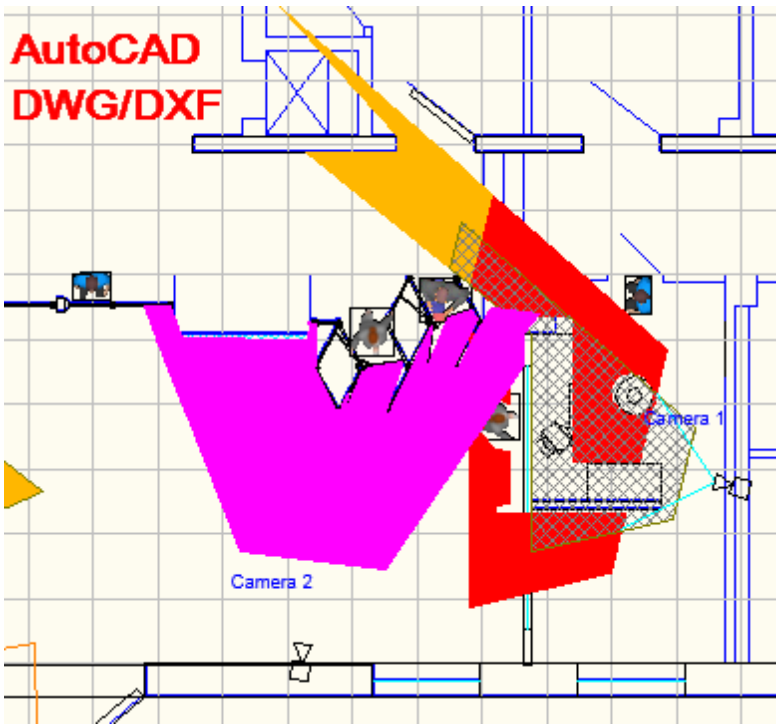
*Raster images are exported to a separate **<export file name>_img** directory in the directory of saving the exported DXF/DWG file. To the DXF/DWG file the references to the raster files are written. You must move the folder with raster images along with the DXF/DWG file.*

4.5 When finish adjusting export, click **OK**. Standard file saving dialog will appear. Choose file name and directory then click **Save**.

The resulting file will be a copy of the background supplemented by cameras and constructions placed in additional layers.

Cameras with view areas are exported as AutoCAD blocks, view area bounds are exported as polylines. In attributes of the block the most important parameters of the camera are recorded: Name, Model, Lens focal length, Height of installation, Base height, Heights of view area lower and upper bounds, View angles, Number of pixels, Spatial resolution pattern, Quality level.

Illuminators are exported as AutoCAD blocks. In attributes of the block the most important parameters of the illuminator are recorded: Lamp type, Number and power of lamps, Height of installation.
Distribution by layers 276, set in VideoCAD is saved.

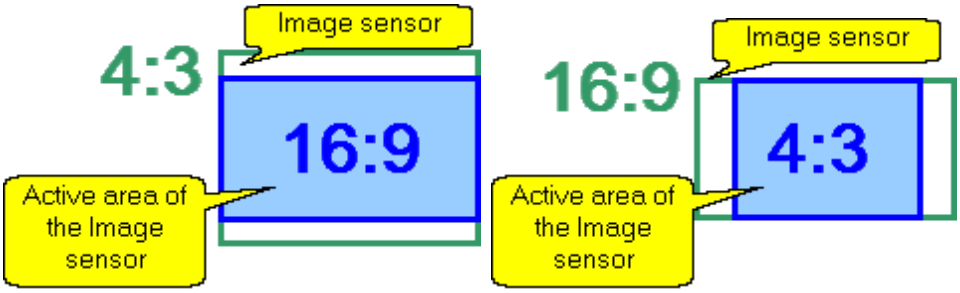


See also: Drawing>Load background 222, Drawing>Adjust background 223, Drawing>Save as 219, Drawing>Import DXF/DWG background 224, Options box>Export 485, Export 3D view areas to general 3D design software 611

10.38 Example 38 Specifying active area size of the image sensor

The Image sensor size in VideoCAD implies the size of the entire light sensitive area of the image sensor, which can form an image with the maximum number of pixels horizontally and vertically.

Active area of the image sensor in VideoCAD implies an area of the image sensor on which the image is formed in a given mode of the camera. The sizes of the active area may be less than or equal to the **image sensor size**. Active area can differ in different modes of operation of the same camera.

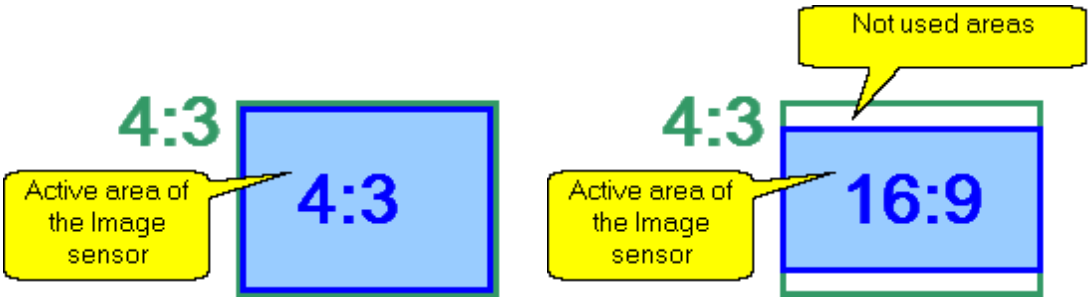


Exactly the **active area size** and **lens focal length** determines the **angles of view**, and through them influences on the results of camera modeling. Accuracy of specifying the active area size greatly affects the accuracy of modeling the camera.

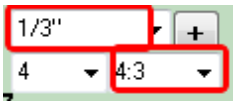
The traditional method of specifying the active area size of the image sensor

In the past, specifying the active area size was a simple task. Each camera specification includes the **image sensor format (type)** in "vidicon" inches from the standard series (**1/4 ", 1/3", 1/2 "..**) which determines the size of image sensor. Although the translation of the format to the size is not accurate, the accuracy was acceptable for most practical purposes.

Native Aspect ratio of image sensors used in CCTV cameras was **4:3**. When camera's output image had the same aspect ratio of **4:3**, the active area occupied the entire image sensor. To get image with the Aspect ratio of **16:9** only central area across the width of the image sensor was used, and areas on the top and bottom of the image sensor was not used. Reducing the number of pixels of the output image had no affect on the active area size.



In such circumstances, to uniquely specify the active area of the image sensor it was enough to choose in the Image sensor size 293 box the Image sensor format from a list of standard formats (1/4 ", 1/3", 1/2 "..) and choose the Aspect ratio of the output image in the Aspect ratio box 295 (**4:3, 16:9 ...**).

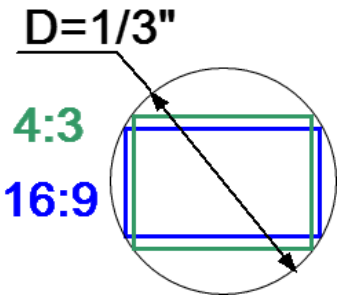


Now this way might be used for specifying active area size of the image sensor of cameras of previous generations, or in cases when accuracy of the simulation is not important.
For modern cameras, this method is not sufficiently accurate. An error may exceed 20-30%.

- Image sensors with non-standard sizes have appeared, with fractional inch formats that do not fall into the list of the standard formats (eg, 1/2.8", 1/2.9", 1/3.2", 1/1.9" ..).
- Image sensors with aspect ratio different from **4:3** have appeared.
- In specifications of some cameras the sensor size is indicated more accurately in the form of diagonal length or side lengths, in millimeters.
- Cameras can form images with different numbers of pixels and aspect ratios.
- Some cameras in some modes use active area of the image sensor which does not touch the edges of the image sensor.

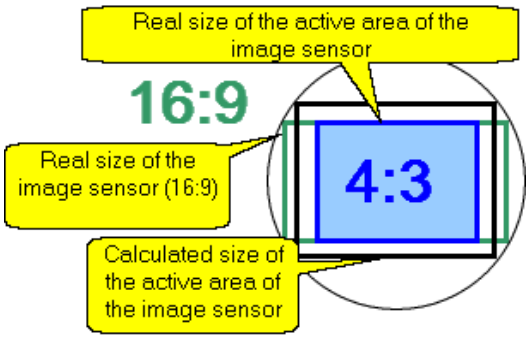
Examples of errors during specifying size of the active area of image sensor by the traditional way

Example 1: A camera has an image sensor of 1/3" with aspect ratio of 16:9, but the output image has aspect ratio of 4:3.



The Image sensor format (1/3") determines the length of diagonal (6mm). Aspect ratio of any image sensor in the traditional way is always assumed to be 4:3. Therefore, in camera simulation the active area with diagonal of 6 mm and aspect ratio of 4:3 will be used, ie 4,8 * 3,6mm.

However, the real aspect ratio of the image sensor is 16:9, so the actual size of the image sensor with diagonal of 6mm will be 2,94mm to 5,23mm.



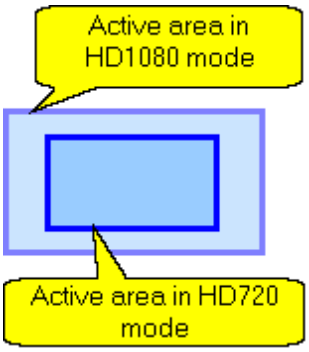
At the same time, the aspect ratio of the output image (=aspect ratio of the active area) is 4:3, so that the active area is formed by "cutting' side areas from the Image sensor of 16:9 laterally. Therefore, the actual size of the active area is 3.92 * 2,94mm.

Thus, the actual size of the active area image sensor, and hence the field of view will be **20% less** than the calculated values.

Example 2: Some cameras can produce images with reduced number of pixels using the active area in the central part of the image sensor. The active area does not touch the edges of the image sensor. The size of the active area may depend on the number of pixels of the output image.

For example, the same image sensor *SONY Exmor R IMX291LQR* has format 1/2.8"(diagonal 6.46 mm) in the full HD1080 mode and 1/4.2" (diagonal 4.31 mm) in the HD720 mode. In the HD720 mode the image sensor uses only the central part of pixels.

If you use format 1/2.8" in the HD720 mode, the actual size of the field of view will be **33% less** than calculated one.



Problem

For accurate camera modeling we must specify the sizes of the active area of the image sensor in a given mode of the camera.

Order of work

1. If **side sizes of the active area of the image sensor** in a given camera mode are known, then enter them directly.

Direct specifying side sizes of active area of the image sensor

If you know the side sizes of active area of the image sensor in a given mode of the camera, simply enter them in the Image sensor size 293 box separated by asterisk in the form **W*H**. Where W and H - width and height of the active area of the image sensor in millimeters.
For example: **4.8*3.6**
Thus the size of the active area image sensor was specified and the problem is solved.

However, in most cases, camera specifications don't give the side sizes of the active area for each camera mode separately, so the program will have to calculate them. For the calculation it is necessary to set the following parameters, are known in the most cases:

- Image sensor size (it is better to set side sizes in millimeres 639, but possible via the length of diagonal 639 (format, type) and aspect ratio of the image sensor).
- Aspect ratio of the output image 641.
- Crop 641 - a factor of decreasing active area size. The Crop is provided for cases when the active area does not touch the edges of the image sensor. In other cases Crop=1.

On the basis of this information, VideoCAD will calculate size of the active area of the image sensor, which will be used in camera modeling.

You can specify the required parameters in the Image sensor size 293 and the Aspect ratio 295 boxes in the Camera Geometry 289 box, but it is more convenient to do it in the special Sensor and Lens 308 box .
Open the Camera Geometry 289 box, and then clicking on the **Sensor and Lens** button

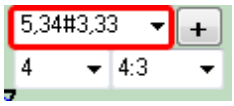
, open the Sensor and Lens 308 box.

2.1.1 If the **image sensor side sizes** in millimeters are known, then enter them directly.

Direct specifying the image sensor side sizes

If the camera specification contains the sensor side sizes (that is the maximum size of the active area), then enter them to the Image sensor size 293 box separated by hash, in the form W#H. Where W and H - width and height in millimeters of the image sensor.

For example: For the camera WV-SFV631L the sensor sizes can be found in the string: **Scanning area 5.346 mm (H) x 3.336 mm (V)**
Enter to the **Image sensor size** box **5.346#3.336**



2.1.2 When the image sensor side sizes are unknown, specify them via the **length of diagonal** (format, type) and **aspect ratio** of the image sensor.

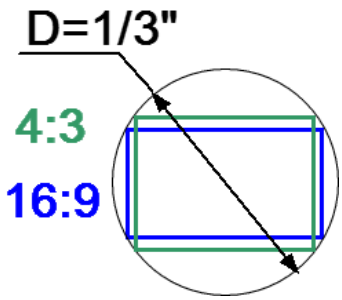
Specifying image sensor size via the length of diagonal and the aspect ratio

The length of diagonal in "vidicon" inches as a format (type) almost always exists in camera specification. For example, **1/2", 1/2.9"**. Enter the format to the Image sensor size 293 box. In the box choose format from the list or type any value, for example, **1/3.15", 1/2.75"**. If you enter a value which not found in the standard list, the Image sensor size box turns yellow and VideoCAD will calculate diagonal from the format.

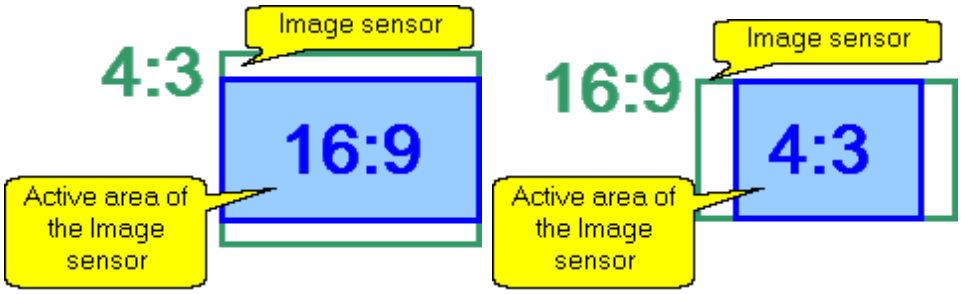
If a specifications give diagonal length in millimeters, it is preferable to use it. The value in millimeters is usually more accurate.The diagonal length in millimeters must be typed with the letter **d**, for example **d6.0** - the length of diagonal is 6mm.

For example: For the camera WV-SFV631L the image sensor format can be found in the line: ***Image Sensor Approx. 1/3 type;***
In the specification of the image sensor SONY Exmor R IMX291LQR the length of diagonal line can be obtained from the line: ***Diagonal 6.46 mm (Type 1/2.8)***

To set the size of image sensor through the format or length of diagonal you must also specify the **aspect ratio of the image sensor**, since Image sensors with the same diagonal, but different aspect ratios will have different sizes.



*One should distinguish between the **aspect ratio of the image sensor** and the aspect ratio of the output image* 295.
Aspect ratio of the output image is the ratio of sides of the image produced by the camera in the given mode. It equals to the ratio of sides of the active area of image sensor in the given mode. The aspect ratio of the output image can be different from the aspect ratio of image sensor. A camera with the same image sensor in different modes can produce images with different aspect ratios.

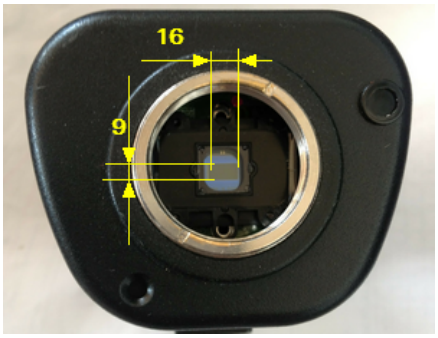


You can learn the aspect ratio of image sensor by several ways:

1. From the camera specification.

For example: In the specification of the camera WV-SFV631L sensor sizes can be found from the string: **Scanning area 5.346 mm (H) x 3.336 mm (V)**
Aspect ratio of the image sensor: **5.346 / 3.336 = 1.60 = 16:10**

2. You can learn the aspect ratio of the image sensor visually, if you remove the camera lens. To determine the aspect ratio of the image sensor, photograph it and calculate the ratio of the number of pixels in the image of the image sensor vertically and horizontally.



3. It is possible to calculate a ratio of the maximum number of horizontal pixels to the maximum number of vertical pixels in all possible modes of the camera.

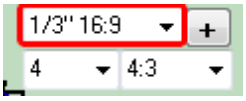
For example, a camera can produce images with the following number of pixels:
***1920** x 1080, 1280 x 720, 640 x 360, 320 x 180, 160 x 90*

*1600 x **1200**, 1280 x 960, 800 x 600, 640 x 480, 400 x 300, 320 x 240, 160 x120*

*The maximum number of horizontal pixels - **1920**, the maximum number of vertical pixels - **1200**. Expected **aspect ratio of the image sensor** 1920/1200=1,6=**16:10***

Enter the obtained values of the **diagonal (format)** and the **aspect ratio of the image sensor** to the Image sensor size 293 box in the Camera Geometry 289 separated by space character. If the aspect ratio of the image sensor is **4:3**, it can be omitted.
For example:

1/3"
1/3" 16:9
d6.0 16:9



Or enter the **diagonal (format)** and the **aspect ratio of the image sensor** separately to the **Image sensor>Size** and **Image sensor>Aspect ratio** in the Sensor and Lens 308 box.

2.2 Then you need to specify the **aspect ratio of the output image**.

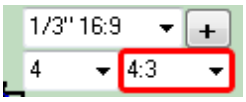
Specifying aspect ratio of the output image

The **Aspect ratio of the output image** equals to the aspect ratio of the active area of the image sensor. It equals to the ratio of number of pixels of the output image horizontally and vertically in the given camera mode. The **aspect ratio of the output image** can be different from the aspect ratio of image sensor 640. A camera with the same image sensor in different modes can produce images with different aspect ratios.

For examples for the following number of pixels:

1920 / 1080**=1.78=16:9. In the mode **1920 x 1080** the aspect ratio of the output image **= 16:9
1600 / 1200**=1.33=4:3. In the mode **1600 x 1200** the aspect ratio of the output image **= 4:3

Enter the **Aspect ratio of the output image** to the Aspect ratio 295 box in the **Camera Geometry**.



It is convenient to use the Image sensor calculator 523, which can be invoked by the **Calculator** button in the **Sensor and Lens** box.

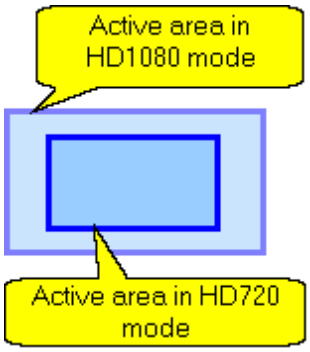
2.3 If it is possible that the active area does not touch the edges of the image sensor, you must set the **crop factor**.

Specifying the Crop factor

Crop is a factor of decreasing active area size provided for case when the active area does not

touch the edges of the image sensor. In other cases Crop=1.

For example, the same image sensor has format 1/2.8"(diagonal 6.46 mm) in the full HD1080 mode and 1/4.2" (diagonal 4.31 mm) in the HD720 mode. In the HD720 mode the image sensor uses only the central part of pixels.



When setting the crop factor one should be guided by the rules:

1. If, in a given mode, the camera uses the maximum number of pixels of at least one dimension (horizontal and (or) vertical), it is used the whole width or height of the image sensor, then the Crop factor equals one.

For example, a camera can produce images with the following number of pixels:
***1920** x 1080, 1280 x 720, 640 x 360, 320 x 180, 160 x 90*
*1600 x **1200**, 1280 x 960, 800 x 600, 640 x 480, 400 x 300, 320 x 240, 160 x120*

*The maximum number of horizontal pixels - **1920**, the maximum number of vertical pixels - **1200**.*
*The modes with maximum numbers of pixels: **1920** x 1080 and 1600 x **1200.***

2. If in the given camera mode **not the maximum number of pixels is used**, it is necessary to get know how the camera produces images with less than the maximum number of pixels. The 3 ways are possible:

1. By resizing the image with the maximum number of pixels of at least one of the direction.
2. Using only the central part of the image sensor, do not touch sides of image sensor.
3. Simultaneous use of 1 and 2 ways. The intermediate image is produced using the center area of the image sensor, and then the resulting image is resized.

In the first case, the size of the active area of the image sensor is not dependent on the number of pixels of the output image, therefore the Crop = 1.
In the second and third cases, the size of the active area of the image sensor decreases with the number of pixels of the output image.

First of all it is necessary to search the specification information whether the image sensor size (format) or angles of view depend on the number of pixels of the output image. If such information is not available, it is likely that the Crop = 1. But if there is a suspicion that the camera reduces the size of the active area, you can check the camera practically:

1. Display the image from the camera in the mode with the maximum number of pixels of the output image.
2. Switch to the mode with reduced number of pixels and note whether the size of the field of view is reduced.

If the size of the field of view is not reduced or it is reduced only in one direction, then the Crop = 1.
If the size of the field of view is reduced in both directions in proportion of reduction in the number of pixels of the output image, it is necessary to separately calculate the horizontal and vertical

ratio of the number of pixels in the given camera mode to the maximum number of pixels in appropriate direction. **Crop equals to the minimum of these ratios**.

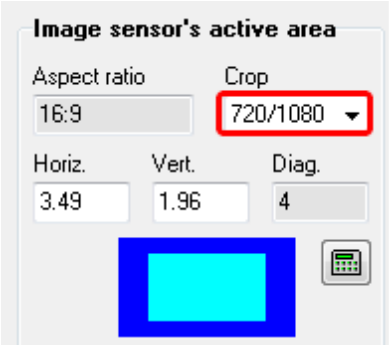
For example, if the camera has modes of 1920 x 1080 and 1280 x 720, and the image in 1280 x 720 mode is formed by a central area of the image sensor, then the ***Crop = 720/1080 = 1920/1280, or 0.67****.*

If the size of the field of view is reduced in both directions less than the reduction of the number of pixels of the output image, it is necessary to separately calculate the horizontal and vertical ratios of the field of view size in the given mode of the camera to the size the field of view in the mode with the maximum number of pixels. **Crop equals to the minimum of these relations**.

As you can see, in the most cases the Crop = 1. But on those rare occasions when the Crop <> 1 ignoring this fact can result to significant error. To calculate the crop factor it is convenient to use the Image sensor calculator 523 that can be invoked by clicking on the Calculator button in the Sensor and Lens 308 box.

Enter the Crop to the Image sensor's active area> Crop 309 box in the Sensor and Lens 308 box. You can enter a number with decimal point or ratio separated by slash /.

For example:
0.67
720/1080



You can enter the Crop to the Aspect ratio 295 box in the Camera Geometry 289 separated by space after the aspect ratio of the output image.

For example: ***16:9 0.67***

As a result of specifying all parameters, on the image in the Sensor and lens box 309 the aspect ratios, relative position and size of the active area on the image sensor will be schematically displayed.

Examples of image sensor images of real cameras:

Aspect ratio of Image sensor	4:3	16:9	4:3	16:9	16:10	16:10	16:9 (1920*1 080)
Aspect ratio of Active area of Image sensor	4:3	16:9	16:9	4:3	16:9	4:3	16:9 (1280*7

							20)
Crop	1	1	1	1	1	1	720/1080=0.67
Image							

In the Image sensor's active area 309> **Hor. Vertical Diag**. boxes the calculated sizes of the active area of the image sensor will be displayed.
In the Lens 310> **Calculated angles> Hor. Vertical. Diag**. the calculated view angles will be displayed.

The sizes of the active area may be adjusted or typed new values.

After setting all parameters for recording the result to the active camera, click **Save**.

3. After specifying all parameters it is recommended to verify correctness of the set active area size using the obtained angles of view.

Verifying correctness of the set active area size using camera view angles

Sometimes camera specifications include view angles with a lens with known focal length. Considering these angles as a result of practical measurements, it is possible to verify correctness of the set active area size by comparing the angles from specification with the angles calculated by VideoCAD in the Sensor and Lens box>Lens> Calculated angles> Hor. Vertical. Diag 310. The comparison may confirm the correctness of the obtained size of the active area of the image sensor or show an error. If an error will be detected, please carefully check all parameters you specified.

When verifying it is necessary to bear in mind the following:

- You need to know which angle is given in the specification of the camera (horizontal, vertical or diagonal) and compare it with the same calculated angle.
- You need to know in what mode of the camera the angle is obtained and simulate this particular mode.
- When the lens focal length is less than 6mm possible discrepancy between the calculated angles and angles from the specification because of lens distortion 654.
- The difference between the calculated and specification's values of angles within 5% is normal, due to measurement error, error of specifying the size of image sensor and lens focal length.

You can measure the view angles practically 622.

See also: About Lens distortion 654.

10.39 Example 39 Teaching materials

When studying VideoCAD the educational article series **The principles of CCTV design in VideoCAD** is very useful.

The principles of CCTV design in VideoCAD. Part I. Camera view area (*.pdf)
The principles of CCTV design in VideoCAD. Part 2. Person detection area, person identification area, license plate reading area. Spatial resolution."(*.pdf)
The principles of CCTV design in VideoCAD. Part 3. 3D modeling in VideoCAD"(*.pdf)
The principles of CCTV design in VideoCAD. Part 4. Illumination and camera sensitivity in CCTV"(*.pdf)
The principles of CCTV design in VideoCAD. Part 5. Video surveillance of moving objects."(*.pdf)
The principles of CCTV design in VideoCAD. Part 6. Lens distortion in CCTV design."(*.pdf)

... to be continued...

These articles contain a short theoretical material and illustrated step by step instructions on how to use VideoCAD.
You can download the articles here http://www.cctvcad.com/CCTVCAD-Download.html

There you can also find:

VideoCAD User's Guide in *. pdf format
Package to import 3D models.
Other useful programs for CCTV design.

Part XI

Recommendations on the program use

11 Recommendations on the program use

Precision in calculations

VideoCAD calculates results on the base of laws of geometrical optics, video sensor's characteristics, lighting engineering and radiometry. Mathematical precision in VideoCAD calculations is not less than ±1 %.
At the same time, parameters of real cameras and lenses are not so precise.
The difference with reality depends on the accuracy of the input data.
A big influence on the accuracy of camera modeling has accuracy of specifying image sensor sizes 636. For wide-angle lens consideration of lens distortion 654 is very important.
Nobody can guarantee that just your camera and lens have no significant inequality of focal length value with the one declared in the specification. It is advisable to test a camera with a lens practically 622 in especially crucial cases.
If not performing such a test, it is recommended to leave a reserve about 10-15 % in the results.

See also: About camera sensitivity. 651 *Measuring real view angles* 622, *Specifying active area size of the image sensor* 636, *About lens distortion* 654

Calculation of horizontal projections of person detection, identification and license plate reading areas.

Horizontal projections of person detection, identification and license-plate reading areas are calculated strictly according to the criteria numerical values specified. In case the projection sizes are not suitable, it is recommended to understand, which criteria might cause the restrictions. Probably, in your case it is possible to sacrifice some values and obtain a sufficient projection with a less capacity of detection, identification or reading.

See also: Spatial resolution 316.

Numerical values criteria of person identification and license plate reading.

Criteria themselves are very subjective and depend on a number of external factors.
For instance, the license plate reading capacity, beside lighting, depends on weather conditions, road down-grade, etc. The person identification might depend on such factors as, whether people in a place of surveillance are looking upwards or downwards, whether the familiar or unfamiliar people are being identified, whether people in a place of surveillance wear headgear, etc. The numerical values specified in the program by default are rough and are given with some reserve. It is recommended to formulate your own numerical values of criteria proceeding from your requirements, type them in VideoCAD and apply them according to actual conditions in a place of surveillance.

With the help of 3D modeling video surveillance scenes and image quality you can make own criteria values, having several examples of images from your video system.
In more detail the process of determination own criteria is viewed in the Example 6 Determining person identification criteria by a real image 542.

Eventually, you would be able to estimate the required quality level for each individual case.

Program speed and system requirements

Recommended system requirements:

- IBM compatible computer with 2 Core processor;
- 1 Gb of RAM;
- 40 Mb of free hard disk space;
- SVGA video adapter with Open GL 3D Hardware support;
- Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 10 operating system;
- Wheel Mouse;

As with other CAD software, real system requirements greatly depend on complication of your working materials.
If you use a lot of 3D models, background file of tens of megabytes, you need more productive hardware.
But you can simplify your materials and make the same work on outdated computer. Thus there can't be clear system requirements which are correct in all cases.
Program speed depends on several factors.
Redraw speed of the image depends on number and complexity of displayed 3D models and the size of opened 3D Video. VideoCAD offers powerful but resource-intensive operations for image processing, which can be enabled or disabled.
The speed is considerably decreased when modeling illumination 372, depth of field 379 exposure 377, rolling shutter 378, animation 386. The speed is decreased in a less degree when modeling interlace 376, using PiP 391, modeling lens distortion 310, using gradient 175..
Compression 383 modeling and other additional image processing reduces speed to some extend.
You can quickly enable and disable all image processing with the help of the 3D Video>Main menu>Speed>Disable image processing 369.
Using the 3D Video>Main menu>Speed>Redraw 3D image only by clicking 369 you can avoid unnecessary redrawing the 3D view.The 3D Video 357 and 3D World 342 windows opened simultaneously decelerate program speed.
It is recommended to enable the resource-intensive operations only when needed and disable them during normal operation.
VideoCAD Lite 31 and VideoCAD Starter 45 may seem less demanding of computer resources because of absence of resource-intensive tools. However, these tools when they are not needed, can be disabled in version Professional too.

See details: Errors in rendering 3D images 395

Mastering VideoCAD

To master the program it will be very useful to get acquaintance with The principles of CCTV design in VideoCAD articles. See also Examples of work with VideoCAD 527.

11.1 About camera sensitivity

Camera's ability to create images with a necessary quality in low light conditions has an important value in many of outdoor video surveillance systems.

Unfortunately, there is no unified standard of measuring sensitivity in CCTV industry. Cameras' producers give values of sensitivity measured in there own methods. The values of sensitivity given in specifications of many producers correspond to the image on which on the strong noise background it is hardly possible to distinguish only silhouettes of large high-contrast objects.
Few producers give values of the sensitivity measured according to open standards.
As a result, cameras with actually equal sensitivity, but produced by different manufactures, have values that can differ in ten times in the specifications.

However for design calculation or modeling the cameras' sensitivity should be specified unequivocally.

In VideoCAD sensitivity is defined through the **Minimum scene illumination (lux)** of a scene with reflection factor = 0.75, at which the image from the camera with mounted lens with **a known aperture (F number)** has known **signal/noise ratio (dB)** and **video signal amplitude (IRE).**
The scene is lit by a tungsten halogen lamp with colour temperature Tc=3100 +-200K.

For the unequivocal description of sensitivity the following parameters should be specified:

- **Minimum illumination (lux);**
- **Lens aperture (F);**
- **Signal/noise ratio (dB);**
- **Video signal amplitude (IRE);**
- **Exposure time.**

The definition is based on standard CEA 639 ' Consumer Camcorder or Video Camera Low Light Performance'.

If precise modeling is required, it is recommended to measure 554 sensitivity of camera models in use.
The measurement results can be inserted to parameters of camera's model 419 in VideoCAD. After that to obtain the image from the camera's model in any illumination conditions it is enough to assign 185 necessary model to the active camera.
Sensitivity of cameras' models, which are available in the Table of camera models 419, have been measured in accordance with detailed procedure 551.

The method is based on standard CEA 639 ' Consumer Camcorder or Video Camera Low Light Performance '.

At comparison of measured parameters in **the Table of camera models** with data of producers it is possible to see, that the measured sensitivity of camera Pelco MC3710H-7X exact matches to the value given in the specification. Cameras by JVC have the close sensitivity.
Sensitivity of other tested cameras is **essentially lower** the values given in specifications.

Correspondence of sensitivity measuring method to the standard CEA 639 is declared also by Axis Communications Inc.

If an installation firm does not have technical conditions to measure sensitivity of cameras practically, at a choice of sensitivity value for camera models in VideoCAD it is necessary to be guided by following practical **rules for the defect-free, competently designed cameras without extended dynamic range.**

1. Sensitivity 334 of **black-white** cameras with high resolution CCD image sensors (752x582 effective pixels) **1.3" IT CCD, Sony Super HAD ™ CCD** is **0.06-0.15lx** at signal/noise 334 ratio =17dB, lens aperture 334 F1.2.

2. Sensitivity **of black-white** cameras with high resolution image sensor (752x582 effective pixels) **1.3" Sony ExView HAD** ™ CCD is **0.04lx** at signal/noise ratio =17dB, lens aperture F1.2.

3. Sensitivity of **high resolution color cameras** (752x582 effective pixels) is approximately 1lx at signal/noise ratio =17dB, lens aperture F1.2.

4. Sensitivity of cameras with **standard resolution** CCD image sensor (500x582 effective pixels) is better than ones with high resolution CCD image sensors (752x582 effective pixels) approximately **by 15-20 %**.

5. Sensitivity of **day/night cameras (removable IR filter)** in black-white mode is approximately twice worse than the sensitivity of black-white cameras with the same image sensors.

6. Sensitivity of **easy day/night cameras (permanent IR filter)** in black-white mode is approximately 1.5 times better than the sensitivity of color cameras with the same image sensors.

7. To obtain camera sensitivity with a **lens with aperture different from F1.2** it is necessary to multiply sensitivity with aperture F1.2 by the ratio of squared lens aperture by 1.44 (1.2 squared).

*For example, a camera with 1.3" Sony ExView HAD ™ CCD and a lens with aperture F2.0 (mini, M12) has sensitivity equal 0.04 * (2*2/1.44) =0.11lx. Where 0.04 lx is sensitivity at the aperture F1.2.*

8. Real sensitivity of cameras **with extended dynamic range** and **complex digital image processing** can be insufficient despite good values in the specification. It is recommended to test 551 such cameras before usage in a project. During testing pay attention to possible strong reducing of resolution in low light conditions.

Sometimes the high sensitivity is attained due to reducing of noises as a result of digital image processing. Measuring shows good signal/noise ratio up to low illumination. However at the same time the resolution decreases substantially.

VideoCAD can take into account the exposure time 335 at modeling sensitivity to simulate motion blur 585, depending on the exposure time and speed of objects 203.

Reducing of resolution and increasing exposure time at decreasing illumination are typical for cameras with night vision modes and some IP cameras as well.
Use Sharpness 383 parameter for modeling of resolution reducing in VideoCAD.

9. IRE 334 value at sensitivity measuring for different cameras can differ substantially and equal from 20-50 for normal AGC gain (Normal AGC, Standard AGC) up to 90-100 for the high AGC 337 gain (HI AGC, Super AGC).

Use Max. AGC 337 gain parameter for modeling boosted contrast without signal/noise ratio enhancement.

About IP camera sensitivity

Recall that the maximum exposure time of analog cameras is **20ms for PAL** and **16.5 ms for NTSC**.
Exactly for this exposure time the sensitivity values of simple analog cameras are shown above.
IP cameras in low light conditions automatically use the exposure time **greater in several times**.
This is not noticeable on static scenes, but leads to blurring of moving objects.
Sensitivity of **IP cameras** is strongly dependent on the size of pixels on the image sensor. The smaller the size of each pixel (smaller size of the image sensor or more the number of pixels on the same size of the image sensor) - the worse the sensitivity.
Correctly measuring sensitivity of modern IP cameras is not an easy task. When light is decreased, IP camera automatically turns on the noise reduction, merges neighboring pixels, reduces frame

rate, multiplies exposure time, disables color. The black level rises and the noise is lost in black together with dark image details. Meanwhile turning off this automation is impossible in many cases. When the noise reduction system can not be disabled, the signal/noise ratio becomes not good criterion of image quality.

In our tests, we got from an IP camera with 1/4" CMOS image sensor with 640 * 480 pixels and F2.0 lens, an image with SNR 17dB at 1,3 lux scene illumination, when the camera sets the exposure time = 40ms. Increasing exposure time up to 160ms increases sensitivity to 0.3 lux.

2-megapixel IP camera with 1/3" CMOS sensor with resolution 1600 * 1200 pix and F1.2 lens, gave out an image with SNR 17dB at illumination of 1.0 lux, with exposure time of 80ms. Increasing the exposure time up to 240ms increases the sensitivity to 0,3 lux.

The exposure time was checked by our own technique 593.

11.2 About lens distortion

Studying the manufacturers specifications of lenses and cameras we can see that in many cases the actual view angles obtained by measurement and listed in the specification do not coincide with the calculated view angles for an ideal lens, based on the lens focal length 294 and the size of the image sensor 293.
For example, the specification of the lens **T2314FICS-3** (Computar) contains the following values:

Model No.		T2314FICS-3		Effective Lens Aperture	Front	Ø22.8mm	
Focal Length		2.3mm			Rear	Ø7.0mm	
Max. Aperture Ratio		1:1.4		Back Focal Length		7.1mm	
Max. Image Format		4.8mm x 3.6mm(Ø6mm)		Flange Back Length		12.5mm	
Operation Range	Iris	F1.4 - F16C		Mount		CS-Mount	
	Focus	0.2m - Inf.		Filter Size		—	
Control	Iris	Manual		Dimensions		Ø34.5mm x 35.4mm	
	Focus	Manual		Weight		43g	
Object Dimension at M.O.D.		60.8cm x 37.5cm					
Angle of View	D	1/3 type	137.9°	1/4 type	106.7°		
	H		113.3°		86.3°		
	V		86.3°		65.3°		
Operating Temperature		−20°C - +50°C					

With lens focal length of 2.3 mm and the size of the image sensor **1/3"** real horizontal view angle is **113.30 deg**., and the vertical view angle is **86.30 deg**. But calculation gives lower values - **92.40 deg** . and **76.10 deg**.
The form of the camera view area with this lens differs from the standard pyramid and therefore can not be accurately calculated by lens calculators or modeled by CCTV design programs of previous generation.
The cause of warping the view area is the **Lens distortion**. The Lens distortion arises from the fact that the optical magnification of a real lens is not constant over the entire field of view. Optical magnification varies depending on the distance from the center to the edges of the field of view.

Depending on whether the optical magnification of a lens is decreased or increased with distance from the center of the field of view, the **barrel distortion** and the **pincushion distortion** is distinguished.

*The titles **barrel** and **pincushion** are associated with the distortion of the **image**. But the shape of the field of view varies oppositely the title. Thus, with the **barrel distortion** the image resembles a barrel, and the shape of the field of view resembles a pillow. With the **pincushion distortion**, the image resembles a pillow, and the shape of the field of view - a barrel.*

Lens distortion leads to warping:

- shape of view area and field of view;
- image from the camera;
- distribution of the spatial resolution 316.

*The **Lens distortion** should not be confused with the **Perspective distortion** (Fig. 7 656), which is natural on all images obtained with wide-angle lenses. **Perspective distortion** does not change pyramidal shape of the view area, rectangular shape of field of view and distribution of the spatial resolution 316.*

Barrel distortion

If by moving away from the center of the field of view the **optical magnification** decreases, then

objects at the edges of the field of view seem compressed, and the **spatial resolution** decreases from the center to the edges, and the field of view is stretched to the edges. **Real angles** in this case are more than the **calculated angles**. This is called **Barrel distortion**. The Barrel distortion is most common and usual for wide angle lenses.

In particular, the lens **T2314FICS-3** has just the Barrel distortion. Let's consider a model of image from this lens, the model of field of view, view area projections built with and without simulating distortion. Position of the camera in both cases is constant.

*Note the warping of distribution of the **spatial resolution** (Fig. 4 655). Barrel distortion increases the field of view, but reduces the spatial resolution, the farther from the center of the field of view, the stronger.*

Without lens distortion simulation

With simulation of barrel distortion

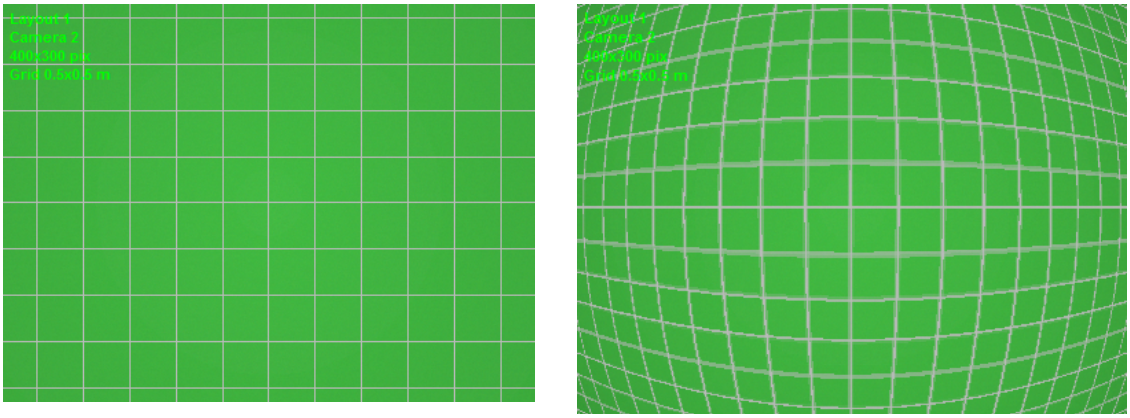


Fig. 1,2. View of a cross-hatch. With barrel distortion the cross-hatch resembles a barrel.

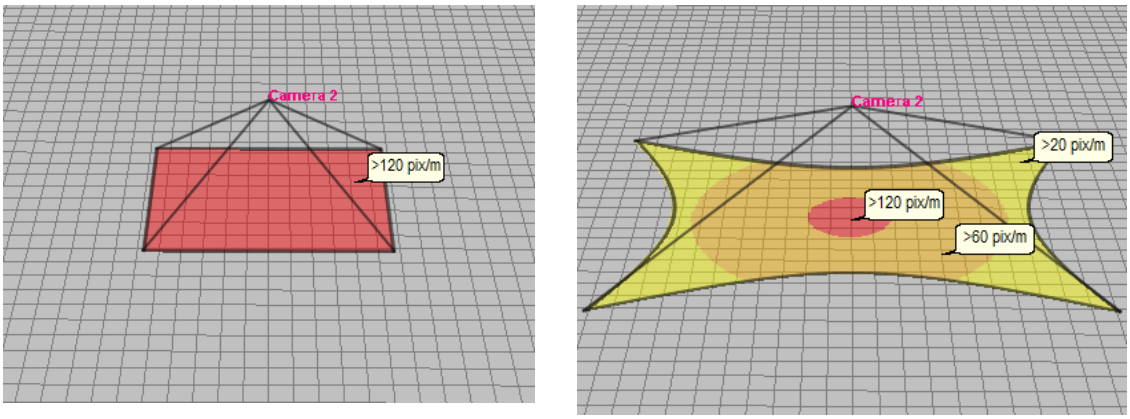


Fig. 3,4. Field of view. With barrel distortion the cross-hatch resembles a ***pillow***. The **spatial resolution** decreases from the center to the edges.

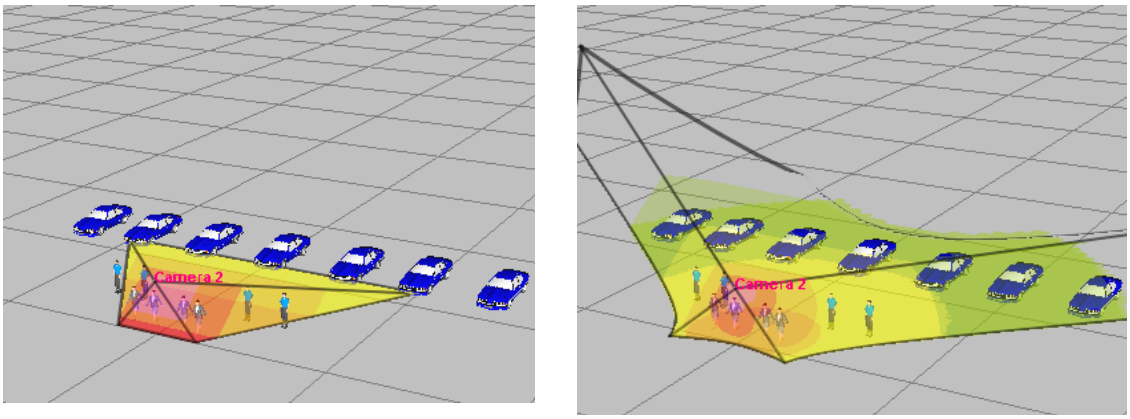


Fig. 5,6. View are and scene model.

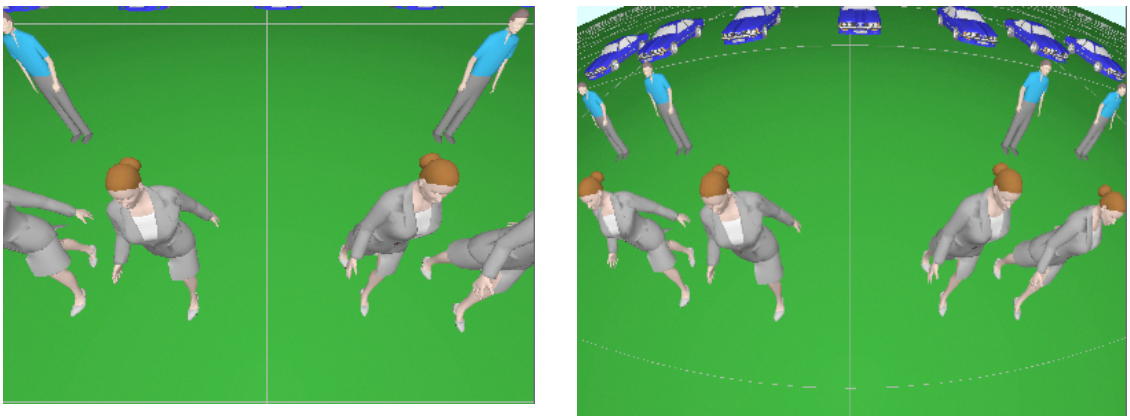


Fig. 7,8. Camera image model. The slope of the men in the upper corners (**Fig. 7**) is caused not by the lens distortion but by the **perspective distortion**, which is natural for any wide-angle lens.

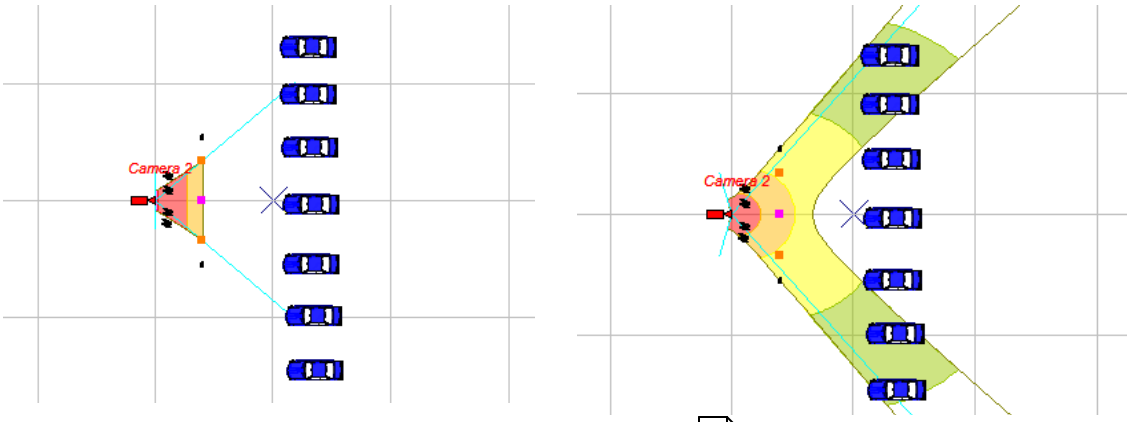


Fig. 9,10. View area projection. *View area projection bounds* [173] *in the **Projection** mode.*

Pincushion distortion

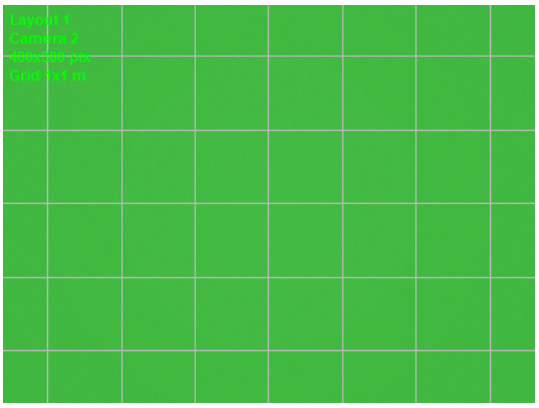
If by moving away from the center of the field of view the **optical magnification** increases, then objects at the edges of the field of view seem stretched, and the **spatial resolution** increases from the center to the edges, and the field of view is compressed to the edges. **Real angles** in this

case are less than the **calculated angles**. This is called **Pincushion distortion**. The **Pincushion distortion** occurs seldom with teleobjective lenses.

Let's consider models built with and without simulating distortion. The models are given to illustrate the pincushion distortion, they are not associated with a certain model of lens. Position of the camera in both cases is constant.

*Note the warping of distribution of the **spatial resolution*** (Fig.14 657). ***Pincushion distortion** decreases the field of view, but increases the spatial resolution, the farther from the center of the field of view, the stronger.*

Without lens distortion simulation



With simulation of pincushion distortion

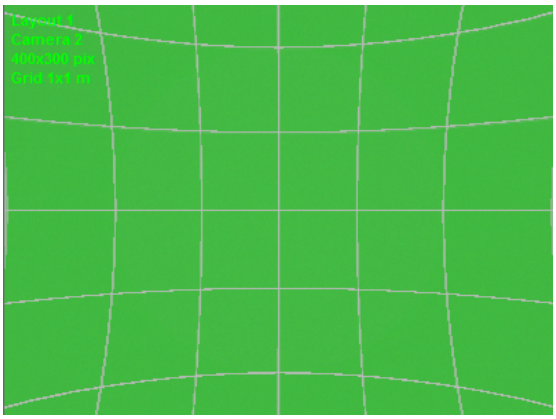
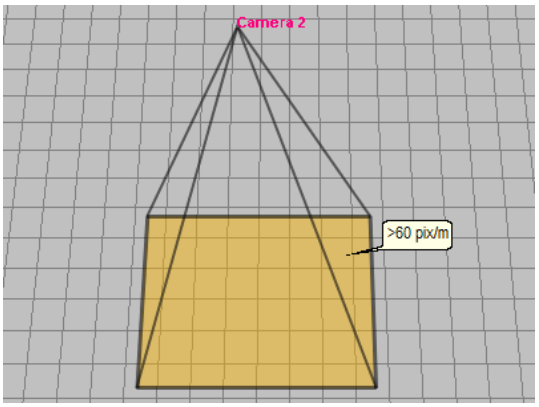


Fig. 11,12. View of a cross-hatch. With Pincushion distortion the cross-hatch resembles a **pillow**
.



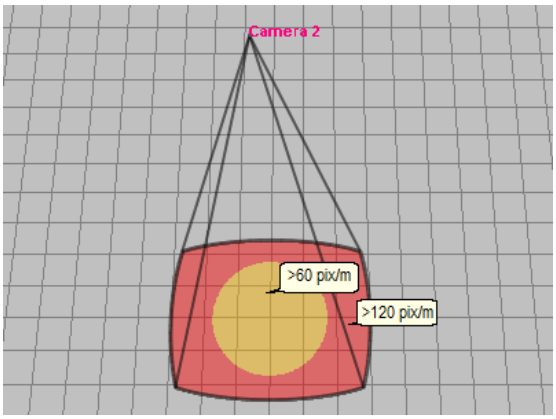
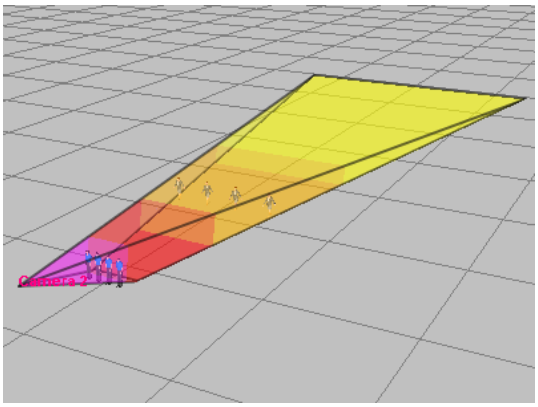


Fig. 13,14. Field of view. With Pincushion distortion the cross-hatch resembles a **barrel**. The **spatial resolution** increases from the center to the edges.



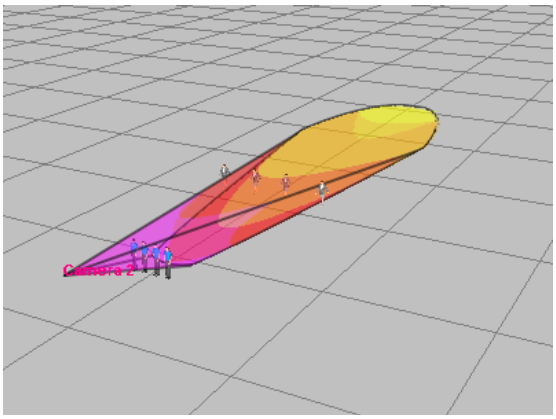
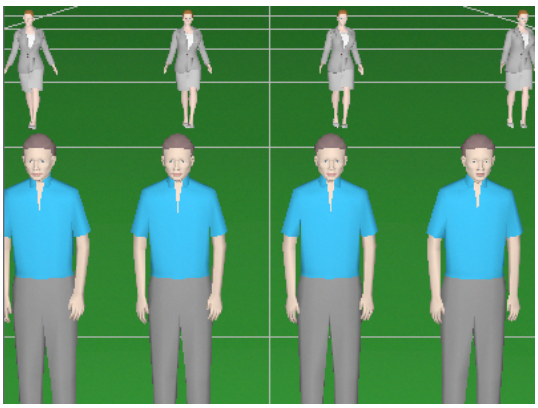


Fig. 15,16. View are and scene model.



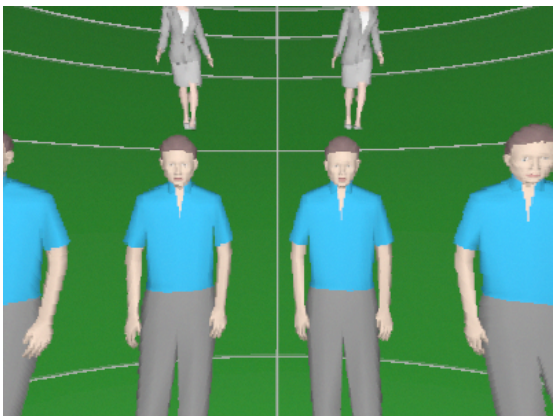
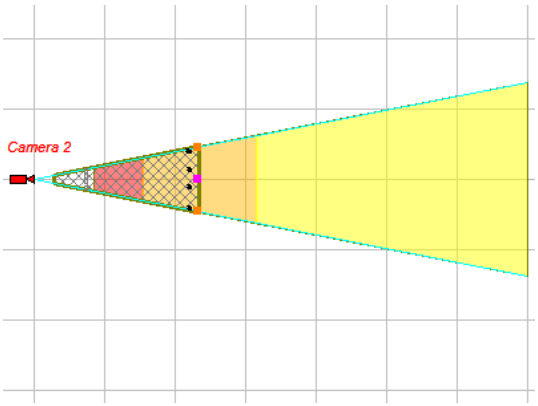


Fig. 17,18. Camera image model. As the lens is teleobjective (narrow angles), the perspective distortion is not unnoticeable (compare with Fig. 7 656).



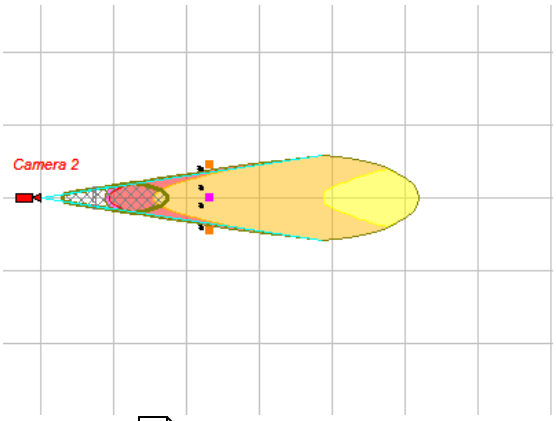


Fig. 19,20. View area projection. *View area projection bounds* 173 *in the **2 levels** mode.*

Modeling lens distortion in VideoCAD

Despite the complexity of internal calculations, simulation of lens distortion in VideoCAD is very easy. The lens distortion in VideoCAD is defined by a combination of **calculated view angle** and **real view angle**. The calculated view angles are calculated in the program from the lens focal length 294 and format 293 or the actual size 308 of the image sensor.

The real angles are usually given in the specifications of cameras and lenses. If the angles are

unknown, it is possible to get them by practical measuring 622.

To determine the lens distortion it is enough to set one of three real angles: horizontal, vertical or diagonal. It is preferable to set the horizontal angle. Missed real angles will be calculated by VideoCAD. For maximum accuracy, you can specify 2 or all 3 the real angles.

See more: Lens distortion 310, *Modeling lens distortion* 619, *Measuring real view angles* 622
See also: Specifying active area size of the image sensor 636

Part XII

Ordering and contacting

12 Ordering and contacting

12.1 Contacting CCTVCAD Software

For the latest versions of our programs, please check our web site at
http://www.cctvcad.com

Any questions can be e-mailed to us at info@cctvcad.com
Technical questions can be e-mailed to us at support@cctvcad.com

We try to answer e-mail as quickly as possible.

You may also use our on-line form on our website http://www.cctvcad.com/CCTVCAD-Support.html.

Telephone support is available only by request. If you need telephone support, or just want to talk to a live person, please contact us at one of the above addresses for the current hours of availability, as they change often.

If you have ideas, suggestions, comments, criticisms, or questions, we would love to hear from you about our programs!

12.2 Order and registration

For the latest order options, visit the CCTVCAD Software web site at:

http://www.cctvcad.com/CCTVCAD-Order.html

For details of the registration please see VideoCAD registration procedure

Part XIII

USB dongle

13 USB dongle

Dongle is a device used to protect applications and data against unauthorized usage and replication. The dongle is attached to the computer's USB port.

- **VideoCAD 8 Professional** can work **only with USB Senselock dongle**.
- **VideoCAD 8 Lite** 31, **VideoCAD 7 Starter** 45 are registered only by personal registration code, without dongle, without hardware locking.

Dongle models 670
Operating instructions for USB dongles 671

13.1 Dongle models

When ordering VideoCAD you can choose USB dongle from the following models:

The models differ in embodiment only. If you did not specify dongle model at your order, we will choose model at our option.

SenseLock EL-Genii

Senselock EL-Genii is featured as a cute, tiny and fascinating gadget with fashionable color. Its size is only 17x12x4mm, and weights 2.8 - 3.5g. It is especially suited for notebook computers.

When any software with a common USB dongle is used on a notebook computer, the dongle often suffers unexpected impact or collision due to its long body, which may lead to damage on USB port. With a smart appearance and exquisite body, Senselock EL-Genii effectively avoids these situations, thus reduces the possibility of damaging the computer and secures the software running on it.

SenseLock EL-STD

SenseLock EL-STD is a complete analog of SenseLock EL-Genii, but in classic design. It is suited for desktop computers.

13.2 Operating instructions for USB dongles

Operating Instructions for USB Dongles

Dongle Operating and Storage Instructions

1. Protect the dongle from physical damage (fall, toss, vibration, etc.), exposure to high and low temperatures, aggressive environments, high voltage; all these may cause damage to the dongle.
2. Do not press too hard when connecting the dongle to the computer.
3. Do not expose the dongle (especially its connectors) to dust, dirt, damp, etc. In case dirt gets into the dongle connectors arrange for their cleaning. Use a dry cloth to clean the case and connectors. Never use organic solvents.
4. Do not disassemble the dongle. This may cause damage of the dongle's case, printed wiring elements, and consequently lead to unstable functioning or failure of the hardware.
5. In case of failure or improper functioning of the dongle, contact us.

Note: *For stable functioning of the dongle it is required to use **dongle driver**.*
A set of drivers for various operating systems is supplied together with the VideoCAD.
The driver is installed automatically during VideoCAD installation.
To install or reinstall driver manually choose All programs>VideoCAD>Dongle driver. Then choose Install driver or Uninstall driver.

Possible problems

In case of any problems with USB dongle, first of all, do the following:
1. Stop VideoCAD, if it is running.
2. Disconnect the dongle from the USB port.
3. Reinstall dongle driver.
3.1 Enter under LOCAL administrative account. No Domain account!
3.2 Choose Start>All programs>VideoCAD8>Dongle driver
3.3 In the appeared box choose **Install driver**.
4. Connect the dongle to the USB port then follow the instructions 665.

If these actions don't solve your problem, try to install VideoCAD, dongle driver and the dongle on other computer according to the instructions 665.

Possible reason of problems is connected to installed dongle emulators for other software.

Warranty

The USB dongle is a material carrier of the VideoCAD license. In case of losing the dongle the license is considered lost too.

In case of dongle failure during one year after purchasing and the dongle has no any physical damage marks, the Dongle can be exchanged free-of-charge.
In case of failure later than in one year after purchasing or the Dongle has physical damage marks, the Dongle also can be exchanged, but after payment for the new Dongle and its delivery.
In any case sending the new Dongle can be performed only after receiving the broken one.

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