

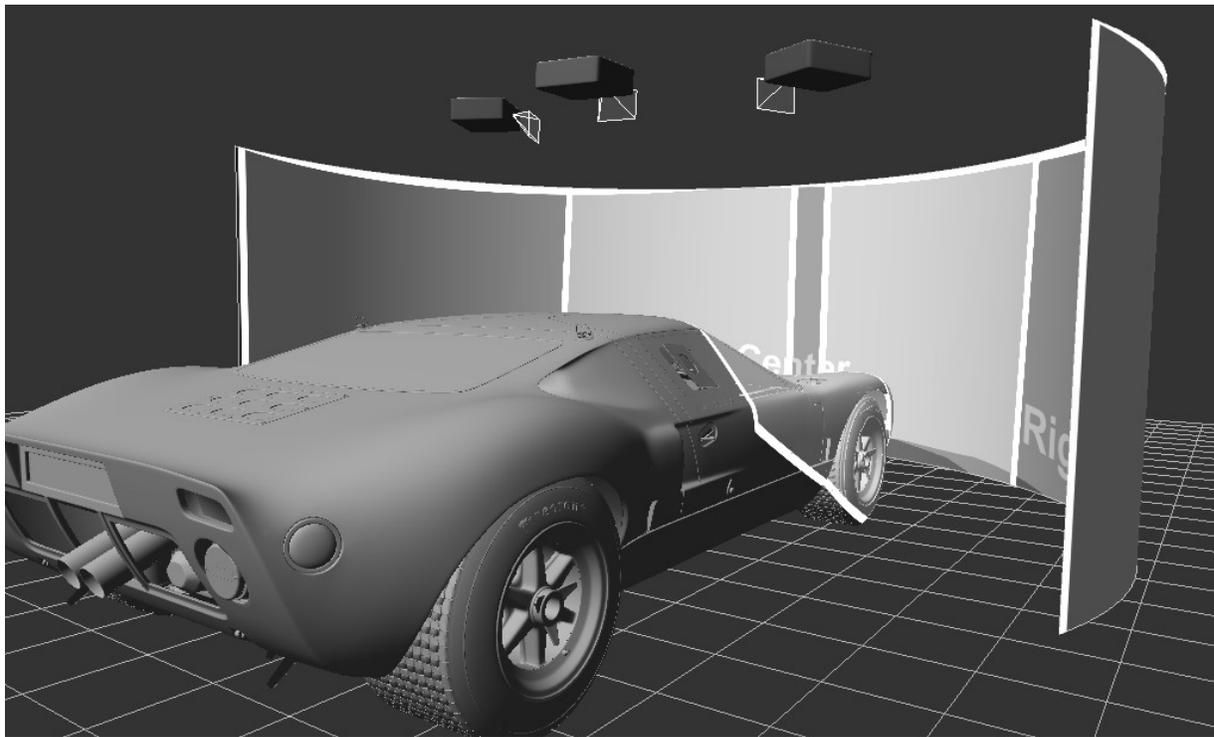
# REFERENCE MANUAL

## Pixelwix Projection Calculator

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Designing and realizing a multi-projector or projection display setups are not a simple or trivial task. You will have to ask yourself a number of questions  
The answer is dependent on many factors:

What type and size of the projection screen should I chose?

·What projectors type, resolution, throw ratio, contrast etc.

Where to put the projectors with respect to the screen for the best coverage and how big should the screen be when soft edge blending?

Will the projectors and screens fit the available space?

If there are objects between the projectors and the screen, will they shadow the screen?

The answer on those questions is not easy and cannot be simply calculated on paper. Curved projection screens also introduce image distortions that can not be simply calculated using the standard projection calculation tools based on flat projection.

Pixelwix Pixelwarp projection calculator software is an essential and must have tool for designing single or multi-projector displays on all screen and room shapes

Pixelwarp Projection calculator user interface provides an immediate 3D visual feedback of the projection environment including the screen, real-time projection image, projector physical size and throw, additional objects,environmental light, etc.

### **Features include.**

- Different types and shapes of projection screens including cylinder (single curved), dome (double curved), planar, etc.
- Load custom projection screens from 3D CAD models.
- Support for unlimited number of projectors.
- Built-in projectors database including 5000+ projectors models.
- Extend the projectors database with additional projectors models.
- Edit projectors properties: resolution, throw ratio, position, orientation, light intensity, horizontal and vertical flip, etc.
- Unlimited number of virtual cameras to view the projection from different room locations.
- Edit cameras properties: resolution, field of view, position, orientation, etc.
- Import Unlimited number of additional 3D objects that can shadow projection image.
- Load objects from CAD models.
- Edit objects sizes, positions and orientation, etc.
- Position the object freely in the scene.
- Direct visual feedback of object occlusion and drop-shadows on the screen.

## System requirements

The following is the required minimal configuration:

- PC with 2.0 Ghz or higher processor (32bit or 64 bit)
- 2 Gb or more RAM
- A moderate graphics card (NVIDIA or AMD/ATI) with support for FrameBufferObjects

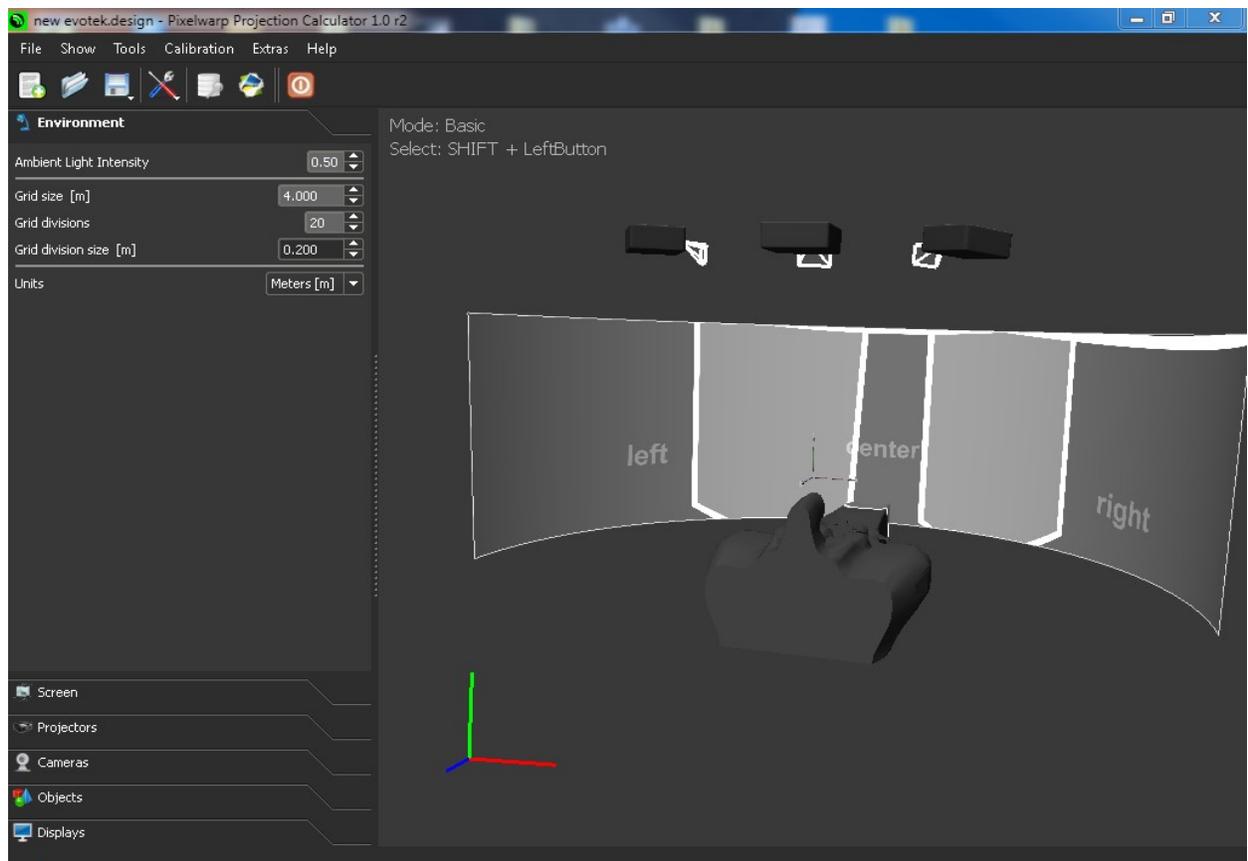
## User interface

The main screen is divided in 3 areas:

The top menu and the toolbar

The elements edit area

The central 3D view area

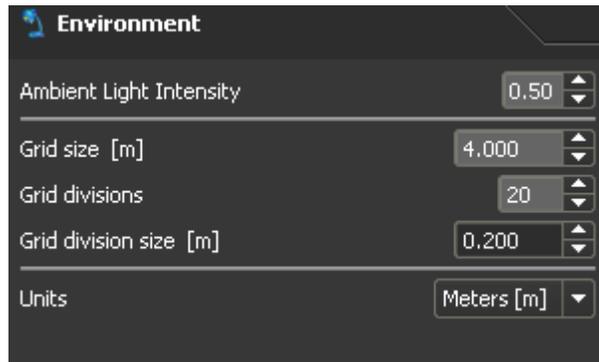


### Top menu and toolbar

The top menu and the toolbar area contain the program menu and the toolbar for quick access of the most common operations (creating a new design project, opening and saving a design project, etc).

### Elements edit area

The elements setup area contains a tabbed dialog for creating and editing the elements of the projection setup (screen, projectors, cameras, displays groups, etc) as well editing the environmental settings.



### **Environment tab**

In the Environment tab user can enter the intensity of the ambient light that casts on the projection area including the projection screen.

The ambient light can have an influence on the black/white thresholds of the camera images when cameras are used for camera-assisted calibration that will be used in future versions.

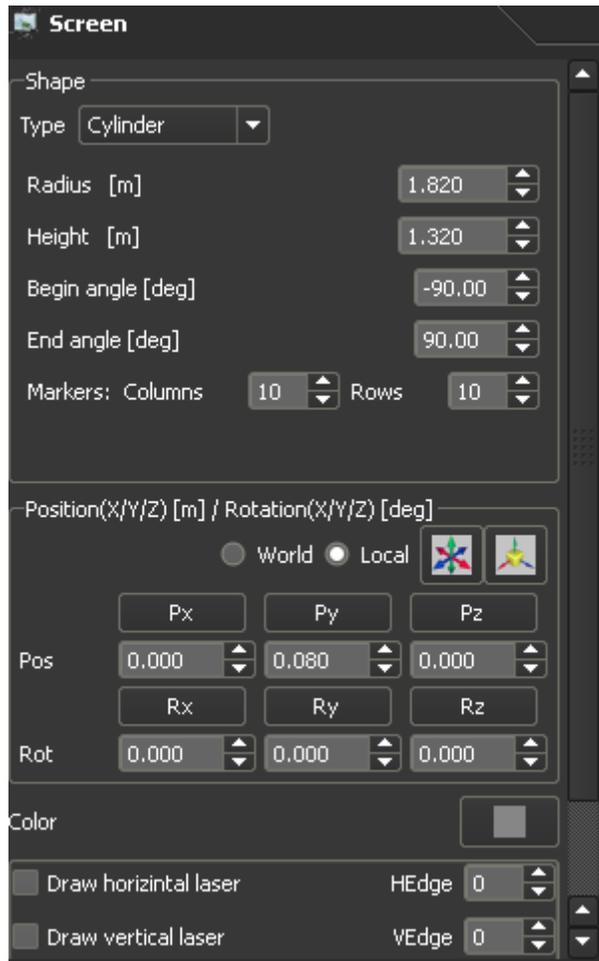
Also user can enter the size of the ground grid and the number of divisions. The size of a grid division is calculated and can be used for visual measurement reference.

In the environment tab user can also select the units for all measurements such as projectors, cameras and objects in the scene. select from metric meters and imperial feet or inches.

### **Screen tab**

In the screen tab the user can select one of the available screen shapes: cylinder, dome (partial sphere), plane(flat) or load a custom shaped screen shape from a CAD models

## Cylinder screen:



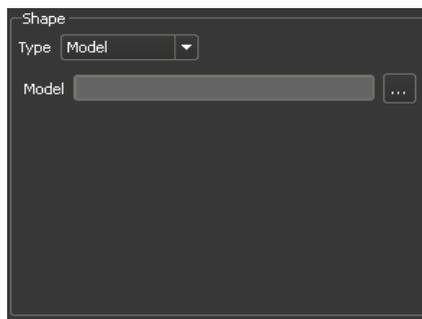
You can select screen type from “Type” pull down menu.

You can define the screen size by entering the information also a radius as “begin” and “end” angle if a cylinder shape.

The angles are expressed in degrees relative to the center of the cylinder.

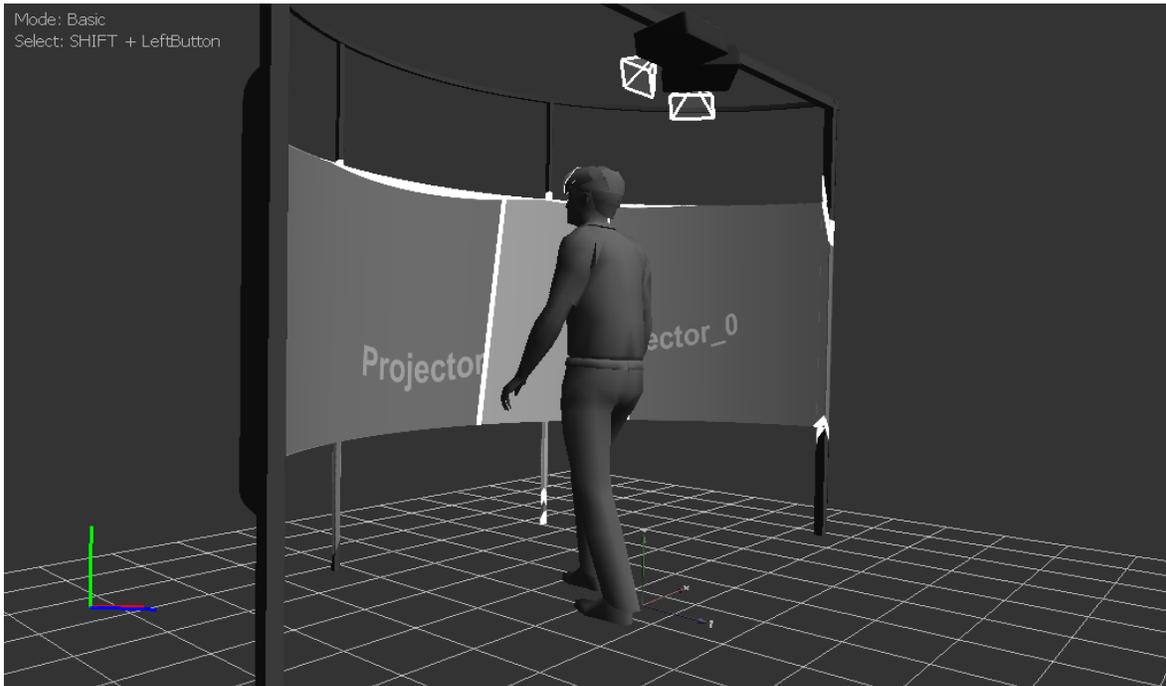
Here you can also control screen position within the virtual space as well as other useful screen perimeters.

## Custom 3D model screen:



Most screen setup can be accomplished from the standard one within the “Type” menu

However for special projection surfaces or for the ability to use say your Sketchup model  
You can import a custom projection screen from a CAD program



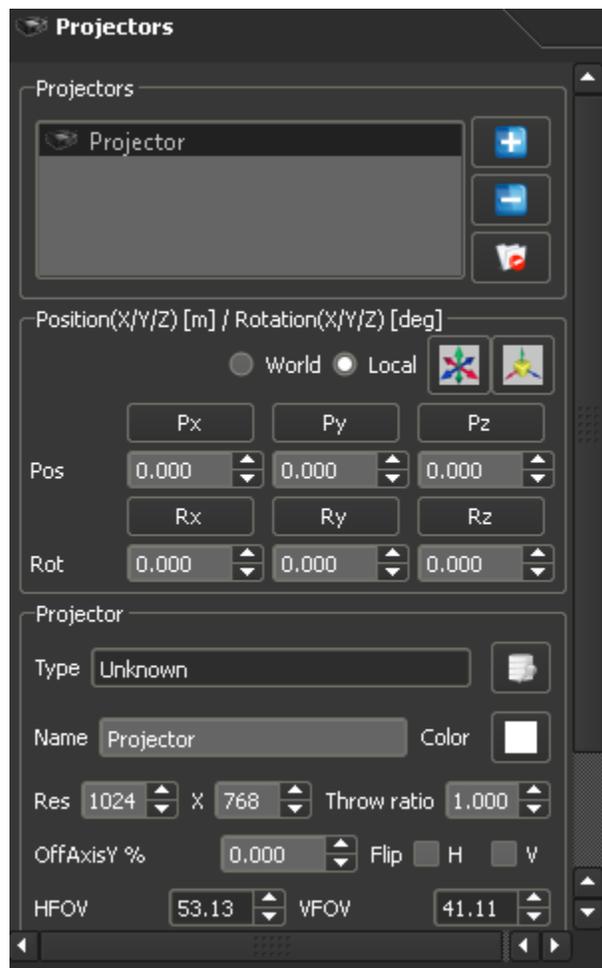
*In the image above you can see a custom frame model imported from Google sketchup with 3 virtual projectors added on the frame and a six foot guy 3D object placed to check for shadowing.*

Select Model from the “Type” menu and select the location of the cad file.  
Current import types available are.

- Collada ( .dae )
- Blender 3D ( .blend )
- 3ds Max 3DS ( .3ds )
- 3ds Max ASE ( .ase )
- Wavefront Object ( .obj )
- Industry Foundation Classes (IFC/Step) ( .ifc )
- XGL ( .xgl, .zgl )
- Stanford Polygon Library ( .ply )
- AutoCAD DXF ( .dxf )
- LightWave ( .lwo )
- LightWave Scene ( .lws )
- Modo ( .lxo )
- Stereolithography ( .stl )
- DirectX X ( .x )
- AC3D ( .ac )
- Milkshape 3D ( .ms3d )
- TrueSpace ( .cob, .scn )
- Ogre XML ( .xml )
- Irrlicht Mesh ( .irrmesh )

- Irrlicht Scene ( .irr )
- Quake I ( .mdl )
- Quake II ( .md2 )
- Quake III Mesh ( .md3 )
- Quake III Map/BSP ( .pk3 )
- Return to Castle Wolfenstein ( .mdc )
- Doom 3 ( .md5\* )
- Valve Model ( .smd,.vta )
- Starcraft II M3 ( .m3 )
- Unreal ( .3d )
- BlitzBasic 3D ( .b3d )
- Quick3D ( .q3d,.q3s )
- Neutral File Format ( .nff )
- Sense8 WorldToolKit ( .nff )
- Object File Format ( .off )
- PovRAY Raw ( .raw )
- Terragen Terrain ( .ter )
- 3D GameStudio (3DGS) ( .mdl )
- 3D GameStudio (3DGS) Terrain ( .hmp )
- Izware Nendo ( .ndo )

## Projectors tab



In the projectors tab you can add projectors to the setup or remove projectors from the setup.

For each projector the parameters of the projectors can be changed individually or for all projectors at a time.

Projectors can be freely moved and rotated using the projector Move and Rotate control boxes or by holding shift and clicking the projector with the left mouse button. Follow on screen display for more mouse controlled movements.

The top part of the projectors tab lists all projectors in the setup. Using the



button and the



button you can add and remove projectors from the project.

Using the



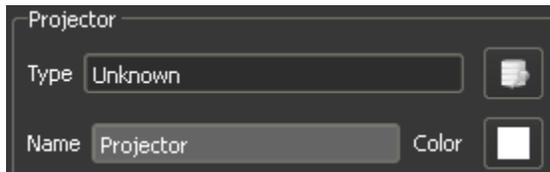
button user can remove all projectors from the project.

When adding a projector, the projector properties will be copied from the currently selected projector.

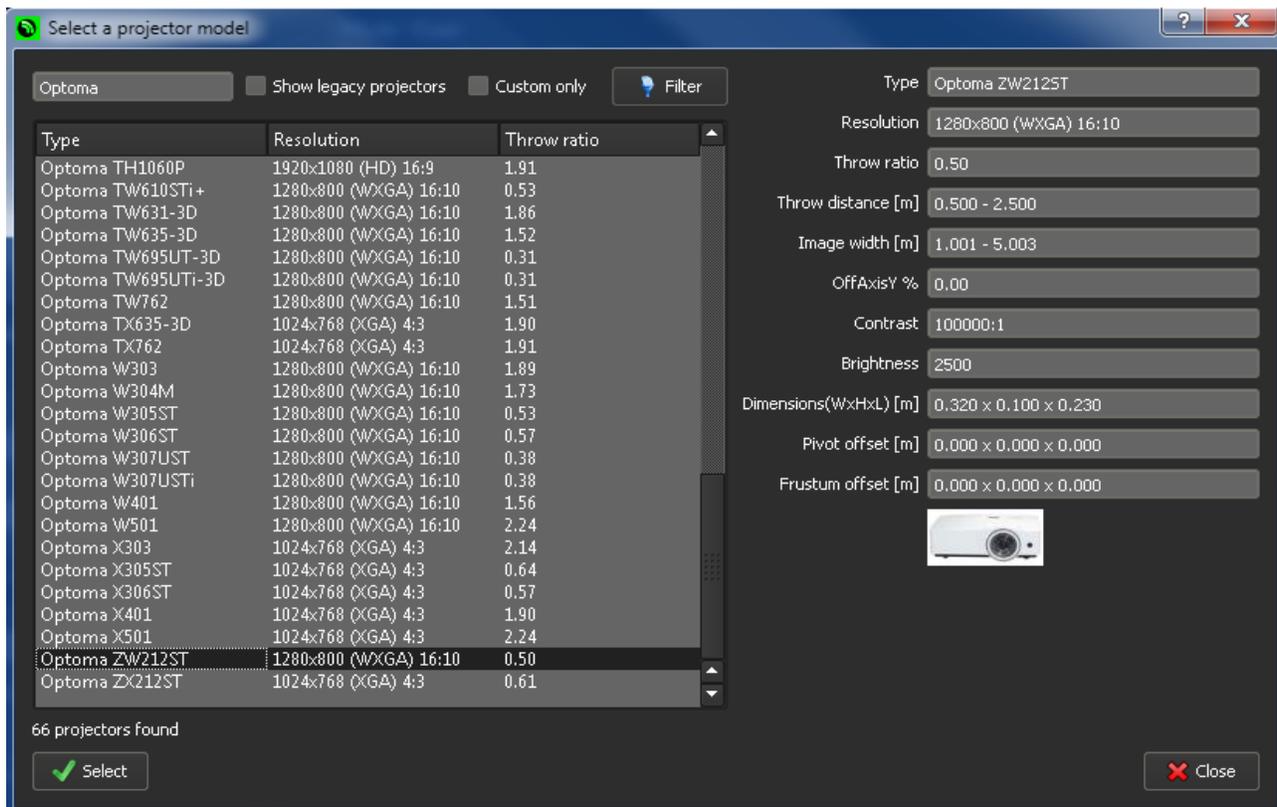
The projector names have to be unique and the software will select the next unique name adding a number at the end of the current projector name.

After adding a projector all projector properties can be changed individually.

The model type of the projector can be selected by pressing the database button to the right of projector type menu.



The software contains a database of 5000+ commercial projectors models including all projector properties (resolution, throw ratio, image size, contrast, projector size, etc.).



After selecting the projector type, all projector properties will be set to the properties of the selected projector model.

For more information about the built-in and custom projectors database, please see the section below “**Projectors models database**”.

When the frustum depth field is set to a number larger than 0, the projection light frustum will be drawn with the projector. The projector frustum can be shown or hidden using the “Show” check box next to the projector frustum field.

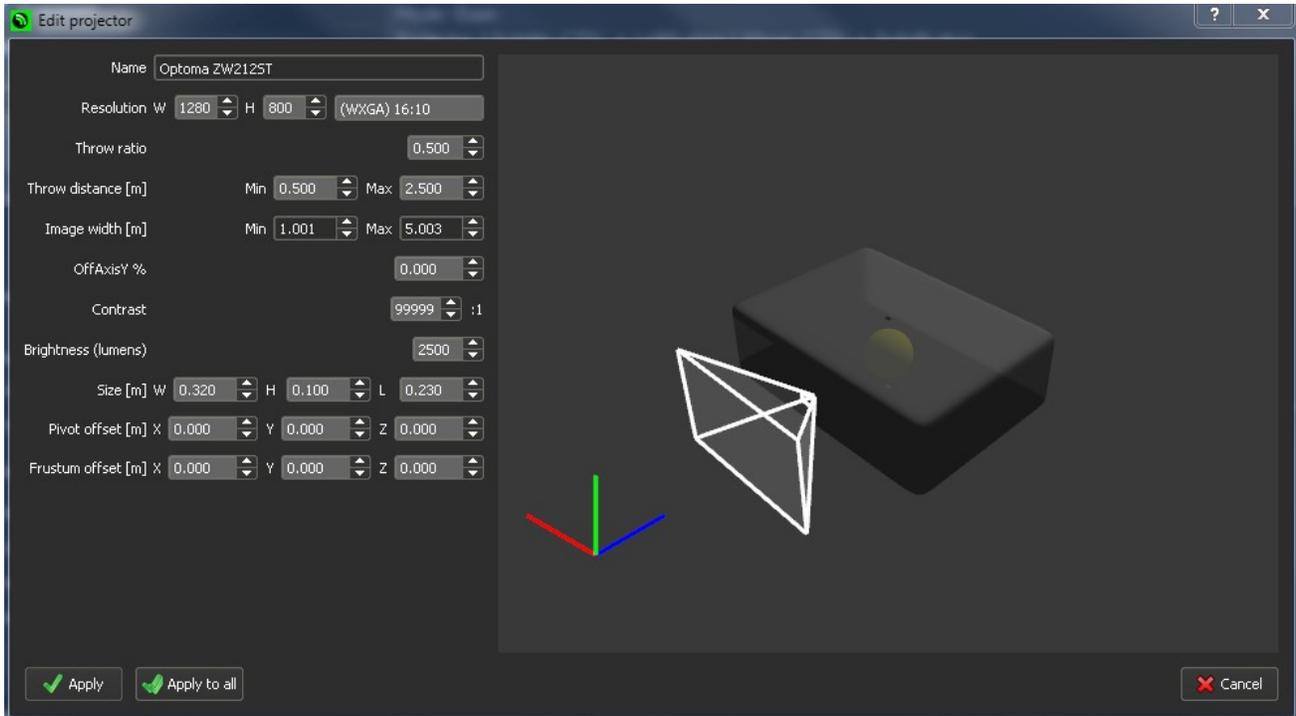
When a projector projects on a irregular surface or when projecting on the back surface, the projection if the frustum can be clipped to the area of the projector frustum. Using the “Clip” check box users can clip and limit the projection only within the projector frustum. The frustum depth can be adjusted to include the surfaces to be included in the projection.

The color of the projectors frustum can be selected by pressing the color button. Different colors can be chosen for different projectors for easier visual distinctions of the projectors in the 3D scene view.

The basic projector properties (resolution, throw ratio and Vertical Y Axis offset) can be entered directly on the projectors tab. The Horizontal and Vertical field of view (FOV) values will be updated automatically according to the resolution and the throw ratio. The Vertical OffAxisY offset is the vertical offset in percentage of the projected vertical image size. When projectors are mounted on the ceiling or on the floor, they have negative or positive Vertical OffAxisY offset.

The projected image can be flipped along the horizontal and the vertical axis using the Flip H and Flip V check-boxes.

For editing and adjusting all projector properties you can use the projector properties edit dialog by pressing the edit button.



## Projector properties dialog

The projector properties dialog can be used to edit all visual and geometrical properties of the projector. You can edit the standard visual properties: resolution, throw ratio, throw distance and Vertical OffAxisY offset. Based on the throw ratio and throw distance, the horizontal image size will be calculated for the minimal and the maximal throw distance.

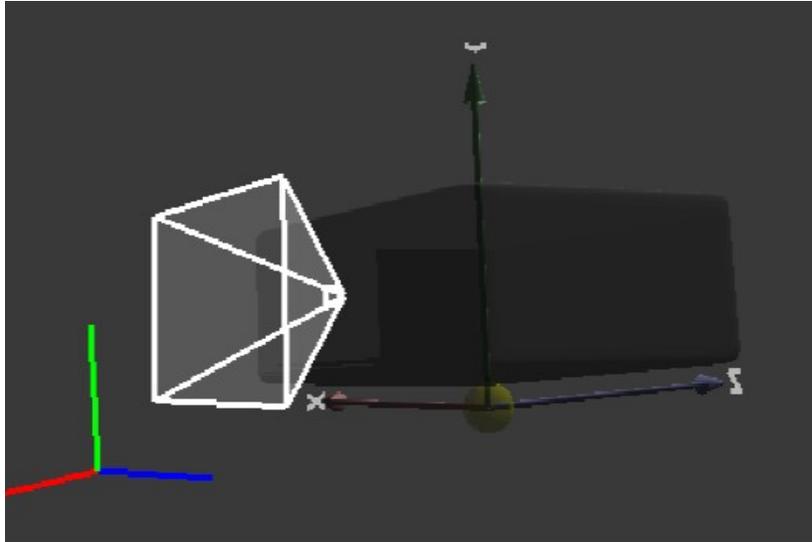
The contrast of the projector and the brightness can also be edited although the values are not used in the current version. All those values can be found from the data-sheets of the projectors.

For drawing the projectors correctly in the 3D scene view, the you can also edit the following geometrical characteristics of the projector: size, pivot (reference point) offset and the frustum offset.

The projector is drawn as a gray box using the dimensions  $W \times H \times L$ . The  $W$  dimension is the width of the projector (along the  $X$  axis). The  $H$  is the height of the projector (along the  $Y$  axis). And  $L$  is the length or the depth of the projector (along the  $Z$  axis). The size of the projector box can also be found in the projectors data-sheets.

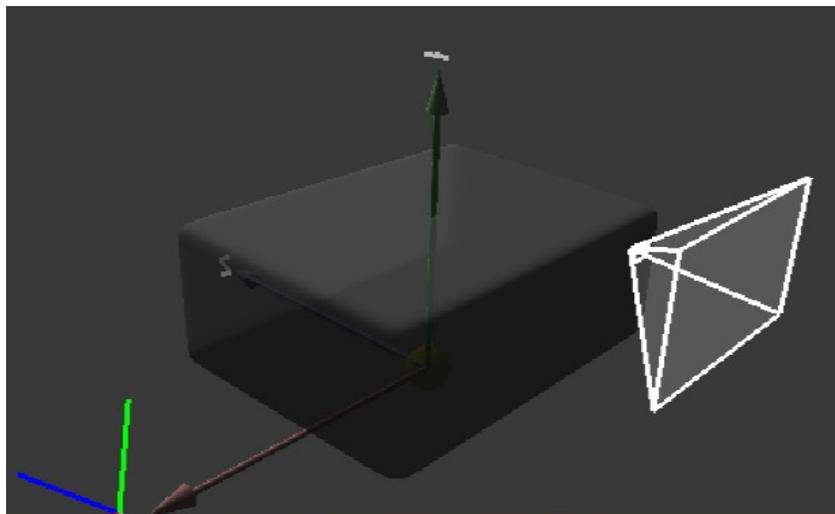
The reference point or the pivot point is initially in the middle of the projector box. This is the point where the projector is attached and the pivot point for all projectors movements and rotations.

The reference pivot point can me moved with respect to the initial center of the projector box using the Pivot Offset  $X/Y/Z$  fields for  $X$ ,  $Y$  and  $Z$  axis respectively. The reference pivot point is drawn as a yellow point ball in the projectors edit 3D preview.



Initially the beginning of the projector frustum is in the middle of the front side of the projector box. This is the place where the projector lenses are allocated. However, some projectors have the projector lenses positioned at different location on the front or even on the top plate.

Using the Frustum Offset X/Y/Z fields for X, Y and Z axis respectively user can define the position of the projectors light beam frustum to match that of your physical projector.



## Camera Tab

In the cameras tab user can add a virtual digital cameras to the setup or remove digital cameras from the setup.

For each digital camera the parameters of the projectors can be changed individually.

Digital cameras can be freely moved and rotated using the camera Move and Rotate control.

The top part of the cameras tab lists all cameras in the setup. Using the



button and the



button you can add and remove cameras from the project.

Using the



button user can remove all cameras from the project.

When adding a digital camera, the camera properties will be copied from the currently selected camera.

The cameras names have to be unique and the software will select the next unique name adding a number at the end of the current name.

After adding a digital camera all camera properties can be changed individually.

When the frustum dept field is set to a number larger than 0, the camera field of view frustum will be drawn with the camera.

The color of the camera frustum can be selected by pressing the color button. Different colors can be chosen for different cameras for easier visual distinctions of the cameras in the 3D project view.

The basic digital camera properties (resolution, and the horizontal field of view) can be entered directly on the cameras tab. The Vertical field of view (FOV) value will be updated automatically according to the resolution and the horizontal FOV.

You can take a shot of the camera using the take photo button.

The camera image can be saved to the disk.

The most common use for the camera is to view the screen project from different angles like may from a cockpit user view or driving position etc.

From the Show tab at the top panel select cameras and then the camera name you wish to view and you will see the image from that cameras perspective.

To go back to overall normal view select perspective from the same menu.

## Objects Tab.

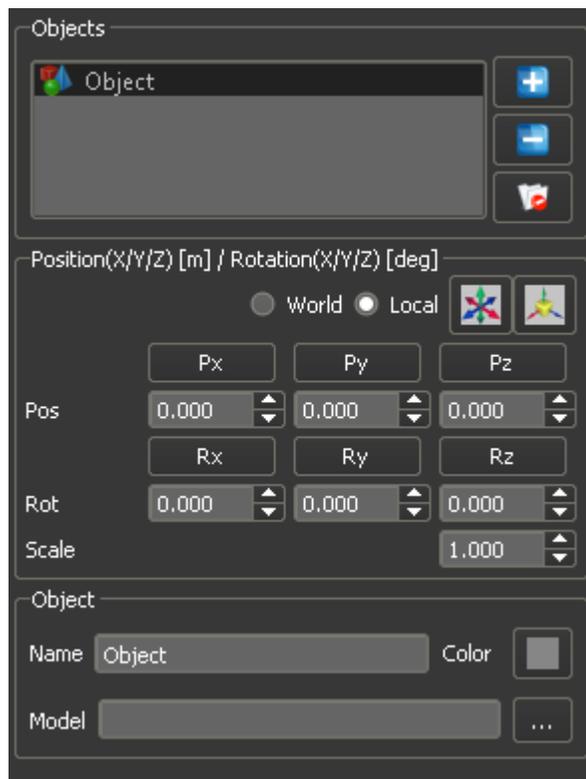
In the objects tab user can add other objects to the setup or remove objects from the setup.

The objects can be loaded from a 3D CAD model.

The current version supports importing of the following 3D formats:

- Collada ( .dae )
- Blender 3D ( .blend )
- 3ds Max 3DS ( .3ds )
- 3ds Max ASE ( .ase )
- Wavefront Object ( .obj )
- Industry Foundation Classes (IFC/Step) ( .ifc )
- XGL ( .xgl,.zgl )
- Stanford Polygon Library ( .ply )
- AutoCAD DXF ( .dxf )
- LightWave ( .lwo )
- LightWave Scene ( .lws )
- Modo ( .lxo )
- Stereolithography ( .stl )
- DirectX X ( .x )
- AC3D ( .ac )
- Milkshape 3D ( .ms3d )
- TrueSpace ( .cob,.scn )
- Ogre XML ( .xml )
- Irrlicht Mesh ( .irrmesh )
- Irrlicht Scene ( .irr )
- Quake I ( .mdl )
- Quake II ( .md2 )
- Quake III Mesh ( .md3 )
- Quake III Map/BSP ( .pk3 )
- Return to Castle Wolfenstein ( .mdc )
- Doom 3 ( .md5\* )
- Valve Model ( .smd,.vta )
- Starcraft II M3 ( .m3 )
- Unreal ( .3d )
- BlitzBasic 3D ( .b3d )
- Quick3D ( .q3d,.q3s )
- Neutral File Format ( .nff )
- Sense8 WorldToolKit ( .nff )
- Object File Format ( .off )
- PovRAY Raw ( .raw )
- Terragen Terrain ( .ter )
- 3D GameStudio (3DGS) ( .mdl )
- 3D GameStudio (3DGS) Terrain ( .hmp )
- Izware Nendo ( .ndo )

Objects can be freely scaled, moved and rotated using the object Move and Rotate control.



The top part of the objects tab lists all objects in the setup.  
Using the



button and the



button you can add and remove objects from the project.

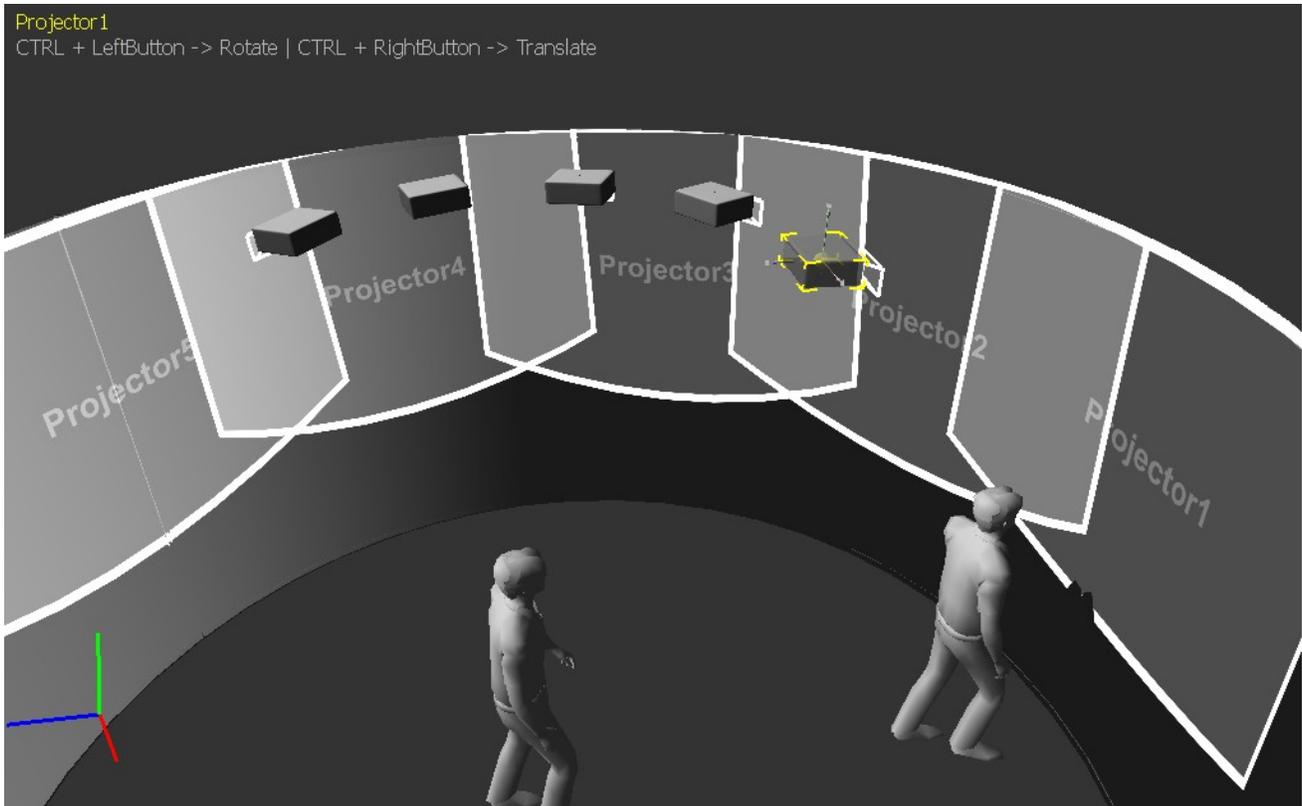
Using the remove all button



You can remove all objects from the project.

The objects names have to be unique and the software will select the next unique name adding a number at the end of the current selected name.

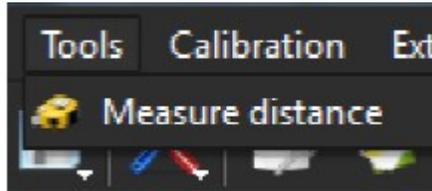
Objects can be positioned freely in the project in front of the projectors.  
Objects will cast shadows on the projection screen and allow you to evaluate the positions of the projectors.



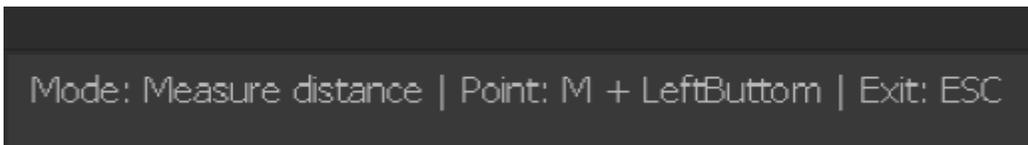
## Display Tab

Although we have this tab here it's for future use intending to be used as a virtual calibration tool.

## Measurement tool



The measurement tape tool is used to measure the distance between two 3D points in the project. This can be the distance between the projectors and the screen, or the distance between two projectors, or the distance between any two points within the project.



When in a measurement mode the 3D display area will show the position of the selected 2 points as well the distance between the points.



Use the keyboard key M and press the Left mouse button to select the first and the second points.

When the first point is selected and the mouse is on top of a project object, the 3D display area will show the distance between the two.

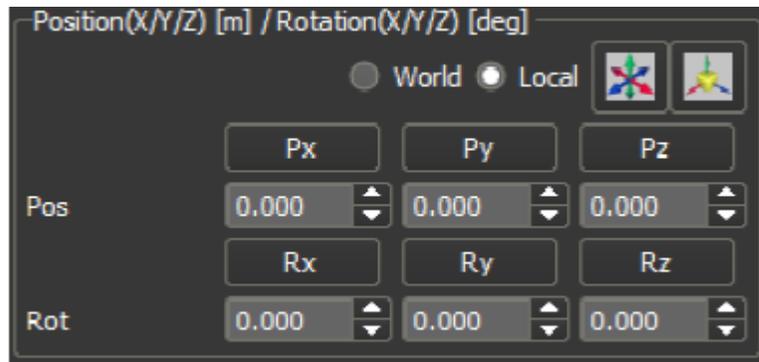
To start new measurements press the ESC button.

This can also be used to work out the Foot-lambert's ( Actual brightness Value) of each part of the screen.

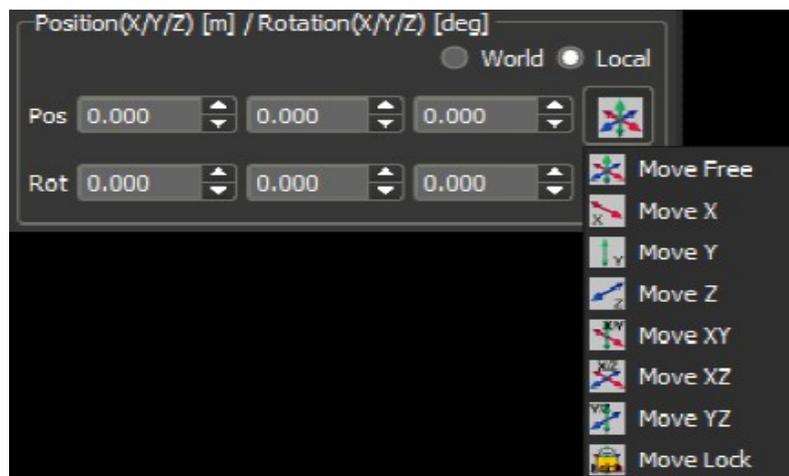
Luminance in Foot-lambert's= (Projector Lumens / Screen Area in feet squared) \* Screen Gain.

## Move and rotate controls.

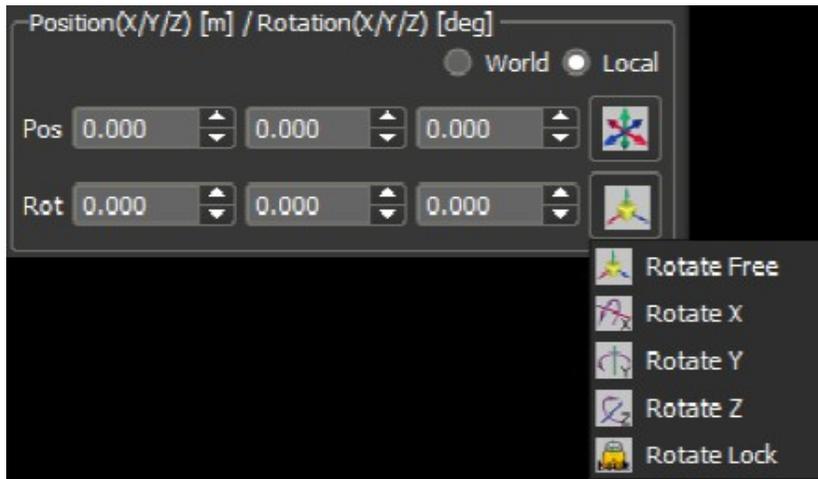
Each element of the projection can be freely positioned and rotated in the projection environment. The projection screen, projectors, cameras and the objects each have a move and rotate control to facilitate and optionally constraint the position and the orientation of the elements in the projection environment. Position and orientation can be changed either entering the position and orientation values in the corresponding boxes or using the mouse and changing the position and orientation in the 3D View area.



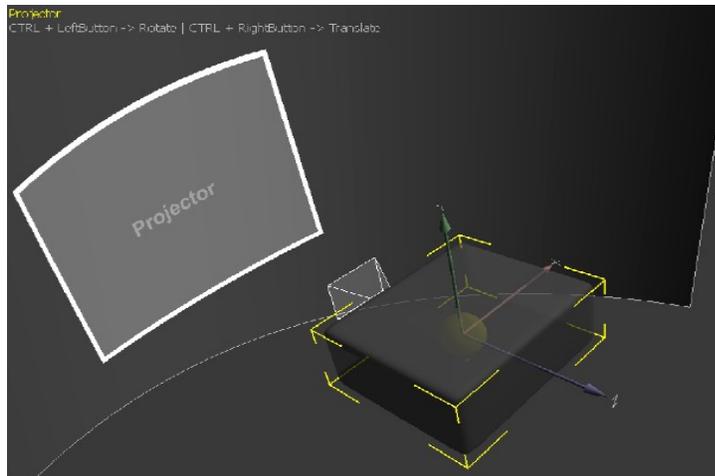
When entering the position and rotation values in the move and rotate control, the element is always translated and rotated with respect to the scene world coordinate system positioned in the center of the scene. By pressing the Px, Py, Pz or Rx, Ry, Rz buttons a dialog box will be opened to enter the relative movement of rotation with respect the current position and orientation. The relative adjustments can be performed in the local or in the world coordinate system. The rotation is always performed after the translation in the following rotation axis order: Rotate around X, rotate around Y and rotate around Z. You can use the move and constraint menu buttons to constraint or limit the movement in a certain axis or plane and to constraint the rotation around a particular axis



Using the move constraint menu, moving can be enabled along all axes or can be limited to a particular axis or a plane constructed by two axes.  
The movement of the element can be also completely locked to disable all movement.



Using the rotation constraint menu, the rotation can be enabled around all axes, or limited to a particular axis.  
The rotation of the element can be also locked to completely disable rotation of the element.  
The translation and rotation can be performed in the element local coordinate system or in the project world coordinate system.  
You can use the World/Local check-box to choose the coordinate system for translation and rotation.



Positioning and rotation can also accomplished via mouse in the 3D View area.  
By holding the SHIFT button you can click on an element using the LEFT mouse button. This will make the element selected and ready for interactive movement and rotation.  
The selected elements are represented with a yellow bounding box and the Local or the Global coordinate system axes are drawn for a reference.  
By holding the CTRL button and pressing the LEFT mouse button you can rotate the object around the coordinate system axis taking into account the rotation constraints.  
By holding the CTRL button and pressing the RIGHT mouse button you can move the object along the coordinate system axis taking into account the

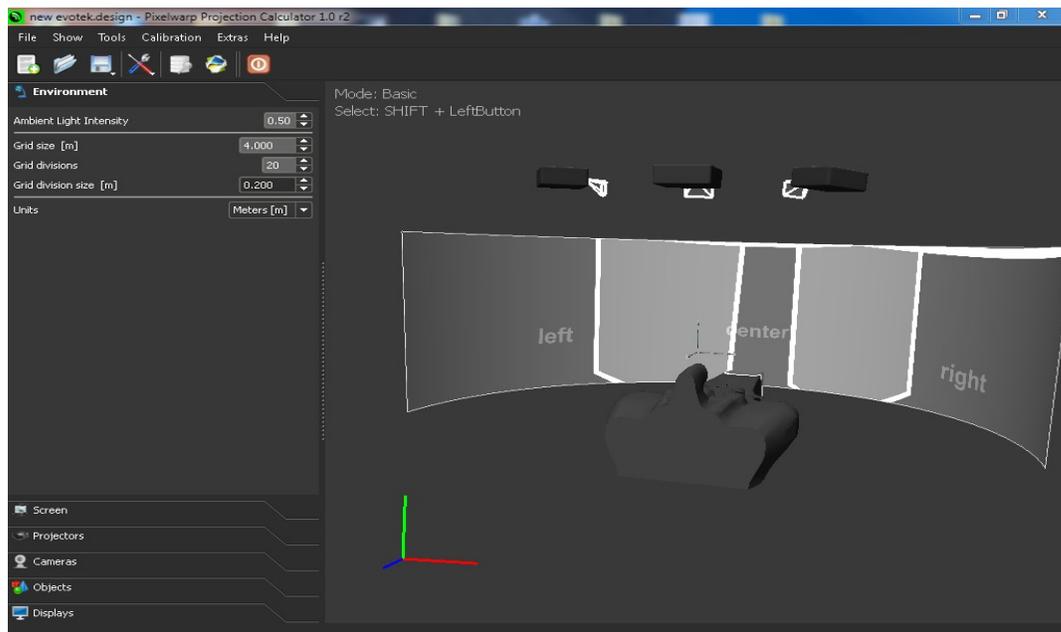
translation constraints.

Holding the SHIFT button and pressing the LEFT mouse button outside of any element will un-select the currently selected element.

### 3D View area.

The 3D View area is the central area of the program.

This area shows a 3D representation of the projection environment including the projection screen, all projectors, camera and additional objects.



The 3D View area also optionally shows a ground grid reference and the coordinate axis of the world coordinate system.

The ground grid and the coordinate system axis can be shown or hidden using the View menu.

Pressing and dragging the LEFT mouse button in the 3D View will rotate the 3D view.

Pressing and dragging the RIGHT mouse button in the 3D View will translate the 3D view.

Pressing and dragging the MIDDLE mouse button in the 3D View will zoom in and out the 3D view.

This can also be achieved using the mouse wheel.

By holding the SHIFT button user can click on an element using the LEFT mouse button.

This will make the element selected and ready for Mouse movement and rotation.

Holding the SHIFT button and pressing the LEFT mouse button outside of any element will un-select the currently selected element.

## Projectors database,

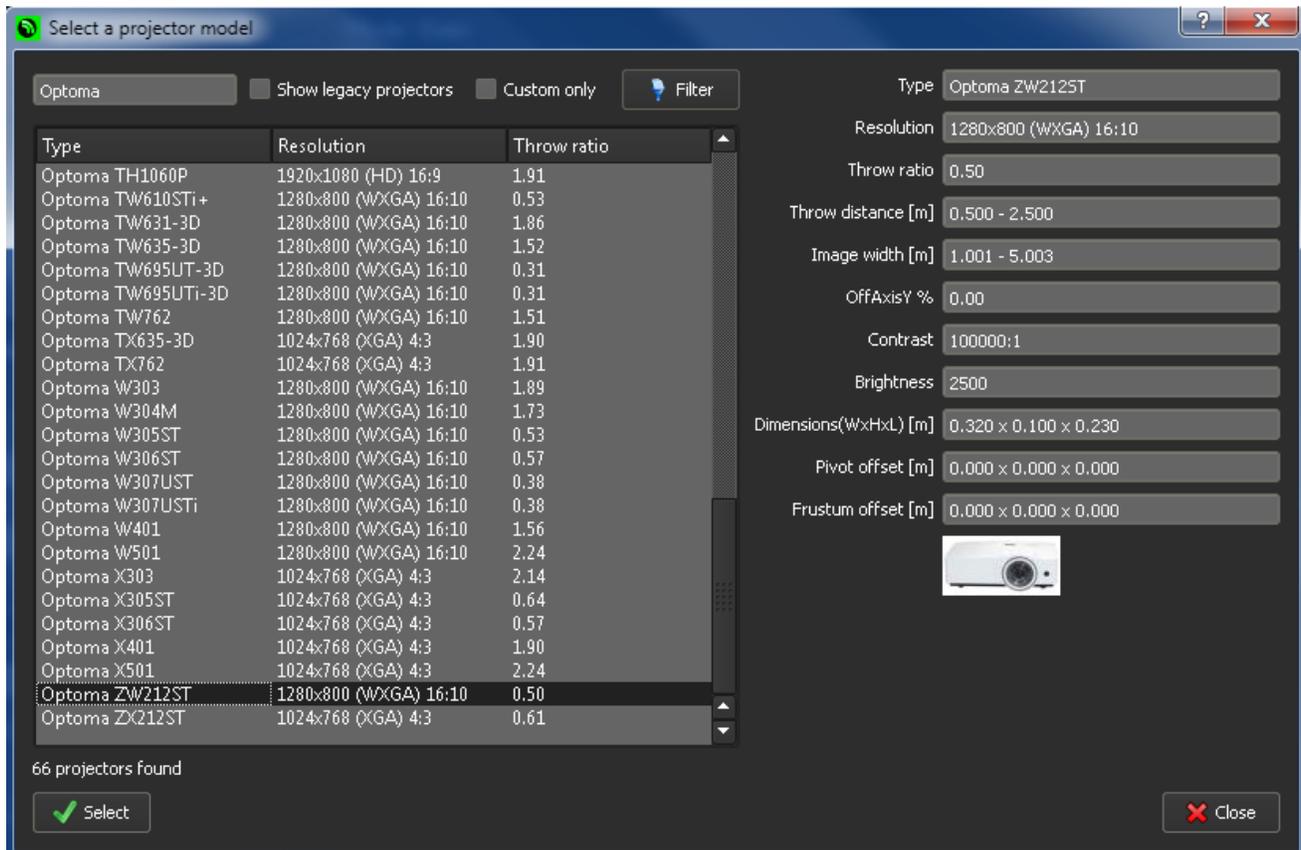
The built-in database has more than 5000 projector types and models.

The database contains the visual characteristics of the projectors (resolution, throw ratio, throw distance, minimum and maximum projection distance, brightness and contrast) as well as the size (dimensions) of the projectors.

The database contains legacy (discontinued) projector models and currently active projector models. The legacy projector models are discontinued from production but you may have them and can still be purchased used.

You can modify and edit the parameters of the built-in projector models and add custom projector models to the database.

The user's modified and added projector models are saved to a separate database that can be stored locally and used when the software is updated to a new version that contains an updated built-in database.



Using the filter button user can filter the list of the projector types that contain the text you have entered in the filter text box.

When the filter text box is empty all projectors from all manufactures will be listed.

Initially, the list does not contain the legacy (discontinued) projectors. When checking the “Select legacy projectors” check box and pressing the Filter button, the legacy projectors will be listed as well. Legacy projectors are marked with the letter [L].

You can modify or extend the built-in database. Using the Add button new custom projector type can be added to the database.

Using the Edit button user can edit a built-in or custom projector type definition.

Edited or added projector types can be removed using the Delete button.

All custom modified or added projectors are marked with letter [\*].

The custom edited or added projectors are stored in a separate file projectors.data. This file is updated automatically every time a user modifies, adds or deletes a projector. Whenever the software start it looks for the file projectors.data and merges this projector database with the built-in projectors database.

### **Virtual calibration.**

This section is intentionally left blank. Virtual calibration will be supported in the future versions.

## **Order & Registration**

### **Order**

To order a license for Pixelwarp Evo, please visit:

<http://pixelwix.com>

This license provides you with the free version updates within 2 years.

The software license is based on a PC HardwareID.

**The registered version is bound to a single PC identified by the unique Hardware ID. Hardware ID is constructed from the PC unique components numbers (HardDisk, CPU, NetworkCard, etc). The software can be run only on the PC with the same Hardware ID.**

The USB key license is stored on an USB key.

**The registered version is bound to the USB key and is will run on every PC as long as the USB key is present.**

Purchasing of the Pixelwarp Evo can be performed through the Pixelwix website with PayPal .

- A PayPal account is not required to use this payment method. You can set up an account when you are directed to PayPal's Web site.
- You will be automatically redirected to PayPal's Web site. You can then log in to PayPal as usual or set up a PayPal account to pay for your order.

- During the payment process, all information will be exchanged in encrypted format exclusively between you as the account holder and PayPal's Web site.
- After the transaction has been successfully completed, you will be returned to Pixelwix Inc web pages.
- Typically, product license delivery will be initiated within 24 hours during business hours.

Payment can also be achieved by wire bank transfers upon request.

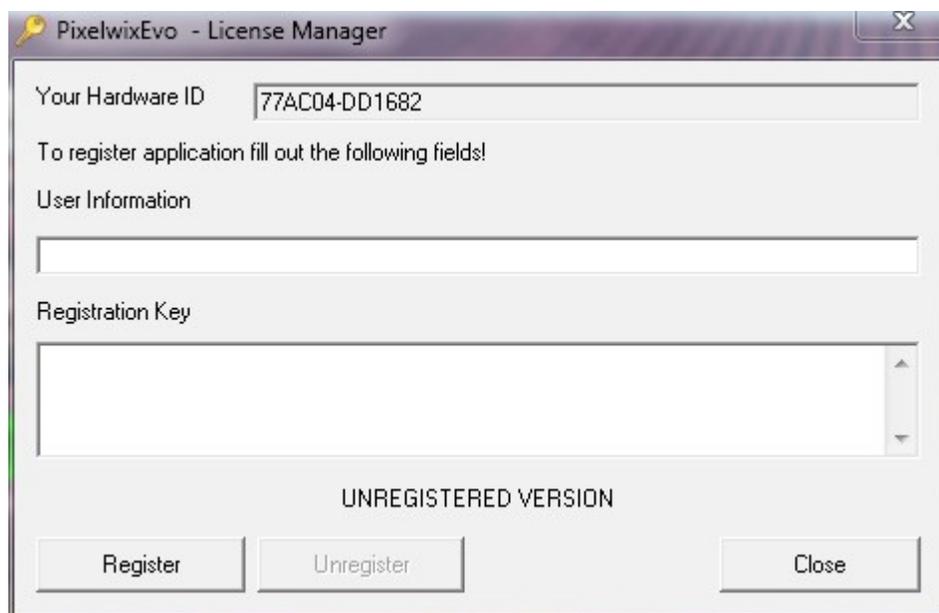
## Registration

### For Hardware ID license:

After the purchase “Your Hardware ID” has to be sent by e-mail to sales@pixelwix.com

A license will be e-mailed back to register the program.

The program can be registered using the provided Hardware ID License Manager located in the installed Pixelwarp folder.



### For USB license:

A USB key will be shipped to the customer along with registration information.

The unregistered (trial) version can be user for a period of 30 days after which the running of the program will stop. The unregistered version has the following limitations:

Stops working after 10 min cannot use database, no save or save as functions.

## **PIXELWIX SOFTWARE LICENCE**

The Pixelwix Corporation (Pixelwix Inc USA) is authorised to license the software of this installation (the Pixelwix Pixelwarp Software) and by installing the licensee accepts a non-exclusive, non-transferable Licence to "Use" (as hereinafter defined) the Pixelwix Pixelwarp Software on a single computer system ("The System"), subject to the terms and conditions contained herein.

This Licence entitles the Licensee to:

- (a) use the one copy of the Software contained in this package on the System;
- (b) use the Software strictly in accordance with the provisions of Clause 2 of this Licence;
- (c) receive the benefit of the warranty specified herein;

### 1. Acceptance of this Licence.

The terms and conditions of this Licence are deemed to be accepted by the parties as follows:

- (a) by the Licensor upon despatch/delivery by the Licensor of this package to the Licensee, and
- (b) by the Licensee by installing the software.

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