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Warpalizer tutorial

How to set up your visuals to perfection using the

3D view setup

Revision 1.1



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What is the point with the 3D setup function?

Most simulations on the market today is 3D visualisations of the simulation you are running. But our monitors/projectors will show this as an physical 2D image on your screen/monitor.

When you are warping your image on a curved screen using a regular "checkerboard/2D warping", the warping does not correct for the radius of a curved screen, even if your checkerboard is perfectly aligned. This will result in image distortion on screens with a large FOV. Specially noticeable on your sideviews, as your runway/horizon can be noticed as slightly curved. The greater the field of view, the worse the distortion will appear.

The 3D setup, is a calibration tool that calculates exactly how your View should be, based on your physical screen measurements. This is done by entering the Vertical and horisontal screen degrees into the warpalizer.

2D warping is best suitable for flat screens, and screens with very small curvature. For example a home theatre or a control room installation.

3D warping is best suitable for visuals with a larger curvature. Single curved screens, double curved screens and domes.

Notice

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The 3D setup is an advanced feature that require some expertise in relation to multi channel projection systems, and the use of a imagewarping software. This tutorial is written to help users to do this bythemselves. This tutorial is no guarantee for you to be able to configure such a setup.

Be prepared that this is a time consuming and difficult task to do for novice people.

For Commercial customers it is highly recommended that a Univisual representative do the configuration on-site for a professional result and to avoid down-time on your system. Please contact us for further information.

This tutorial is an addition to the Warpalizer user manual. Not a replacement.

Let us get started

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You have already installed the warpalizer as per instructions from the user manual, and tested that the warpalizer works fine by using the DirectXtest. Subjects not covered or missing in this tutorial can be found in the Warpalizer user manual.

In this tutorial we will be using FSX, with 3 undocked views, and three projectors with a total of 3840x800 resolution on a 180 degree curved screen.

First we need to do some math to calculate a few parameters. This must be done exactly. Any guesswork will affect the setup. Please brush up your math and geometry skills, as we need to calculate on a circle.

Measure the total horisontal FOV that your projectors is covering. You should already know the radius of your screen from when you built it. My example here is with a screen that has a radius of 235cm.

Use a measuring tape to measure the total horisontal view area by following the curvature of the screen. I measured 738cm on my screen.

The outline of our screen is calculated with PI x Diameter (3,14 x 4,70) which result in a outline of 1476cm on my screen. First we want to find the measure per degree of a circle using the following formula.

Outline 1476cm circle 360 degrees =4,1 cm per degree

To find our actual FOV, use the following formula:

Measured screen distance 738cm Screen per degree 4,1cm =correct FOV 180 degrees

Then we simply divide the total FOV into our number of channels.

Total FOV 180 degrees Channels 3 = 60 degrees Now we want to find our vertical FOV.

Since our projectors have a 16:10 aspect ration, and we have three of them, our true screen format is 48:10. (16x3=48). Then calculate the Vertical FOV by using this formula.

Horisontal FOV 180 degrees Horisontal aspect ratio 48 =Multiplier 3,75

Multiplier 3,75 X Vertical aspect ratio 10 = Vertical FOV 37,5 degrees

Next step is to find how much view angle to apply for each channel, and for our FSX views. First you need to measure the actual overlap on your screen. (Follow the curvature). On my screen, the overlap between the left and center channel is 37cm. And my overlap between the center and right channel is 40cm. <u>This give a total overlap width of 77cm.</u>

Proceed with the following calculation to find the correct angle.

Total overlap 77cm 2 overlap sections =38,5cm per overlap

Total FOV 738cm - 38,5cm per overlap = 699.5 cm.

<u>699,5cm</u> 3 channels = <u>233,2cm per channel</u>

233,2cm per channel 4,1cm per degree of a circle =56,9 degrees angle per channel

This means that your FSX windows must be angled to 56,9 degrees.

Colour calibration

The colour calibration is important to achieve a best possible result from the edge blending, so do this as good as you can.

Start your DirectXtest application and hit F2. You will see the menu with the controls for colour calibration. Use the colour sliders to adjust the RGB colours. Use the projector with the lowest brightness as your visual colour template. Try to make all three as identical as possible. Use the "connect sliders" to move all sliders for one channel at the same time. Check the square box



next to "Test image" and use the arrows to swap between different images for colour calibration.

When you are satisfied with the colours, click the Save button.

Quick setup

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I will recommend to use the quick setup to set the points for edge blending in an easy way. This is not really necessary as the basic blending points is present anyway, but it will save you some blending work at a later stage, if you are accurate when you set the points.

Click on the "Calib" button on the warpalizer menu, and select if you are using single curved or double curved screen. Set the points as described on the picture. When you are done with the first channel, you will automatically be transferred to the next.



Number 3, 4 and 7,8 on the first channel, set the overlap and blend points for the first projector overlap. The same with 1,2 and 6,7 on the center channel.

Set the control points horisontally. A laser is recommended to make sure all the points will be level.

Please have a look at the picture on the next page for a more visual explanation of how to set the control points. Hopefully you have a much bigger overlap than on my reference picture...

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When you are done with all your control points, the settings will be saved automatically, and we are ready to start with the next step. We have now defined both the blend area and the overlap zone. But we only want to keep the blend area so open the F2 menu again, and pull both overlap sliders all the way to the left. Then save.



Now we are ready to insert our calculated parameters.

3D setup

Open meny with F2, and click the "Adv" button and you will get the following image on your screen. Check the 3D view setup to apply the grid on your screen.

Then insert the numbers in green boxes Advanced × 3d view setup V from our calculations earlier. Horizontal FOV: 60.0 Left and right "view rotation" will be the Vertical FOV: 37.5 Left view rot: -56.9 same. Right view rot: 56.9 Decimal: Check the "Decimal" to change degrees in decimals.

When this is done you can proceed to align the 3D setup grid to your screen.



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First you should make tape marks on your screen for every 10 degrees of horisontal FOV. Measure your entire screen by following the curve, and divide the total FOV into sections of 10 degree each. Use the center of the front projector as the main reference, and stick a piece of tape in place for every 10 degrees to the left and right. Accuracy always matters... Do the same for the vertical degrees. Use your simulators physical eyepoint (Your eyepoint) as the reference center height, and then calculate the 10 degree vertically angle according to the distance/radius.

When you have inserted your neccessary degree marks, it is highly recommended to use a laser when warping the 3D setup lines.

First click the "Edit" button on the menu, then right click on your left channel, and the image to the right will appear. Click on "Warp", and our important control points will appear.

First an explanation of how the control points is working. Click on a control point to make it active. You

can move it around with your mouse, or with the keyboard arrows.

Check the "All" to move all the control points on the channel you are working on. Check "Row" to move all control points in a row, and "Col" to move all the points in a column.

"Row", and "Col" is very handy for our warping. "All" is not frequently used.



Now our job is to make the 3D grid lines on your screen to perfect vertically and horisontally lines. Set your laser to mark both horisontally, and vertically according to your tape marks, then move the control points, until all the lines on your left channel is perfectly aligned. Dont think about outside lines on your screen at this stage. That is not really interesting. Our goal is to get the image correct. This is not a cinema after all...

The "Row" and "Col" function is very handy to do all the "rough" positioning, and the keyboard arrows is the tool for perfection.

When you are done with the left channel, simply right click on the center channel and select "Warp" again. Finish the center channel, and do the same procedure on the right channel until you are finished.



When you are done, just click F2 and select "Save". You can always go back and finetune more at a later stage if neccessary.

Now we will proceed to the edge blending...

Edge blending

This will now be very easy if you were accurate when running the quick setup. First go to the F2 menu, and select "Edit". Right click on your left channel, and select "Blend graph" and the control pictured on the right side will appear. For now, just pull the slider all the way to the left.

Then right click on the center channel and select the "blend graph" which has an arrow that points to the left channel. Then again, pull the slider all the way to the left. Now you have a good starting point to adjust the black levels if neccessary. If you need to calibrate the blend, just pull up/down on the white control points to finetune smaller areas of your blend-zone. Finetune white points until you are satisfied. Do this on



both the blend graphs that goes to the left edgeblend. Close the colour graphs by clicking on the X, and press F2 to save your setup.

Same procedure for the right edge blend. Dont forget to save your setup.

Notice regarding view settings.

It is very important that the view settings in your applications is set identically in the application you are running, and in the 3D setup configuration on the "Adv" menu. The 3D warping will not be correct if this is ignored.

Zoom setting

There is a difference between a professional simulation application and a entertainment application such as FSX. Most professional applications do not have/need a zoom setting. FSX users do need to adjust the zoom setting for each view so they are identical on all views. There is no recipe for calculating this at the moment, so trial and error is the solution.

More about FSX zoom and view settings in the Visual tutorial that can be downloaded from <u>www.ivarhestnes.com</u>

FSX window borders

When using the 3D setup feature, these borders will normally not be visible, as they are hidden in the blending. If for some reason you get these borders visible, please refer to the Warpalizer user manual.

Advanced edge blending'

This is neccessary if you have any bright areas in the blendzone, areas in the blend zone that does not look good, or if you skipped the quick setup.