

## **The Ortho-Stereoscopic Perspective and 3D “Realism” by Ken Burgess, October 2009**

One of the main benefits of a lensed stereoscope is the ability to view images with an “Ortho-Stereoscopic Perspective” (OSP). The OSP is obtained when the physical Field Of View (FOV) of the viewed image is the same FOV that the camera recorded. This is a very important factor in achieving the realism promised by 3D photography.

Most digital 3D viewing systems (computer monitors or “picture frames”) provide only a very narrow FOV as compared to “what the camera saw,” resulting in severe 3D distortion. When a stereoscopic image is viewed with a FOV that is narrower than the FOV of the camera, the “stretch” in the z-axis makes objects in the scene look smaller than real life, like a scale model, the scene does not look “real.”

In the “old days” the stereoscopes sold with stereoscopic cameras were “matched” to the cameras so that one always saw an ortho-stereoscopic perspective in the viewer. This was accomplished by using a lens in the viewer that had the same focal length as the (fixed fl) lens in the camera. Modern cameras with zoom lenses, and the numerous widely varied digital 3D viewing methods make Ortho-Stereo viewing much less common these days. As a result most digital 3D is viewed with a FOV that is way too narrow (except for telephoto shots that don't look real for other reasons).

The Cyclopital3D Digital Hand Viewer (C3DV) is capable of presenting images with a physical FOV of 50 degrees. This is wider than the FOV of most digital cameras, so for a true OSP the image may not use the entire width of the screen.

For instance the Fuji Real 3D W1 camera takes a picture with a FOV of about 45 degrees at its widest (power on default) zoom. Un-cropped images with an aspect ratio of 4:3 that fill the C3DV screen vertically will have a horizontal FOV of about 40 degrees. This is slightly short of the OSP, but close enough to look real. If you set the Fuji to an image size that has an aspect ratio of 3:2 the un-cropped result will have a horizontal FOV of 45 degrees. This is pretty much exactly that of the camera. When set to a 3:2 aspect ratio, the Fuji W1 is essentially perfectly “matched” with the viewer to provide the OSP.

The old “Stereo Realist” had a fairly narrow FOV (32 deg) compared to today’s cameras. It turns out that (by design) if you digitize a Realist image the un-cropped result will fill the C3DV screen vertically and have exactly the correct width to provide the OSP!

For any camera, pretty much all but the most wide angle shots can be cropped to provide the OSP in the Cyclopital3D viewer. Usually this means cropping the image vertically so it shows up “wide enough”.

Zooming in with your stereo camera can produce some “special 3D problems” which are much too complex to cover here. Suffice it to say that for realistic 3D it's best not to zoom in too far, but some interesting affects can be had if you can also vary the stereo base...

The “immersive” nature of a lensed stereoscope also blocks out visual distractions, really putting you in the picture. Interestingly, the feeling of realism can also be enhanced by pointing the viewer up or down in the direction the picture was taken; the Cyclopital3D hand-held Viewer gives you the ability to do this. For instance if a picture was taken looking up a tree, point the viewer up when you're looking at that scene. It's really quite remarkable! It's all about reproducing the sensory input exactly, for each eye- and for the gravity sensors in each ear!