Stereo Vision

The 3D-XplorMath Consortium

Stereo vision is a feature of 3D-XplorMath that is missing from most mainline mathematical visualization programs, and that is a pity, since it adds greatly to the ease with which a user can develop a good feeling for a complex three-dimensional object.

The program can actually produce three different kinds of stereo images. One of these goes by the name anaglyph stereo, and requires the red/green (or red/blue) glasses that you may be familiar with. In this case there is a single image on screen, or rather the left eye and right eye images are drawn together on the screen, the first in red and the second in green. The other two kinds create what are called stereo pairs, namely separated left eye and right eye images. In the case of parallel view the left eye image is to the left of the right eye image, and for cross-eyed stereo these are reversed. The advantage to stereo pairs is that they are in full color.

For highest quality anaglyph stereo viewing, the monitor, should be set to millions of colors. In addition, the user must have a pair of red/green glasses. These are usually not "glasses" at all, but a paper frame with a red plastic film filter that fits over the left eye, and a green (or "blue"—really cyan) filter that fits over the right eye.

The way that anaglyph stereo vision works is as follows. First the program paints one perspective view of an object on the screen in green, as the object is seen from a first ViewPoint. Then it moves the Viewpoint left by the distance EyeSeparation and paints a corresponding perspective image on the screen in red. Against a black background the green lens filters out the red image, so the right eye sees only the first image, and similarly the left eye sees only the second image. By some sort of magic, the human brain takes these two only slightly different images on the right and left retinas and somehow synthesizes them into what our visual cortex interprets as a view of the object with an extraordinarily realistic illusion of depth. Against a white background the red filter only shows the green image and the green filter the red image. To see the object as computed one has to switch the filters, green for the left eye, red for the right. These anaglyphs are much better for printing than the black background ones.

(Unfortunately though, about ten percent of people are unable to see anaglyph stereo, either due to color-blindness, or a severe imbalance in the acuity of their left and right eyes. But if you do not see the stereo effect immediately, don't give up too soon. Some people cannot see it at first, but then after some practice their eyes "learn the trick". If you have trouble, try practicing in a very dark room with a large monitor, and with the stereo window nearly filling the screen. View polyhedra since, at least for the simpler ones, you know their 3-dimensional shape and this helps the brain to interpret the two 2-dimensional images as a 3-dimensional object.)

(By the way, the red/green or red/cyan glasses are equally good. The green filter passes green and blue and filters out red, while the cyan filter passes only green and filters out both blue and red. Since their is no blue in either of the stereo images anyway, the effect of filtering them with a green or a cyan filter is the same.)

The stereo glasses are quite inexpensive, but not always easy to come by. If you need them in quantities of a hundred, you can purchase them from a company in Memphis, Tennesee called American Paper Optics (Tel. 800 767 8427) for about $60 per hundred delivered. Another source is Reel 3-D Enterprises, Inc., P.O. Box 2368, Culver City, CA 90231 (Tel. 800 837-2368). (Or just search Google for anaglyph) stereo glasses.) You can also get glasses with prisms in them for helping you see parallel view stereo pairs. In particular Reel 3-D carries inexpensive plastic glasses of this type.