Create Anaglyphs Using ArcScene

By Bill Harbour, Baldwin County Commission

ArcGIS 8.3 3D Analyst extension offers users an excellent tool for visualizing and analyzing surface data. ArcScene, at the core of the 3D Analyst extension, provides the interface for viewing layers of three-dimensional data and creating and analyzing surfaces.

This article will show how images exported from ArcScene can be converted into stereo three-dimensional images called anaglyphs using StereoPhoto Maker, a free software program. StereoPhoto Maker V2.12 was written by Masuji Suto and David Sykes and can be downloaded from www3.zero.ad.jp/esuto/stphmkr/index_e.htm.

A working knowledge of the ArcGIS 3D Analyst extension is assumed. Although this article does not present detailed instructions on using StereoPhoto Maker, the software is user friendly and some experimentation will provide pleasing results.

What Is an Anaglyph?

The Second College Edition of The American Heritage Dictionary states that an anaglyph is "a moving or still picture consisting of two slightly different perspectives of the same subject in contrasting colors that are superimposed on each other, and that produces a three-dimensional effect when viewed through two correspondingly colored filters."

A method for creating printed anaglyphs was first patented by Louis du Hauron in 1891. We've all seen anaglyphs—images in a comic book or sci-fi movie that look out of register to the naked eye, but seem to jump off the page or screen when viewed through a pair of cardboard glasses that have one red lens and one blue lens. Disney's *Spy Kids 3D* is the latest Hollywood release to reach out and grab audiences with three-dimensional trickery.

Anaglyphs are not just a gimmick. They have serious applications, too—especially when viewing terrain data. Of course, there are other ways to view three-dimensional GIS data, but those methods can be expensive. Three-dimensional images can readily be created using the ArcGIS 3D Analyst extension and StereoPhoto Maker.

Anaglyphs are produced from a combination of two images. One represents the perspective of the left eye and is captured with a red filter. The other represents the perspective of the right eye and is captured using a cyan filter. The brain combines the overlapping complimentary colors—the red and cyan—from the anaglyph into a single three-dimensional image.

Humans can see in stereo because the distance between each eye (i.e., the interocular or base distance) is approximately 2.5 inches (or 6.5 centimeters) apart. In stereo photography,

this information has been used to produce three-dimensional images by varying the base distance with the scale of the scene. A good rule of thumb is to vary the base 1/30 of the distance between the observer and the nearest object of a scene. However, in practice determining the correct base distance between left and right images may require some experimentation.

Capturing Left and Right Images in ArcScene

Rendering an anaglyph requires two slightly shifted images of the same scene. The anaglyphs for this article were created from a triangulated irregular network (TIN) that was generated from Baldwin County LiDAR (Light Detection and Ranging) data. The process for creating anaglyphs is illustrated on page 51.

Additional Help With Three-Dimensional Imagery

Photo-3D, an excellent list for the discussion of true three-dimensional (stereoscopic) imaging techniques, is hosted by Yahoo! Groups and can be found at groups.yahoo.com/group/photo-3d/. The list is frequented by many amateurs and professionals who are delving into this area.

Conclusion

This basic method of creating anaglyph three-dimensional images can be used for creating anaglyphs that can be quite spectacular. The ArcGIS 3D Analyst extension and ArcScene provide the user with powerful tools for three-dimensional visualization that can be extended further with the creation of true three-dimensional images using software such as StereoPhoto Maker. For more information, contact

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About the Author

Bill Harbour began working in GIS in 1993 when he became the coordinator for the Bishop State Community College's Project Environmental Protection and Information Center. In 1996, he came to the Baldwin County Commission as its first GIS coordinator.
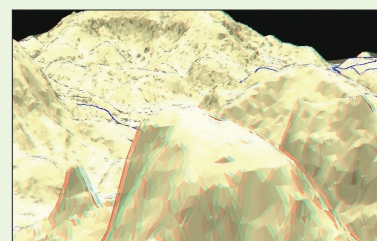
StereoPM

Start StereoPhoto Maker and load the left and right images by first clicking on the Open Left folder icon in the toolbar. This invokes a dialog box that asks for the left image. Click the Right Image folder icon and in the dialog box choose the right image. Both images will be displayed side by side. To render the two images as an anaglyph, choose Stereo > ColorAnaglyph from the menu and select Color (red/cyan).
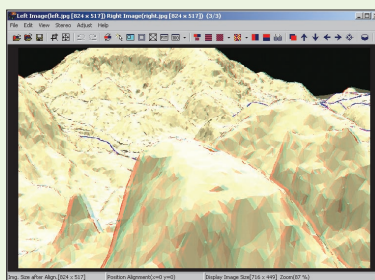

This image shows the result of the anaglyph creation process. The rule of thumb has generated a good starting image.


After further experimentation, a base distance of 50 feet yielded a more pleasing three-dimensional effect. Save the resulting stereo image as a .jpg by choosing File > Save Stereo Image. Adjustments to the positioning of each image can be made in StereoPhoto Maker as the software has significant capabilities. See the application documentation for more information.
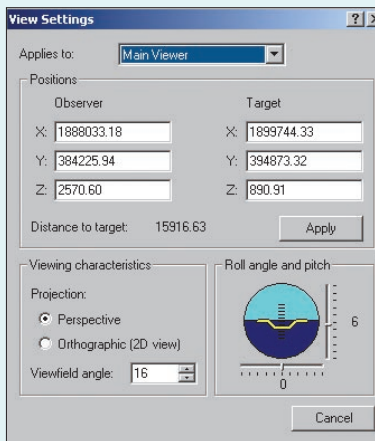
ArcScene
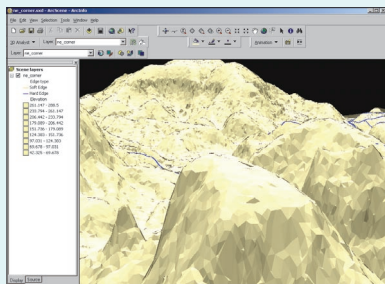
This perspective view in ArcScene shows terrain relief of an area in the northeast corner of Baldwin County, Alabama. The Z (height) scale was exaggerated by a factor of 10 to clearly show the change in elevation.
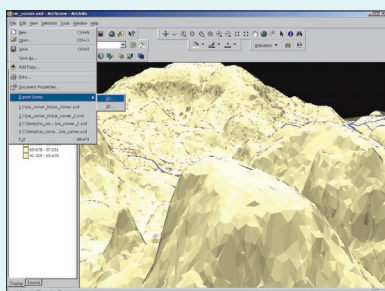

The right image will be captured using nonshifted coordinates that were displayed in the previous step. Exporting to an image is easy in ArcScene. From the menu, choose File > Export Scene and select the 2D option. Export the image as a .jpg file.

Access the ArcScene View Settings dialog box by choosing View > View Settings. This dialog box contains controls for the Observer and Target coordinates and elevation settings, Distance to Target, Viewing characteristics, and roll angle and pitch information. For this exercise, the Observer and Target coordinates are of interest.
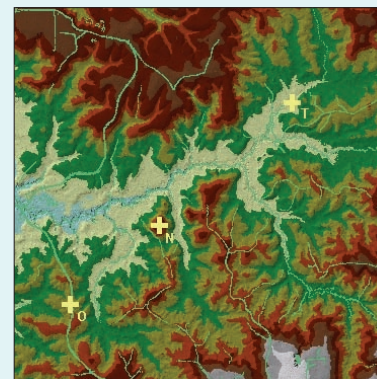
This orthographic (two-dimensional) view of the TIN area indicates the positions of the Observer (O) and Target (T). An additional coordinate, Object (N), is also shown. The orthographic view is handy for determining the base distance. The distance from the observer to the object is 6,334 feet. Multiplying this distance by 0.033 (or 1/30 of the distance from the observer to the object) yields a base distance of 211 feet. This base distance will be a starting value for determining the shift needed to generate the left and right images.
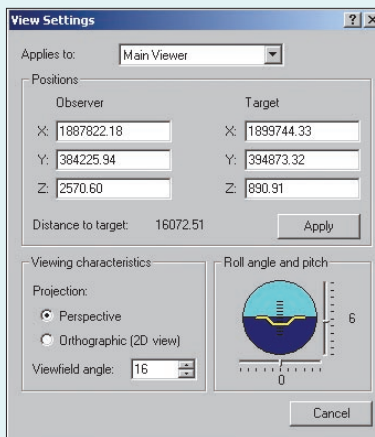
To apply the shift for the left image, choose View > View Settings. Subtract the base distance (i.e., 211 feet in this example) from the Observer X coordinate value. Click Apply and the image will shift to the right. Export the scene as a .jpg. Note that rule of thumb cited earlier is only a good starting point and some experimentation will be needed to determine the correct base distance.