

## Printed Holographic Cartographic Land Survey Images

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### Abstract:

[Texas A&M University-Corpus Christi](#) will demonstrate the usage of holographic technology to show temporal change of land surveys. Cartographic survey plats are generated in a GIS using ArcGIS and ArcSurvey. The images are converted into a holographic image using developed software. The final results of this research are past and present land survey plats fused into a holographic image. Different temporal images are visible when the printed holographic cartographic survey plats are viewed from different angles. The research demonstrates a new method to view land survey plats in printed format. Conclusions show the processes to develop printed holographic cartographic land survey images.

### Introduction:

Holographic cartography uses lenticular technology. Lenticular technology, also known as 'Autostereoscopic' displays allows three-dimensional image to a viewer without the need for special glasses (Roberts, 2003). Lenticular images are made using two or more images and a lenticular lens. Being able to concurrently view two or more map images at the scale help in cartographic visualization of information. This method of visualization is particularly important in being able to see change detection in land aerial images and survey plats. This research worked to demonstrate the method to develop these land survey images. This paper will discuss briefly how lenticular processes work. This will lay the ground work for what is needed to develop a printed holographic cartographic land survey image. Conclusions will be drawn that illustrate the application of a printed holographic cartographic land survey image.

### Lenticular Theory:

Lenticular theory is a method of making a two-dimensional surface look three-dimensional by using cylindrical lens that are molded in parallel rib-like rows to allow the viewer to see different perspectives as the surface is rotated. The parallel rows of lenticules have a focal length and field-of-view to each narrow strip of two or more interlaced images. The images are interlaced as seen in figure 3 where each lenticule magnifies a very narrow strip of the images behind the lens. As the lenticular board or lens sheet is rotated the view angle will expose one or more of the strips into the field-of-view. Figure 1 illustrates how the process works (Curtian,2003).

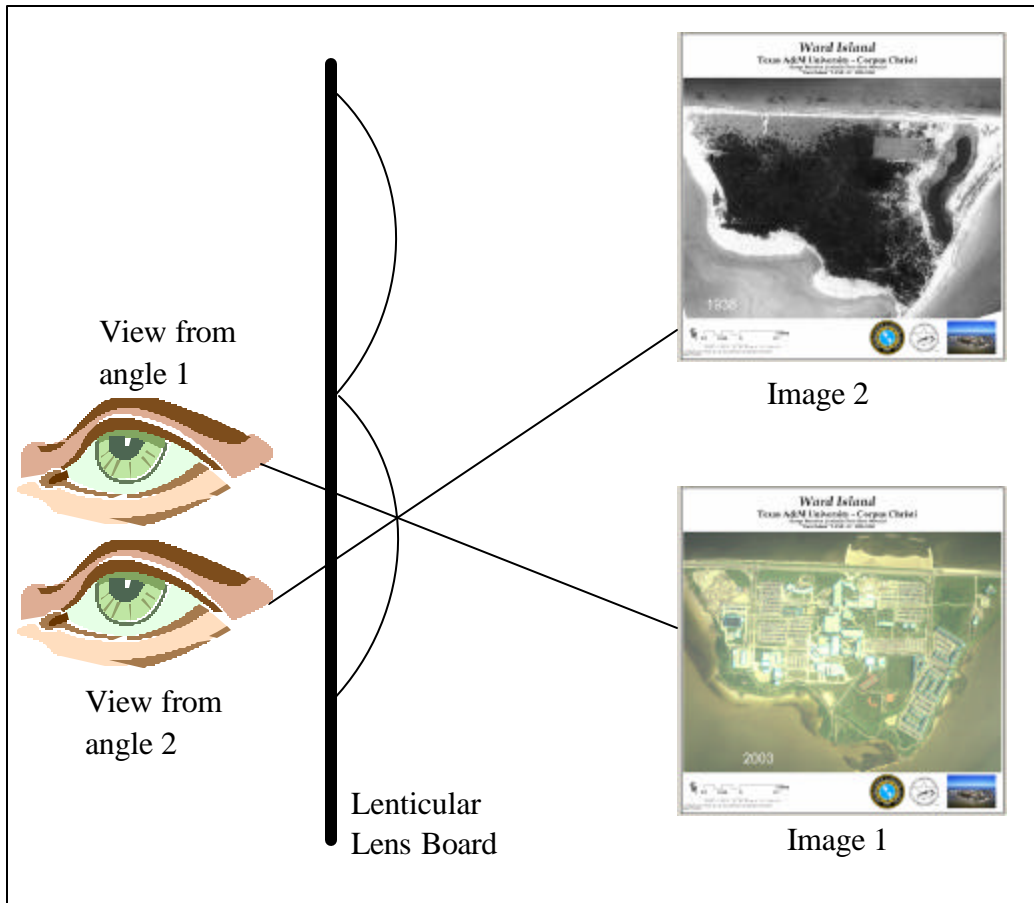


Figure1: Image One, 1938 aerial image georeferenced to 2003 aerial image (Roberts, 2003).

## **Lenticular Process:**

To make a holographic cartographic image you need to follow these steps:

### **Step One:**

Using ArcGIS create a number of final images that are the same image size and scale. It works best if the aerials images are georeferenced using the tool in ArcMap. If the data are survey files comprised of vectors from ArcSurvey, they should be in all in the same projection. Make a layout view with the first image having only the text needed for that image. In our example we have an aerial image taken in 1938. Export a map in TIF or JPG format (Figure 2) based on your lenticular interlacing software. Turn off the first image and update any text. Export another map of the second image. Continue this process until all images are produced in the holographic cartographic process (Figure 3).

### **Step Two:**

The images must now be interlaced so that each image can fit to its lenticule. The lenticule is designed to be configured in a lines-per-inch (LPI) specification. The more LPI the more detailed and animation of the image as it flips from image to image. Course LPI such as 30 LPI does not allow small lines to show very well. Finer LPI such as 60 LPI will allow smaller linear features to animate better. Commercially available software such as Magic Interlacer Pro 100 allows the import of the TIF or JPG and the configuration to match the lenticular LPI being used. Figure 4 illustrates the two cartographic maps interlaced together. Care should be taken to not have vectors and text that disappear within the LPI.

### **Step Three:**

Once the final interlaced image is made it must be adhered to the lenticular sheet. Micro Lens Technology Inc. manufactures lenticular lens that can be used in screen press operations or the images can be directly applied to the lenticular sheet. The sheet can be made to work with back light or front light for viewing. Micro Lens Technology Inc. has a simple step-by-step procedure to adhering the image to the lenticular sheet.



Figure2: Image One, 1938 aerial image georeferenced to 2003 aerial image.



Figure 3: Image two, 2003 aerial image with survey data.



Figure 4: Interlaced images

## **Applications:**

Change detection computer animations with cartographic images are common today. In digital presentations these animations are used to illustrate how areas have evolved. A&M-CC have used images and land survey plats animations in court cases. The difficulty with digital presentation is the limitation to a single user's point of view or speed of animation or control of the animation. It has been found that if we make a holographic cartographic image using lenticular then an individual can view the information within their own limitation. This allows them to view the information and form their own ontological process.

The holographic cartographic image is now in a fixed static, but flexible format that can be easily distributed to a larger audience that might not be available for the digital viewing. Examples included an animation of a proposed building on A&M-CC to alumni and stakeholders. These images help the university in obtaining funding by marketing ideas in three-dimensions to the spatial disjoined group such as alumni.

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## **Reference:**

Curtin, D.P., 2003, "Lenticular Prints" Retrieved from <http://www.shortcourses.com/how/lenticular/lenticular.htm> on June 23, 2004

Roberts, D.E., 2003, "History of Lenticular and Related Autostereoscopic Methods" Retrieved from <http://www.microlens.com/HistoryofLenticular.pdf> on June 23, 2004

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