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White Paper

Harnessing the Power of Raster Imagery

Autodesk® Raster Design is *the* solution for working with nonvector information in the Autodesk® product family. Raster Design offers a complete suite of tools for working with scanned maps, aerial photographs, and other digital raster images, and can be installed with any of the following products:

- AutoCAD®
- Autodesk Map™
- Autodesk® Land Desktop
- Autodesk® Architectural Desktop
- Autodesk® Building Systems
- Autodesk® Mechanical Desktop®

Using the tools in Autodesk Raster Design, you can quickly and easily insert, edit, correlate, convert, and manage your images, regardless of the source. This paper covers the most common uses of the software for professionals in the terrestrial sciences, including civil engineers, surveyors, environmental engineers, developers, community planners, and GIS managers.

Using Autodesk Raster Design for Surveying, GIS, and Civil Engineering

Surveying, GIS, and civil engineering firms face challenges brought on by working with information that does not fall within the traditional CAD arena. These challenges include working with satellite imagery, using multiple aerial photographs to cover large regions, editing historical records that exist only on paper, and incorporating as-built information into a new or revised design. These tasks fall into four major categories:

1. Importing raster imagery
2. Correlating and adjusting multiple images
3. Editing existing imagery
4. Converting scanned maps

These tasks may require multiple software packages or many hours of manual labor. Using multiple software packages decreases office efficiency because employees must learn new software environments and keep up with changes to several different platforms. Let's take a closer look at how Autodesk Raster Design can increase performance, accuracy, and efficiency in each of the four categories.

Importing Raster Imagery

Image capture techniques such as satellite imagery and scanned aerial photographs often use a global coordinate system, such as the Universal Transverse Mercator (UTM) projection, to identify locations on a worldwide basis. These are known as georeferenced images. When working on local maps, GIS project managers and civil engineers often use projections other than UTM. When you use Raster Design with Autodesk Map or Autodesk Land Desktop software, powerful transformation tools are available to match raster data to the coordinate system used in the CAD maps.

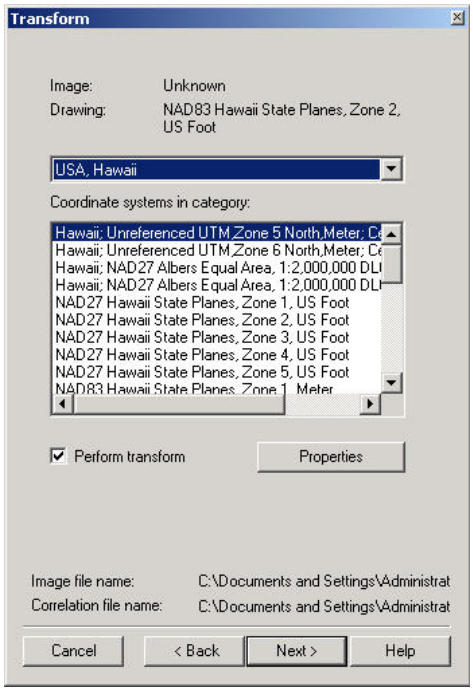

Figure 1: Autodesk Raster Design can use the full power of Autodesk Map, transforming images to match the current drawing's coordinate system.

"I often work on projects that involve inserting georeferenced ortho quads. These may be in a different projection system than my drawings. With Raster Design, I can insert these, and everything is just the way it is supposed to be," says Karl Fuls of AEC Training and Consulting in Pennsylvania. "We'll do this several times a week, and sometimes many times each day." Using these transformation tools, companies can ensure that their data is precisely placed, without manual calculations and transformations.

Correlating and Adjusting Multiple Images

Projects covering extremely large areas may require several images. "We had a project that spanned 23,000 feet of pipeline. One sheet would often have several images on it. Raster Design provides a means to use these georeferenced aerials as a backdrop for all our plan and profile sheets," says Larry Finnerty of Brown and Caldwell in San Diego, California. "We can merge several images together and create two plan views for each section of pipeline. One view will have just the CAD linework, the other will have the aerials in the background. Clients really like this technique since they can view the features on the ground easily."

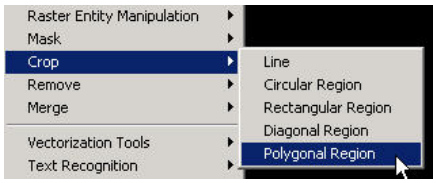

Figure 2: Use merge and crop tools to create custom imagery from many data sources.

One problem with using multiple images is file size. Georeferenced images can be extremely large, although only a small portion may be required for the job. "Often, my projects lie on the corner of as many as four quad maps," says Fuls. "These can be up to 45 megabytes each. With the merge and crop tools in Raster Design, I can have nice little snippets of these images, which are much easier to work with." By using smaller, custom images, designers save time when loading, saving, and printing files.

Editing Existing Imagery

Until recently, Autodesk products were known primarily for the power of their vector editing capabilities. To edit raster information, many companies turned to professional photo-editing software programs. One drawback, however, was that employees had to master several different software environments to get their job done. With Raster Design, you can edit images directly in the AutoCAD environment. As a result, users learn the software faster and the skill retention rate is much higher than for other software platforms.

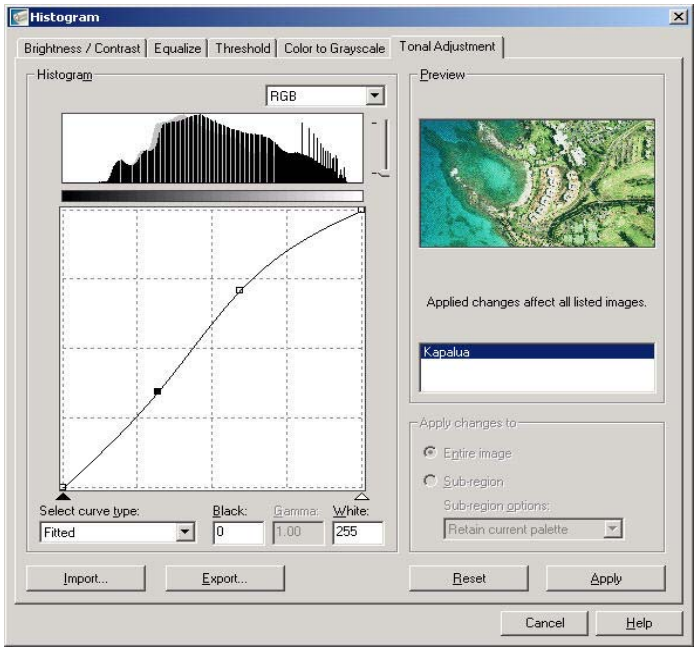

Figure 3: Use built-in editing tools to edit images directly in the AutoCAD environment.

In addition to the complex image editing tools, Autodesk Raster Design adds a new technique called *raster entity manipulation* for editing scanned maps. Using these tools,

anyone can edit a scanned map as easily as editing a vector-based drawing. Raster entity manipulation can target elements of an image and treat those elements as native AutoCAD line, arc, or circle objects. Once you have identified a portion of the image through raster entity manipulation, you can use standard AutoCAD commands such as Move, Rotate, Stretch, and Copy. You don't have to learn a new set of commands. You can use this technique to update archived maps that may have changed since the map was printed. In the past, these changes had to be made manually or by converting the entire map into a vector drawing—both time-consuming processes. With raster entity manipulation, you can incorporate these changes with minimal time and effort.

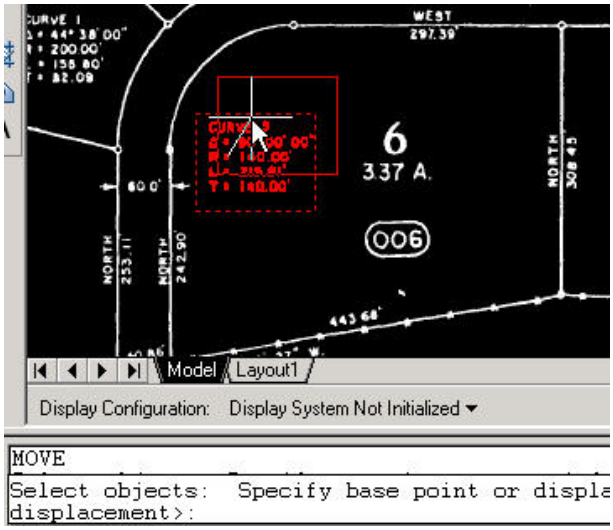

Figure 4: With raster entity manipulation, you can easily edit linework in a scanned image using the standard AutoCAD vector editing tools.

Converting Scanned Maps

Although you can use raster entity manipulation to touch up existing plans, sometimes these drawings, or portions of these drawings, must be converted to a full vector drawing. For example, such conversions are often required for existing ground or as-built topography to bring the contour lines into Autodesk Land Desktop for use as the basis of a surface model. In the past, a drafter would spend as much as 30 hours per sheet digitizing existing flow lines, assigning elevations, and creating a terrain model—a tedious task at best. Raster Design provides a full set of vectorization tools that automate much of this process, saving up to 80 percent of the time and labor costs associated with such conversions.

Because Autodesk Raster Design integrates smoothly with Autodesk Land Desktop, contour lines from a scanned map can be generated as true Land Desktop contour objects. These contour objects are then available for use in any Land Desktop project as the basis for a surface model, grading scheme, or site analysis.

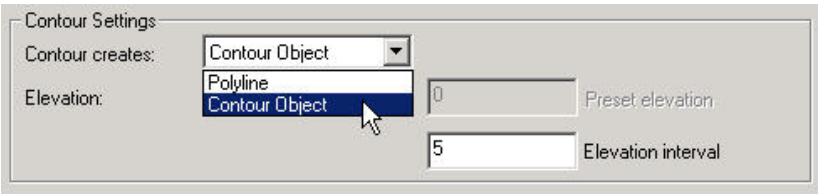

Figure 5: Use Autodesk Raster Design to convert scanned topography into Autodesk Land Desktop contour objects.

Autodesk Raster Design also provides tools for accurately converting any type of scanned map into native AutoCAD vector objects such as lines, arcs, polylines, and text. This can save you time when importing archived data into a GIS system such as Autodesk Map, Autodesk Envision™, Autodesk MapGuide®, or Autodesk® GIS Design Server software.

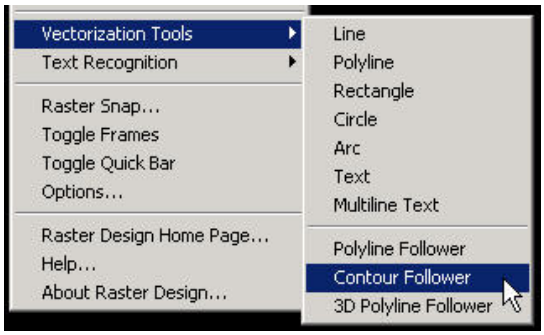

Figure 6: Conversion tools are available for all types of data.

When Seattle Public Utilities (SPU) saw the value of digital data, it decided to digitize 300,000 utility plan sheets dating back as many as 100 years. Once scanned, the plan sheets can be used with Autodesk Map and Autodesk Raster Design, giving design teams access to an entire library of usable plans. Drafters can pull out plans from decades in the past, coordinate the elements they need for the design project they're working on, and integrate data from other sources. Instead of going through 300,000 plan sheets, copying the parts needed, creating a scale, redrafting into AutoCAD—and hoping it comes out right—they can look up images on the intranet, pull out the relevant one, put it into the drawing, pick out the common points, and register it as a full-scale reference. Underground utilities on the plans, for example, are isolated, extracted, and converted into a feature on new project layers.

"Digitizing has made our extensive paper records far more accessible and useful," notes Gavin Schrock, a professional land surveyor with SPU. "We get faster, more productive use from our historical maps and plans because the software makes it so easy to extract the features and text we need, adjust the coordinates, and integrate with other GIS and CAD data."

Conclusion

To remain competitive, companies must make full use of their design data. Because historical and design information may not always reside in a traditional CAD system, Autodesk Raster Design can dramatically increase the use and reuse of this information,

without requiring you to learn a new platform and toolset. When asked if Raster Design could help other firms, Finnerty says, "I would absolutely recommend this software to anyone who uses Autodesk Map or Land Desktop. It is worth every nickel." As Fuls concluded, "With the amount of raster data out there, I don't see how people can do without it."

About the Author

Felicia Provencal is an independent consultant with K-Tek Solutions and is based on Maui. She has more than 17 years of experience working with Autodesk products in the civil engineering, GIS, and construction industries. As an author for the Autodesk *Toplines* newsletter, she writes monthly tutorials on Autodesk Infrastructure Solutions. A popular Autodesk University instructor, she currently offers training and consulting for firms throughout the United States and Pacific Basin.

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Autodesk, Inc.
111 McInnis Parkway
San Rafael, CA 94903
USA