

Editing DEM and Multispectral Data in Autodesk Raster Design

Digital elevation models (DEMs) can provide an accurate, affordable representation of the earth's surface and are a valuable data source for civil engineers and other land-use professionals. With Autodesk® Raster Design 2005 software, DEM and multispectral data could be displayed, viewed, and visually analyzed, but not edited.

With Autodesk® Raster Design 2006 software, engineers and land-use professionals can use DEM and multispectral data in new ways, for example, transforming, editing, and saving this data in the Autodesk project environment.

Many projects require images for presentations, reports, or websites, consisting of different displays from a given data set to show various site characteristics. The new image capture functionality of Autodesk Raster Design 2006 software enables users to save a displayed image as a small file in JPEG, PNG, or several other formats.

This paper shows how the ability to edit DEM and multispectral data brings greater value to users of Autodesk Raster Design software.

Transform DEM and Satellite Imagery to Your Drawing Coordinate System

DEM or satellite images are often projected in a different coordinate system from that of a project or drawing in which it will be used. For example, engineers may be working in a regional coordinate system (such as State Plane in the United States), but the available DEM files are in Universal Transverse Mercator (UTM). New functionality in Autodesk Raster Design 2006 software makes it easy to transform the coordinate system of an image as it is inserted into a drawing.

Figure 1 shows an example of coordinate transformation. It shows the original drawing of a street network, the Image Insertion settings used to import a DEM image, and the resulting display of the terrain aligned perfectly with the street network. As shown near the bottom of the dialog box, the drawing uses the NAD27 New Hampshire State Plane coordinate system. When a user selects the DEM image, the new version of the software reports its coordinate system as NAD27 UTM zone 19 (at the top of the dialog box). To correlate this with the drawing, the user selects the coordinate system of the image in the middle section of the dialog box, and then selects the Transform check box at the bottom.

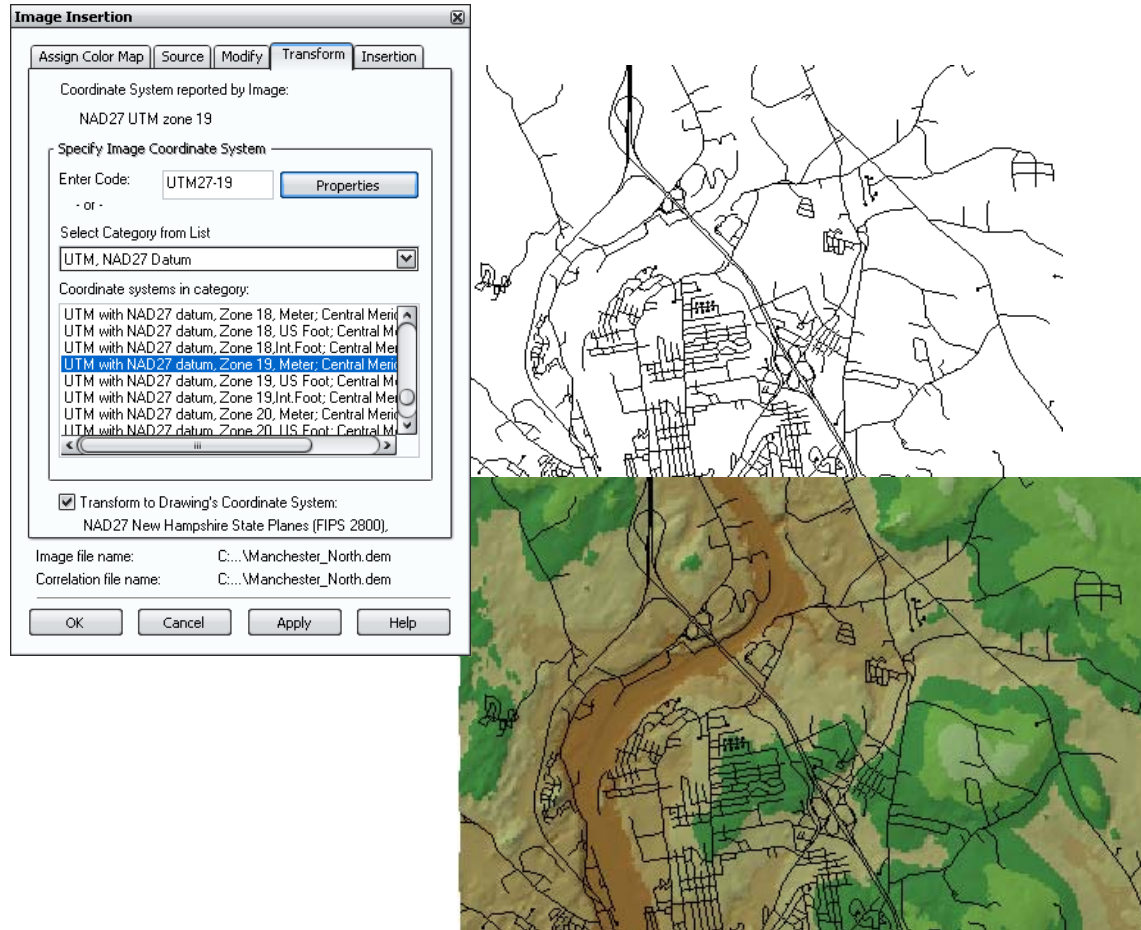


Figure 1: DEM file transformed to the drawing's coordinate system.

Sometimes it is necessary to transform a DEM from one UTM coordinate zone to another, such as when two adjacent USGS DEM files lie in different UTM zones. When they are imported, they do not appear adjacent in the import dialog box. X coordinates within UTM zones repeat, so the DEMs may be misaligned. Transforming them to the same coordinate zone resolves the problem.

Prepare Images for Visual Analysis and Display

The DEM display in Figure 1 shows the elevation bands of the terrain with a small amount of vertical exaggeration and hillshading effect. In specific projects, users may also want to show the degree of land slope or aspect (direction of slope) in relation to the streets and other project details. In this case, simply change the color map to show these relationships and use the new Image Capture feature in Autodesk Raster Design 2006 software to save lightweight copies of the image for presentations. Figure 2 shows the slopes in the project area.

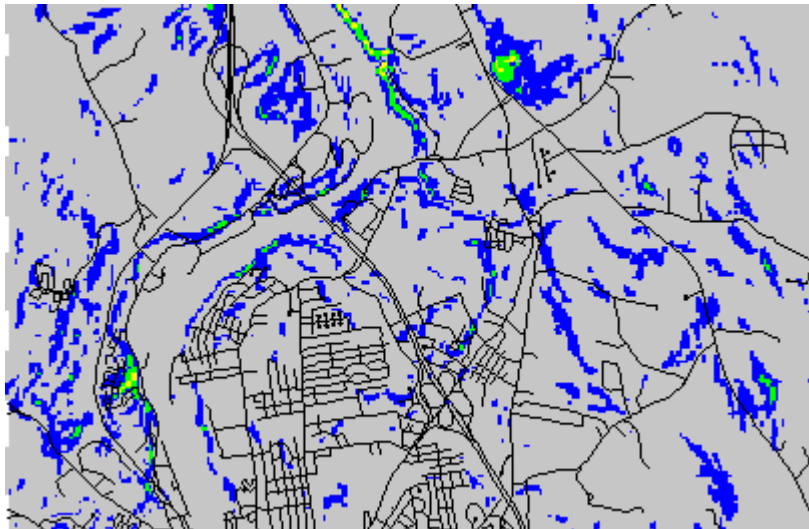


Figure 2: Equal distribution color map of land slopes.

The key to this color map is as follows:

- Gray, 0–7 degree slope
- Blue, 8–15 degree slope
- Green, 16–22 degree slope
- Yellow, 23–29 degree slope

The color map in Figure 2 shows an equal distribution of slope values, with each color representing a range of 7 degrees. Although this provides a good overview of the terrain, users might want a more detailed presentation of slopes in certain areas. The new version of the software makes it easy to edit the color map for specific purposes and capture the results for analysis. For example, to see more detail of the low-slope areas in Figure 2, apply a quantile distribution of slope values, as shown in Figure 3.

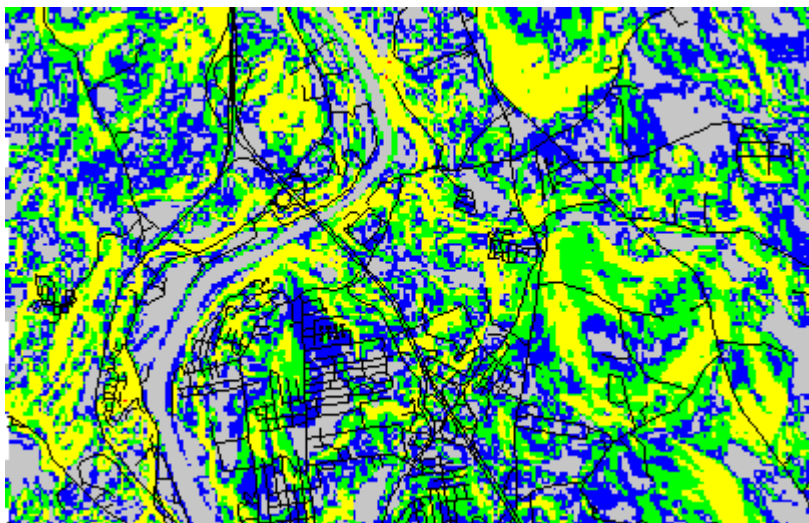


Figure 3: Quantile distribution color map of land slopes.

The key to the quantile color map is as follows:

- Gray, 0–2 degree slope
- Blue, 3–4 degree slope

- Green, 5–6 degree slope
- Yellow, 7–26 degree slope

With this color map, users can zoom in to particular areas of interest and capture displays that clearly show the difference between areas that are almost flat and those with a slight slope.

The Autodesk Raster Design 2006 product also supports the production of specialized images with GeoTIFF Export and Image Capture. These features combine well with other image-editing tools. For example, users can merge multiple images and save them in a different format such as JPEG2000, apply masks or crops, and then process the image to improve the resolution of details. The resulting images are portable to other image-handling applications, such as the family of AutoCAD®-based products. Figure 4 shows an example of a circular image crop used to show land elevations within a small area of interest.

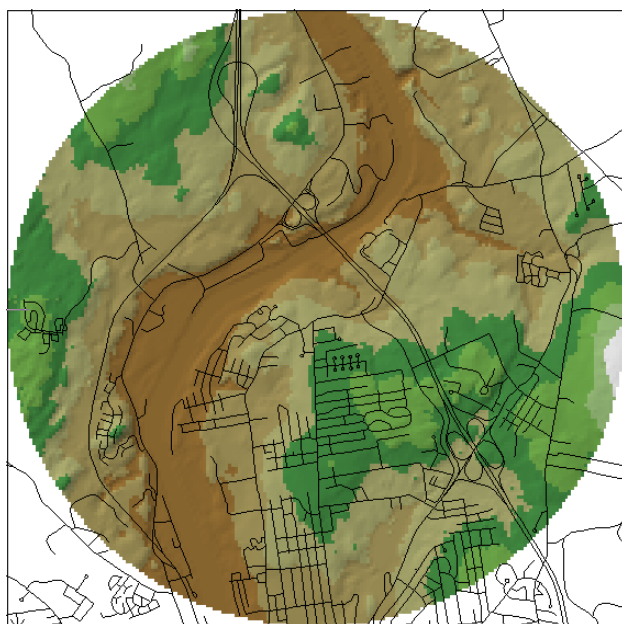


Figure 4: Circular cropped image.

Capture Images in Multiple Formats

The Image Capture feature enables users to, in effect, take a snapshot of the display on their computer and decide later which format to save it in. This is especially useful for working with multispectral satellite images.

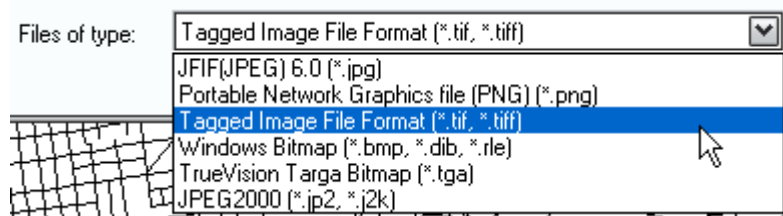


Figure 5: Sample choices for saving a captured image.

For example, Figure 6 is taken from an 18 MB multispectral data set. This image capture is an 11 KB JPEG file that preserves enough detail for many analysis and display purposes.



Figure 6: Lightweight capture of a satellite image.

When saving a correlated image, Autodesk Raster Design 2006 software's new GeoTIFF Export feature provides a convenient and reliable means of ensuring that correlation data is not lost when working with multispectral imagery. Users assign the drawing's coordinate system to the saved image, which ensures that it always aligns correctly with the data in the drawing.

Coordinate System Assignment

File horizontal coordinate system

Code: 32010

Name: NAD27 / New Hampshire

Area of use: United States (USA) - New Hampshire - counti

Citation: NAD27 / New Hampshire

File vertical datum

Code:

Vertical units:

Drawing coordinate system

Code: NH

Description: NAD27 New Hampshire State Planes (FIPS 2800), US Foot

Description

Specify the coordinate system code that matches your Drawing global coordinate system. Leave the field blank if you want no code to be used.

"Select" may be used to choose the code from the list.

Use "Properties" to get more details on the systems to help you specify the correct code.

Use the Citation field to store descriptive text in the file.

Figure 7: Assigning a coordinate system to an exported image.

Conclusion

The new image-handling features of Autodesk Raster Design 2006 software offer great opportunities for the creative display and analysis of DEM and multispectral data. For many users, this provides the ability to lower the reliance on external agencies to produce images. Instead, they can now experiment with different color maps, scales, crops, and other effects on their own desktops. In the process, they may discover new ways to use image data and new ways to save time and money in their projects.

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