

GeoExpress 5.0 Extends the Utility of MrSID Generation 3 and JPEG 2000 Images

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It's not uncommon these days for a geographic information system (GIS) to contain many gigabytes of high-resolution, orthorectified imagery. More counties are being flown to collect one-foot-resolution images, and cities often opt for six-inch-resolution coverage. Such large amounts of data place intense demands on hardware and software that must efficiently store, retrieve and manipulate the imagery. Although computer disc access speed and processing power continue to increase, it's still necessary to employ inventive

software techniques to achieve reasonable performance in a typical GIS.

One of the many solutions on the market and in research labs worldwide is the Multiresolution Seamless Image Database (MrSID) format for image encoding from Seattle-based LizardTech Inc. Based on technology developed at Los Alamos National Labs in 1995, MrSID was one of, if not the first, encoding format to use wavelets. Wavelets encode images with variable amounts of high-quality compression in such a way that lower resolutions of the image can be retrieved and viewed without reading the entire file stored on the hard drive. As the user increases the scale of the view, higher resolution data stored deeper in the file "fills" in the

data already in view. Thus, the reduced-resolution data sets users are familiar with in various formats can be made implicit in the wavelet-encoded image.

Until now GIS and image processing packages had to treat MrSID images as immutable objects. The images can be easily stored and viewed, but the projection of each image was fixed. Although many packages can reproject the images using affine transformations "on the fly," this technique doesn't always satisfy accuracy requirements over large areas or when datum transformations are required. The latest release of LizardTech's GeoExpress software addresses this issue and significantly increases the utility of the MrSID Generation 3 format in other areas. Lizard Tech also provides support for the open-standard JPEG 2000, the latest wavelet-based encoding standard that has been adopted by the Department of Defense (DoD).

Workflows are centered around the idea that images of supported formats may be encoded (compressed), reprojected, and mosaicked into MrSID Generation 3 and JPEG 2000 files. Supported formats include TIFF images with .tiff files, JPEG images with .jgw files; BIL, BIP and BSQ with .hdr files; and LAN, GeoTiff, ERDAS IMAGINE, U.S. Geological Survey DOQ, MrSID Generations 2 and 3, and JPEG 2000.

Image Reprojection

GeoExpress 5.0 allows reprojection from supported formats into MrSID Generation 3 and JPEG 2000. Available coordinate systems include the standard State Plane and Universal Transverse Mercator systems, along with many others in various datums. Options for this feature are what one would expect from a professional application—user-defined resolution and standard resampling options, as well as fast operation. For example, the review team encoded [with a 20:1 compression ratio], reprojected and mosaicked two 350MB three-band GeoTiff files in less than five minutes on a Pentium 4 computer with 2GB of RAM.



Two 350MB GeoTiff files in the State Plane system were reprojected and mosaicked in geodetic coordinates on WGS84.

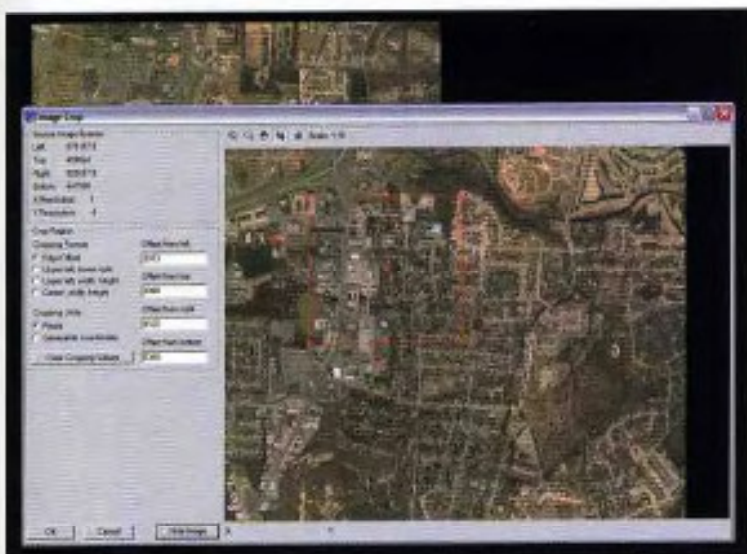


Image cropping is accomplished in a separate window from the preview pane. Crop areas may be defined by user-defined pixel or mapping coordinates, or by a rectangle drawn on the image (red rectangle above).

Area of Interest Encoding

One interesting feature of this version of GeoExpress is its ability to designate a rectangular area of interest within an image to remain high quality as a lossless image while "lossily" compressing the remaining image. One may also want to use this feature to obscure a classified or sensitive area—a feature important to many federal agencies. This feature can dramatically reduce the size of the overall image file for efficient storage and distribution. One limitation in this version is that only one area in a particular image or mosaic may be designated.

Multiresolution Mosaicking

Many GIS users have images that were captured at different resolution (e.g., the aforementioned county and city governments). Although these different coverages may be stored as different layers in a GIS, there are cases

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in which imagery could profitably be mosaicked for distribution or efficient viewing. However, combining these images using other formats would require a user to resample the lower resolution images to the resolution of the large-scale images. This isn't efficient or practical. GeoExpress solves the problem by allowing users to combine

multiresolution images into a single, efficiently encoded MrSID Generation 3 image.

JPEG 2000 Encoding

GeoExpress 5.0 offers JPEG 2000 encoding of any type of "raw" imagery, including all the formats mentioned previously with single and multiple bands. The software allows one to

mosaic existing JPEG 2000 images, MrSID images and "raw" images into a single JPEG 2000 image. The mosaic may be a cropped area that covers several images from different coordinate systems.

JPEG 2000 Image Profiles

GeoExpress 5.0 supports some of the advanced features of JPEG 2000 that are of particular interest to DoD and enterprise GIS users. Users have access to the predefined image profiles that meet DoD image standards. These profiles, defined for NPJE and EPJE, are meant to save time and maintain quality by producing consistent and conformant JPEG 2000 images. The software also allows users to define their own image profiles that may be applied to all images in a particular project.

Workflows and Data Cartridges

The software provides a single, clean dialog interface that allows access to all controls, as well as an image viewing pane from which a user may define cropping areas, examine output mosaics (for seam artifacts for example), and look at reprojected images. Workflows can be a little confusing to the novice, but become familiar with a little practice and guidance from the included documentation. The html help files were more than adequate, but require pop-up blocking to be turned off in one's browser to use the search capability. The installation includes a command line utility, which wasn't tested, that allows encoding in a scripting interface.

One aspect of the application that will require attention from the user is the notion of "data cartridges," which are



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Company: LizardTech, The National Building, Suite 200, 1008 Western Ave., Seattle, WA 98104

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Web: www.lizardtech.com

Price: GeoExpress Lite 5.0 \$1,500

GeoExpress 5.0 \$7,900 (unlimited standalone)

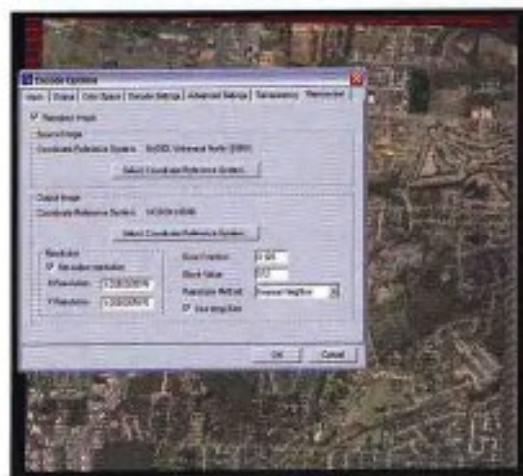
GeoExpress 5.0 Encoding Bundles

\$2,900 Level 1 (100GB of annual encoding)

\$3,900 Level 2 (500GB of annual encoding)

\$4,900 Level 3 (1TB of annual encoding)

basically prepaid encodings counted in gigabytes. Users may buy an unlimited data cartridge for a fixed price, or buy cartridges that allow encoding of, say, 100GB. This allows flexibility for a user who is working on projects with a known amount of data. GeoExpress provides a gauge to see where



In the reprojection options dialog, the image in the background has been reprojected with null areas shown in red.

one stands in the data cartridge, and it is wise to check it often.

Overall, GeoExpress 5.0 offers several new capabilities that should be useful for any imaging or GIS professional who works with large image data sets. Users who require real-time reprojection and mosaicking in their Web mapping service also should check out LizardTech's GeoExpress Server edition.

