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# The Growing Use of Imagery for GIS Applications

Image-analysis applications and RS imagery, provide a cost-effective solution...

It is now more than 30 years since the Landsat sensor began to acquire real-time satellite imagery of earth from space. In the subsequent years, satellite imagery has become an invaluable source of information for people across virtually every industry and discipline, including the GIS community. With satellite imagery becoming more accessible and affordable in recent years, GIS professionals now use it for diverse applications ranging from scientific research to resource management and urban development. The wealth of information users get from imagery is easily related to maps and other spatial data, providing an additional layer of information as well as the ability to come to more accurate, informed conclusions, regardless of application. Image-analysis applications, along with recently acquired satellite imagery, provide a cost-effective solution for updating GIS databases with accurate vector layers.

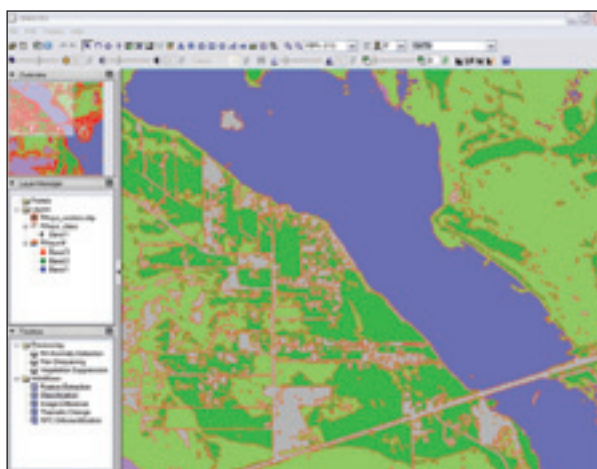
## Imagery Grows as a Source of Information for GIS

GIS professionals, amongst others, have found that remote sensing imagery is becoming an increasingly useful source of information that complements and updates their existing vector layers. Remote sensing can be used for determining the existence of and locating vegetation and other land covers, locating buildings, mapping roads and waterways and pinpointing development locations. In addition, remote sensing can also be used to create topographic and bathymetric maps, predict weather conditions and monitor changes over time. When integrated with a GIS that's capable of ingesting, storing, analyzing and displaying geographically referenced information, imagery provides the additional layer of knowledge that can't be gleaned from a map alone.

A number of factors make remote sensing imagery both a viable alternative and complementary data source to existing manual surveying methods. These include the regular monitoring of large areas, ability to extract additional information and the ease of integration of imagery and image products into a GIS.

## Sensor Data Adds to Value of Imagery

Remote sensing permits the regular monitoring of large, potentially inaccessible areas. The directional sensors onboard the latest satellite systems enable revisit times of less than three days whilst having a spatial resolution of less than 1m. Such capabilities give remote sensing the ability to quickly identify changes, which can be used to update existing maps and vector layers. These short revisit times make remote sensing imagery an essential tool for rapid response disaster management services. The fine spatial resolution of modern sensors permits identification of small scale changes such as new



This image of the Florida Keys has been classified using ENVI EX software. Different types of land cover are now clearly visible and highlighted using different colors assigned to various spectral bands in the QuickBird data.

building construction or deforestation. The economic benefits of using remote sensing are obvious when comparing the price of purchasing and processing a single scene covering in excess of 200 square km with the costs of manually surveying such an extent on a regular basis.

The capability of sensors to monitor outside the visible spectrum gives remote sensing the ability to compliment existing information. Imagery can be used to determine important parameters such as underlying geology and soil type, vegetation health and moisture content. Data sources such as RADAR and LiDAR can be used to create elevation models, examine vegetation canopy structure, monitor for oil and gas leaks and examine surface height variations caused by seismic events.

## Extracting Information from Imagery with Software

Advances in software technology for processing and analysis, such as the ENVI product line from ITT Visual Information Solutions, have increased integration between raster imagery with traditional vector-based GIS systems. Image-processing software developers like ITT have incorporated tools and workflows that are easy to use by GIS analysts who might have a wide range of experience, but may not necessarily be software experts. Such tools, previously used only in the scientific-research community, allow GIS analysts to access, analyze and share information from all types of imagery as well as easily integrate the information with GIS databases. Such advances have enabled GIS analysts to move away from using imagery as a colourful backdrop or for hand-digitization purposes to directly extracting valuable information from the imagery.

These image analysis advances have enabled the development of automatic and semi-automatic vectorization techniques, which are a viable alternative to the often complex and time-consuming process of manually locating and digitizing features. Applying such techniques to high resolution imagery enables the accurate extraction of vector layers of identifiable features such as individual buildings, vehicles, transportation networks, vegetation, etc. Today's GIS

imagery analysts increasingly need to find and identify such features within geospatial imagery to create maps for urban development, placement of telecommunication lines, model pollution, etc. The use of image processing software also allows GIS professionals to combine various datasets and take advantage of the increased information available.

As real-time satellite imagery becomes more affordable and readily available, its uses will continue to grow. More industries and disciplines will benefit from the information that imagery can provide, building on the processing and analysing knowledge that image analysts in disparate industries such as defence, intelligence and science have acquired during the last 30 years.