The most advanced image analysis software available for geospatial applications
Advanced sensors gather earth observation data from above the planet’s surface 24 hours a day – every day. eCognition is designed to improve, accelerate and automate the interpretation of images and geospatial data for environmental monitoring, resource development, infrastructure management and global security.

eCognition imports a variety of geospatial data, such as raster images, LiDAR point clouds, GIS vectors, radar and even hyperspectral data, fusing them together into a rich stack of geodata for analysis. Analysis logic is structured into a series of steps to create a computer-based representation of an expert’s geospatial interpretation process. eCognition then combines the analysis logic with scalable computing power to identify changes over time or features on the earth’s surface across very large sets of data.

At the heart of this process is a sophisticated approach towards identifying the objects contained within geospatial data – and structuring them into an interrelated network. This process is referred to as object-based image analysis or OBIA. This unique approach has proven invaluable to thousands of eCognition users across the globe conducting vegetation mapping, feature extraction, change detection and object recognition.
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eCOGNITION DEVELOPER
The most powerful development environment available for object based image analysis applications

eCognition Developer is used to develop rules which guide your geospatial analysis processes. An extensive collection of algorithms can be dynamically combined to facilitate the rapid development of geospatial analysis applications.

FOR EXAMPLE
• segment a scene using multiresolution, quad-tree, chessboard, or customized segmentation algorithms
• classify using sample-based nearest neighbor, fuzzy logic membership function or specialized context-driven analysis
• utilize layer operation algorithms to apply pixel based filters such as slope, aspect, edge extraction or user-defined layer arithmetics.

The result is a custom application which reflects the user’s desired analysis approach and requirements.

The application development process utilizes simple drag and drop functionality to enable users without any computer programming skills to quickly develop standard applications, while simultaneously allowing advanced users to leverage powerful tools to tackle even the most advanced tasks.

Included with eCognition Developer is a software development kit (SDK) which allows the core capabilities to be extended by adding algorithms, object features, data drivers and more.

Figure 1.
eCognition Developer provides a comprehensive development environment for object based image analysis applications
eCOGNITION ARCHITECT

Configure, calibrate and execute image analysis workflows

eCognition Architect enables workflow-guided solutions to be created from eCognition Developer logic using a toolbox of predefined actions. The resulting applications are easy-to-use and can be configured, calibrated and executed by domain experts, such as foresters or urban planners. This allows experienced geospatial analysts to create solutions for end-users who do not possess specific image interpretation or programming expertise.

As a result, geospatial analysis solutions can be implemented within sectors which traditionally have not relied on remote sensing data or industries which currently under-utilize remote sensing capabilities. It also allows companies wishing to add commercial value to remote sensing data to effectively establish editing and quality assessment production workflows.

After setting up an application in eCognition Architect, it can be stored and applied to a vast number of images by extending the eCognition installation with eCognition Server. This enables an image analysis process to be automated while providing extensive scalability through a service-oriented architecture.
eCognition Server software provides a processing environment for the batch execution of image analysis jobs, unlocking the full potential of eCognition. It can automatically “tile and stitch” (fig. 4) large scenes and process very large datasets. eCognition Server drastically reduces processing time by sharing the analysis workload across multiple processors.

Included with the eCognition Server is an extension for ArcGIS®, to effectively enhance the functionality of ArcCatalog™ and ArcMap™ with automated image analysis applications. Also included is the application programming interface (API) to allow eCognition Server to be embedded into existing workflows. Using the automation API, the system can be set up so that all steps from generation of workspaces to data submission and status monitoring can be triggered by third party software.

Figure 3.
eCognition Server features a service-oriented architecture facilitating batch processing of very large data sets.

Figure 4.
Automatic tiling and stitching allows very large scenes or image mosaics to be processed.
An increasing number of local governments and organizations need standardized, high-quality spatial information across all terrain. For example, maps containing information about impervious surfaces and their relationship to the water cycle are used in planning, site design and stormwater assessment billing.

Traditional methods for defining impervious surfaces are inaccurate and are compounded by poor quality aerial data, time-consuming heads-up analysis methods and the lack of a standardized approach. In addition, they are open to human error.

Recently however, a US company used eCognition Developer to study a representative area in the City of Columbus. Their aim was to improve speed, accuracy and fairness in determining tax dues for landowners.

The new semi-automated method, which involves fusing LiDAR and ortho-imagery, allows new impervious area delineation data to be created for each area owner. This more accurate segmentation and analysis identified 28,884 square feet of impervious surface that was previously unaccounted for – a finding of huge significance for the City of Columbus’ future tax revenue.

However, the overall value derived from this study is in the semi-automated method itself. At about a quarter of the cost of acquiring data via traditional photogrammetric techniques and heads-up digitizing, and with its improved accuracy and 75 percent time saving, this method lends itself to other areas with relative ease.

**HOW IT WORKS**

Firstly, all available GIS, LiDAR and image data are combined for subsequent analysis. Based on spectral and spatial homogeneity, data is segmented into similar regions. By aggregating pixels into image objects, additional information such as texture, shape and context can be leveraged within the analysis process.

Object-based image analysis can be done either using samples as guidelines for the computer or using rules in which features are described by their specific characteristics. Once a feature has been identified, it can then be extracted in standard GIS data formats. The data then goes through a final editing and quality check before being delivered to the customer.

**CONCLUSION**

Accurate impervious surface maps are becoming increasingly important. eCognition offers a cost-effective, fast and reliable solution to make them available over large areas.
The eCognition Suite offers three different components which can be used stand-alone, in combination or together with eCognition services to solve even the most challenging image analysis tasks.