Brochure

# IMAGINE Objective

Feature extraction, update and change mapping

## Addressing business problems

Globally, GIS departments and mapping institutions invest considerable revenue into creating and, perhaps more importantly, maintaining their geospatial databases. As the Earth is constantly changing, even the most precise base mapping must be updated or replaced regularly. Traditionally, the capture and update of geospatial information has been done through labour- and cost-intensive manual digitisation (for example from aerial photographs) and post-production surveying.

More accurate and complete information increases the value and ease of analysis. Remotely sensed imagery, whether airborne- or satellite-based, provides a rich source of timely information if it can be easily exploited into usable information. This transformation of data into tailored, relevant information provides benefits to a number of industries.

- Insurance companies can determine the presence or absence of swimming pools within land ownership parcels to correct liability insurance policies.
- Utility companies can identify and map the location of assets, such as manhole covers, across a citywide sewerage network. With assets installed over a long period of time, possibly by other companies, many utility companies have inaccurate or incomplete historical records.
- Local government institutions mapping urban growth (such as roads and buildings) can maintain a geospatial database for use by first responders, tax departments, planners, etc. When disasters strike, the ability to rapidly identify the location of damaged houses or other infrastructure is critical to aid in recovery efforts and minimise the loss of life.
- Forest management companies can more accurately estimate species mix, yield potentials and environmental impacts.
- Tax assessors can accurately map impervious surfaces and cross-reference ownership parcels, increasing the accuracy of tax billing and promoting better planning.
- State agencies can effectively manage water rights by mapping agricultural field boundaries and crop types.

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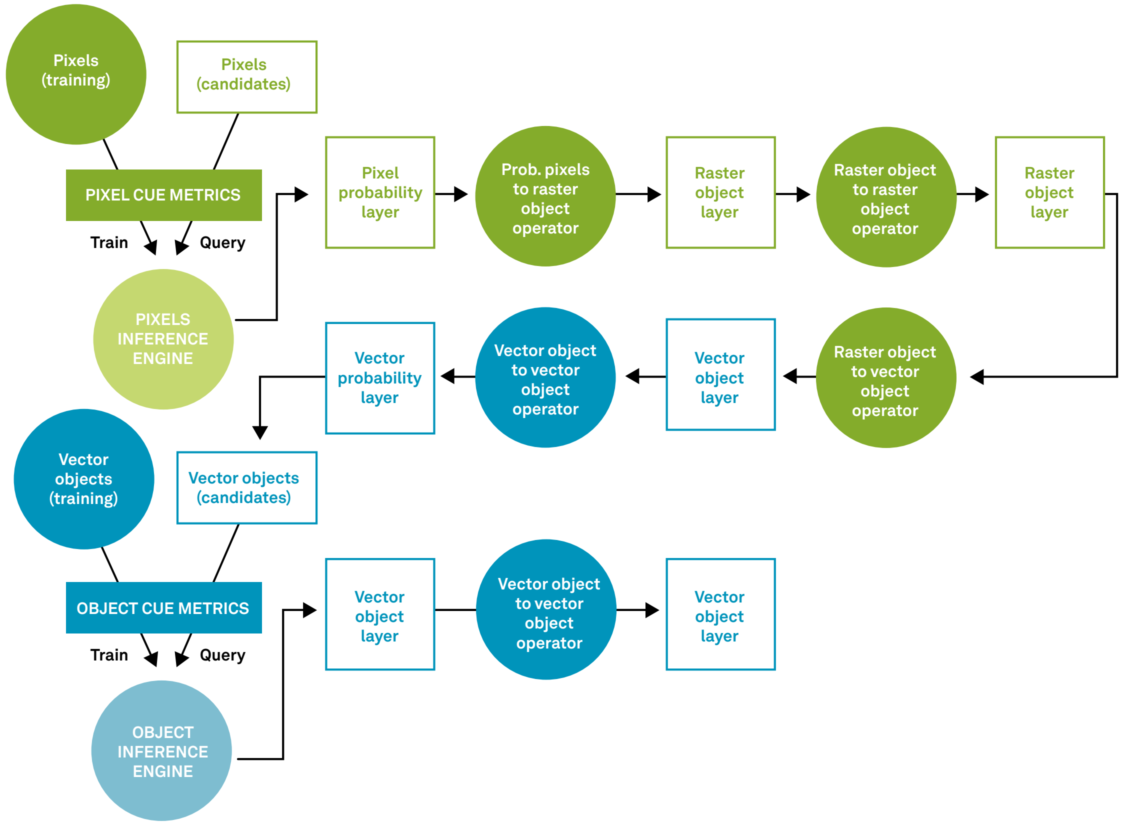


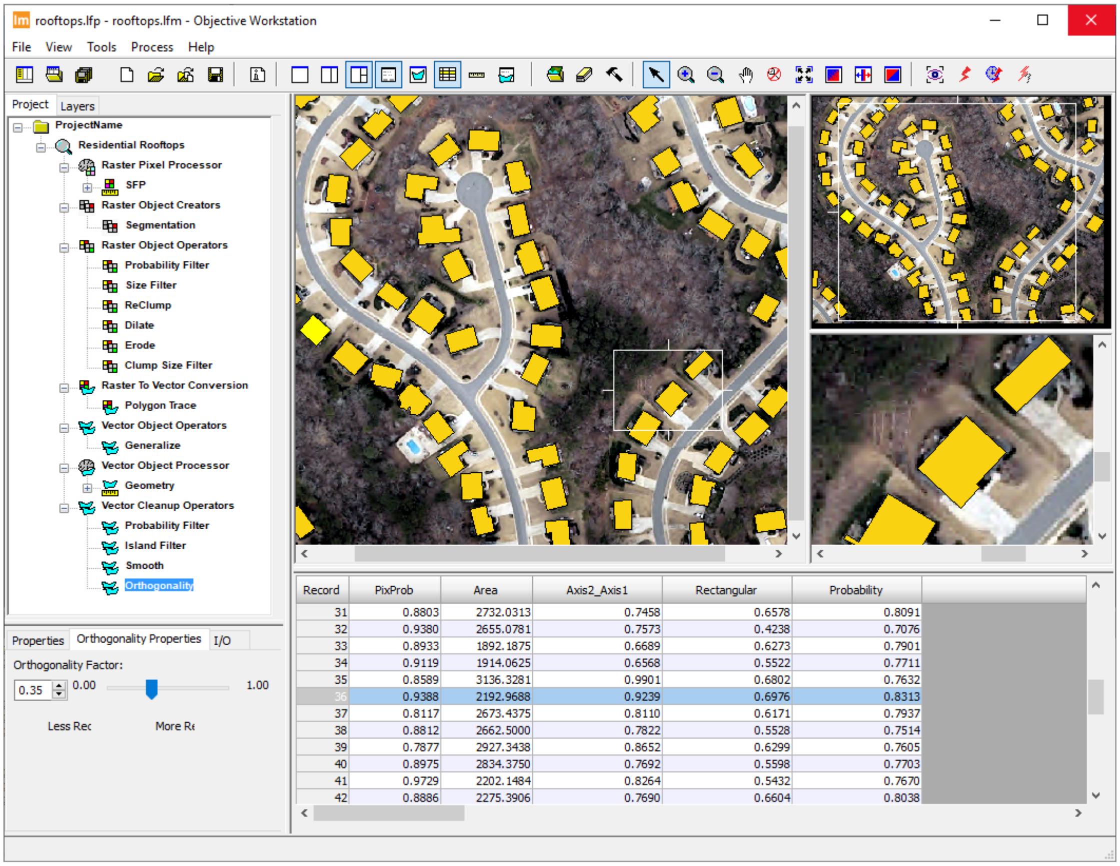

IMAGINE Objective provides object-based multi-scale image classification and feature-extraction capabilities to reliably build and maintain accurate geospatial content. With IMAGINE Objective, imagery and geospatial data of all kinds can be analysed to produce GIS-ready mapping.

## Automating workflows

Originally, workflows were performed manually. Since then, various attempts have been made to help automate workflows that analyse remotely sensed imagery. These attempts have often resulted in limited success, especially as the resolution of imagery and the intended mapping scale increases. With recent innovations in geospatial technology, we are now at a place where workflows can be successfully automated.

When the first Landsat satellite was launched more than 40 years ago, it was heralded as a new age for automating mapping of the Earth. However, the imagery, and therefore the geospatial data derived from it, was of relatively coarse resolution, and thereby became limited to smaller scale mapping applications. In addition, its analysis was restricted to “remote sensing experts.” Equally, the traditional supervised and unsupervised classification techniques developed to extract information from these types of imagery were limited to coarser resolutions.

Today’s sources for higher resolution imagery - 1m or smaller pixel sizes, such as that produced by the GeoEye, Pleiades, QuickBird, and WorldView satellites or by airborne sensors - do not suffer from the “mixed pixel” phenomenon seen with lower resolution imagery. Therefore, the statistical assumptions that must be met for the traditional supervised and unsupervised classification techniques do not hold. Consequently, more advanced techniques are required to analyse the high-resolution imagery required to create and maintain large scale mapping and geospatial databases. The best techniques for addressing this problem analyse the imagery on an object, as opposed to pixel, basis.




The IMAGINE Objective workspace shows a feature model designed to extract the locations of building footprints in a GIS-ready form to minimize manual postprocessing and editing.

## Intuitive feature extraction and classification tools

IMAGINE Objective includes an innovative set of tools for feature extraction, update and change detection, enabling geospatial data layers to be created and maintained through the use of remotely sensed imagery. This technology crosses the boundary of traditional image processing with computer vision through the use of pixel level and true object processing, ultimately emulating the human visual system of image interpretation.

Catering to experts and novices alike, IMAGINE Objective contains a wide variety of powerful tools. For remote sensing and domain experts, IMAGINE Objective includes a desktop authoring system for building and executing feature-specific (buildings, roads, etc.) and/or land cover (e.g., vegetation type) processing methodologies. In addition, more entry-level users may apply existing examples of such methodologies to their own data. The user interface enables the expert to set up feature models required to extract specific feature types from specific types of imagery. For example, road centerlines from 60cm Colour-Infrared (CIR) satellite imagery require a specific feature model based around different image-based cues. Building footprints from six-inch true colour aerial photography and LiDAR surface models require a different feature model. For those familiar with existing ERDAS IMAGINE capabilities, an analogy can be drawn with Spatial Modeler, an object-based workspace to graphically draw and arrange a processing flow using drag-and-drop operators and connectors.

The less experienced user can simply use built-in example feature models or those built by experts, applying them as-is or modifying through the user interface. While similar to the IMAGINE Knowledge Engineer approach, the construction and use of feature models within IMAGINE Objective is simpler and more powerful. Constructing a feature model is more linear and intuitive to the expert building the model. In addition, the support for supervised training and evidential learning of the classifier itself means that the feature models are more transportable to other images once built.

Hexagon's patented approach uses a unique combination of artificial intelligence, computer vision, and traditional image processing and remote sensing technologies. As a result, the algorithms perform not only raster contouring (stair-stepped results), but also incorporate object and vector level processing to yield a spatially matched, precise shape for each feature. Consequently, the output generated from the product, such as smooth roads and squared-up buildings, will be GIS-ready.

The output can be directly merged into a GIS with minimal post-processing, and will accurately reflect the image content. Outputs include clean vector outlines and auto-attribution of polygons with probability measures, enabling querying of dubious results for quality control purposes.

Feature types for built-in example feature models distributed with the software include:

- Vegetation delineation
- Road extraction
- Building footprint extraction
- Building footprint change identification
- Military targets (airplane types, ship types, etc.)

Users may also build their own feature models.

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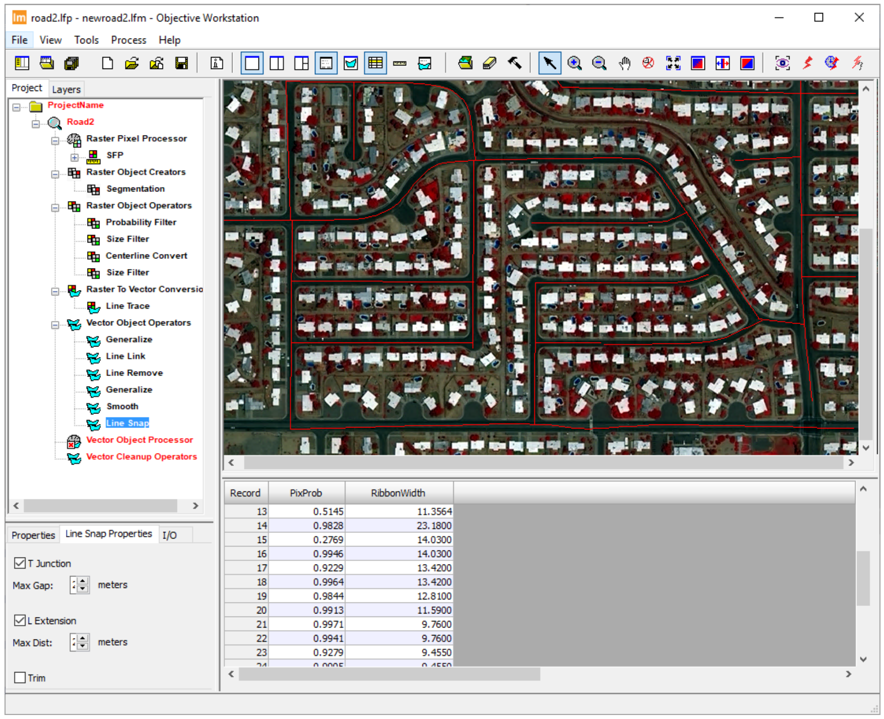


IMAGINE Objective includes a desktop authoring system for building and executing feature-specific processing methodologies for roads.

## IMAGINE Objective methodology

- Offers open, modifiable and extensible feature models. This flexibility means that the classifier can be fine- tuned to the specific circumstances of the imagery being analysed if initial results are not adequate.

- True object-oriented approach means in addition to employing spectral properties, the spatial components are also measurable and available to the processing engine. Caters to discrete feature extraction (e.g., where are the buildings) and multi-class extractions (wall-to-wall classification), providing a flexible tool for a variety of problem scenarios.

- Provides discrete feature extraction, where cleanup operators can be included in the feature model to produce output suitable for merging into a GIS with minimal post-processing (squared-up buildings, smooth gapless roads, aircraft outlines, etc.).

- Integrates with ERDAS IMAGINE, providing a full suite of vector editing tools for further cleanup and editing. This integration provides an end-to-end feature extraction process within one integrated package. Other workflows often require steps to be performed in different software packages, with the inherent possibility of losing information and efficiency.

- Uses ancillary layers (data fusion) – e.g., slope, aspect, LiDAR, texture, etc. – along with the capability inherent with an object-based approach to employ shape metrics, proximity and association, leading to increased feature extraction accuracy.

- Leverages holdings of all remotely sensed imagery, including panchromatic, multispectral, hyperspectral, SAR, LiDAR, etc.

- Extracts features and classes that are attributed based on the measures used to identify them, including a final probability of being in that class, enabling quicker validation of final results and analysis of problem areas.

- Provides the ability to prototype and test a new feature model on user-selected view windows (even if the training evidence lies outside the area to be processed) for rapid fine-tuning and applying the finished feature model to the whole data set (or to different data sets).

- Deploys floating licenses as standard, ensuring that maximum usage of the software can be made across an institution’s network.

| Product and interaction |
| --- |
| Link to a **GeoMedia** environment from the ERDAS IMAGINE interface to synchronise navigation and area of interest. |
| Enhance imagery in **ERDAS IMAGINE** before bringing it into IMAGINE Objective. |
| Raster backdrops using the ultra-fast ECW compression format may be directly consumed in **ERDAS IMAGINE.** |
| Output vector or raster files from your IMAGINE Objective results into any GIS-ready platform like **GeoMedia.** |
| Enhance imagery in **ERDAS IMAGINE** before publishing to GeoMedia WebMap. |
| Publish your results from IMAGINE Objective to **ERDAS APOLLO** and deliver over the internet as server-side geoprocesses (WPS). |
| Raster backdrops can be streamed, using the ultra-fast ECWP streaming protocol, by **ERDAS APOLLO.** |

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Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's critical services and infrastructure. Our solutions turn complex data about people, places and assets into meaningful information and capabilities for better, faster decision-making in public safety, utilities, defense, transportation and government.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 3.8bn EUR. Learn more at hexagon.com and follow us @HexagonAB.