CHANGE DETECTION

Change Detection

Change detection is used to highlight or identify significant differences in imagery acquired at different times; playing   an important role in the lifecycle of GIS features and providing the capability to update feature data based on new imagery.

Key application areas include:

- Detecting changes in land use & land cover

- Delineating wetlands loss and encroachment

- Estimating forest loss through development or disease

- Identifying new housing and infrastructure changes

- Mapping flood extent areas and disaster impact zones

Product Offering

IMAGINE Advantage®

ERDAS IMAGINE® provides two tools for change detection under the Image Interpreter button. From Utilities, the   Change Detection operation allows for two continuous images as input. The user can define a threshold value for the   change a single pixel must have from one year to the next to be marked as change. A "highlight" file will then be created, marking pixels that have increased or decreased more than the threshold value. Those highlighted pixels could represent areas where a new building has been constructed or a forested area clear cut. The tool is meant to give a quick look at the amount of change between the two dates. The output of this operation is rarely useable as a GIS layer. It gives the high-level view of change for an area so that the amount of effort to capture the change can be more reasonably estimated. The function does not differentiate between the types of change or perform any pre-processing to eliminate false positives due to problems with the data (such as radiometric differences, misregistration, clouds, etc.). For this type of change detection, the IMAGINE DeltaCue module is more appropriate.

The Matrix operation from the GIS Analysis menu allows two thematic images or vector files of different years to be compared. By comparing two classified or vector sets of data, you eliminate false positives due to radiometric   differences. If, for example, two simple classified images were fed into the process and had three classes in each file   of water, bare ground and forest, the resulting file from the Matrix operation is a thematic image where classes such as "was water is now water" shows no change from year one to year two. Other classes like „was forest is now bare ground" would show areas that had been clear-cut.

IMAGINE DeltaCue

This add-on module for IMAGINE Advantage uses project-based workflows to manage preprocessing, change detection, change filtering and change results viewing and interpretation. Wizard workflows assist users with initial inputs and selection of preprocessing and processing steps to target changes of interest. Types of change not of interest to the user can be quickly filtered out. Project files established by the wizard manage the resulting ancillary files generated for quick load into the special change detection viewers.

The change thresholds can be set interactively, allowing the user to adjust the levels to key in on the change of interest. This allows the user to make adjustments before the final output is generated, eliminating the need to rerun the process. As stated, prepossessing is included in the workflow to adjust for radiometric differences

and provides the option for cloud and shadow filtering. When data from a supported sensor is used, the resulting change can be filtered for vegetation or non-vegetation change. The workflow also allows for spatial filtering to remove areas failing to meet certain criteria such as a minimum area from the output to automatically filter noise.

IMAGINE DeltaCue also provides special viewing environments for quick evaluation of outputs. The change detection viewer uses geo-linked windows to pan and zoom together with automatic synchronization and overlay change results on top of the original imagery. A change magnifier allows rapid investigation of before and after areas. The site-monitoring viewer is a customized display for the manual interpretation and monitoring of subtle changes of specific sites. It provides multi-temporal display of individual bands, as well as Tasseled Cap components.

The strength of the IMAGINE DeltaCue add-on is its inclusion of the pre and post processing steps as a part of the initial project setup, as well as its ability to give a fine-grained, material based detection of change.

IMAGINE Objective

This add-on module to IMAGINE Advantage provides an extremely flexible environment for building workflows to perform feature extraction and image classification on a variety of input data sources, including high-resolution satellite and airborne imagery. Such analyses can include change detection and mapping, such as training for a specific type of change between two image sources (e.g. vegetation at one date, building at another) or even identifying differences between a vector map and an image (e.g. utilizing an existing polygon geospatial data layer to identify existing building which have changed or new buildings that have been added).

IMAGINE Objective 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. If IMAGINE DeltaCue's pre-built analysis options do not cover the problem scenario you are attempting to solve, IMAGINE Objective should provide the flexibility to build an approach that does.

Additional Resources

- IMAGINE DeltaCue Review – product review of product against similar products in the market.

- IMAGINE DeltaCue Flyer

- Image Analysis for ArcGIS – Part of the Stereo Analyst for ArcGIS Extension, you can review the IMAGINE Advantage section as the functions exist as Image Difference and Thematic Change

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