CHANGE DETECTION IN URBAN AREAS USING VERY HIGH SPATIAL RESOLUTION SATELLITE IMAGES

A Case Study

CHALLENGES:

- The challenge was to integrate or even replace visual interpretation of optical remote sensing images.

INTRODUCTION:

We focus the task on "building" and "transportation areas" object classes. Indeed, both classes are important mapping objects and very good indicators for urban development. In the classification of the multi-temporal colored composition, principal changes are well detected. New buildings where there was only vegetation or changes in buildings structures are easily spotted. But the amount of "false changes" remains quite important. Changes due to the difference of slant effect between the two images for example. Solutions to reduce the number of false alarms will be searched through the application of post-classification rules. These rules can be based on the size and orientation of the change polygons. In fact these false changes polygons due to the slant effect are oriented in the same direction through the image. Other post-classification rules can be applied to smooth the classification image such as a reattribution of small areas that are not well classified using information on surrounding areas, etc.

KEY ASPECTS:

The Project aims mainly at using VHR satellite images in an urban and suburban context. We focus the task on "building" and "transportation areas" object classes. Indeed, both classes are important mapping objects and very good indicators for urban development. We try to map main changes implying these two classes of objects, as these are the most important phenomenon while updating the urban database. The result of the change detection procedure should be presented as a change map, also called an update report.

METHODOLOGY:

- Study zone

  The city presents diverse land cover and land use types. In the framework of this study we decided to work with per-region classifications.

- Data

  - Database - It is built up by photo-restitution. Information is added through the digitalization of the cadastre files and completed by diverse administrative codifications. The aerial photographs of 1996 and 1999 helped during the initial photogrammetrical restitution phase.
  - Aerial photographs - The CIRB kindly gave us access to the aerial photographs from the 1999 (area of 800 m X 800 m & resolution 0.1 m) and 2004 (area of 840 m X 840 m & resolution 0.8 m) flights.
  - Satellite images - We used a Quick bird bundled image product of July 13th 2003 fully ortho-rectified. The resolution is of 0.71 m for panchromatic and 2.84 m for the multi-spectral channels. Ground control points were measured using differential GPS in

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TESTIMONIALS:

Thanks so much.... That is why I never even look to get prices from other aerial companies. I have had nothing but good experiences with Layer.

Training and validation data

To train the classifier and to evaluate the classifications, we gathered training and validation samples across the study areas. As we are using different kinds of data, we developed two methods. The first one, the change detection thanks to a multi-temporal classification, is used when comparing data coming from different sources and with very different scales. The second technique implemented in this study is post-classification change detection.

Multi-temporal color composition and classification

In this study we used this first technique to compare the IKONOS image of 2000 with the Quick Bird image of 2003. As a pre-classification and enhancement technique, we used a multi-temporal colored composition. This image allows us to visually detect important changes as they stand out in bright colors.

Change detection post classification

This method is tested for data from different sources and with different scales. In this classification there are three levels. The first one concerns vegetation and non vegetation. The shadow class is subdivided into two classes (shadow on vegetation and shadow on non-vegetation). The second one is based on the land cover scheme. The third level differentiates, for each built-up class of the second level, transportation areas from buildings; they are classified according to required features such as shape, size, etc. of the objects.

QC/QA

A QC checklist was prepared to assess the Mapping quality. A random QA was performed to make sure the data was within the acceptance criteria.

TECHNOLOGY:

- Erdas Imagine 9.2
- AutoCAD Map 2004
- ArcGIS 9.3

APPLICATION:

- Understanding Landscape Patterns
- Land Management
- Environmental Studies

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SCREEN SHOTS:

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