Support for Automation of Cartography Based on Earth Observation Images – a Data Mining Approach

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INTRODUCTION

Mapping of land cover structures using satellite images is often a tedious, manually made task. In contrast, automatic methods are faster and more precise, but have important lacks: incapacity of ignoring unwanted objects and difficulty of working with high resolution images.

Data Mining methodology tackles the problem of automatic satellite image segmentation. The proposed method aims at adapting the granularity of image segmentation to the cartographic scales.

Figure 1 Automatic vector segmentation. The borders of the objects were smoothened in order to simplify the corresponding shape file.

Figure 2 Segmentation scene with too many unwanted details.

SOLUTIONS

Object Oriented Processing

➲ objects can be extracted at a custom details level;

➲ transformations on the initial scenes to enhance quality;

➲ further simplification available: absorption of the small objects, size & shape exclusion criteria, etc.
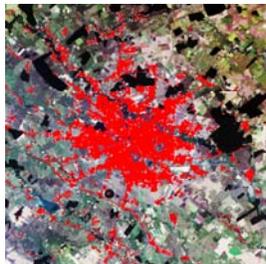
Figure 3 Bucharest scene segmentation. The red area is a collection of extracted objects. The collecting effort is an automatic process based on a machine learning algorithm.

Figure 4a) Original image

Figure 4b) Raster+Vector Segmentation;

Figure 4c) Sub-segmentation inside the borders of the previous vectors

Figure 4d) Unassisted "*smoothened vector to raster*" reconstruction.

Tile Based Processing

➲ tiles are simple shaped areas, in which the original scene is divided;

➲ recommended when there are many details, as in high resolution satellite imagery;

➲ pairs of tiles are compared, based on compression.
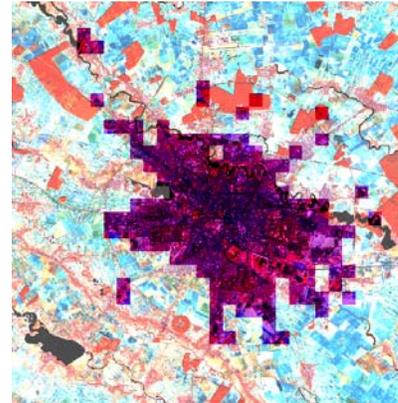
Figure 5 Bucharest scene tile classification. A central tile is a referential for all the other tiles. The degree of resemblance with the sample is related with the level of red color shift.

APPLICATION FIELDS

⚏ ***Automatic Classification*** (together with a supervised learning protocol; pieces can be either objects or tiles);

⚏ ***Automatic Cartography***;

⚏ ***Automatic Monitoring*** of the Earth Surface and Atmosphere.

ORIGINALITY

☑ **absorption technique** is an alternative for ignoring the small objects; size of the unwanted objects is a parameter; absorption is topological as well as spectral.

**Figure 6a)** Original Image (a detail of Fig 2) + Smoothed Vector Segmentation
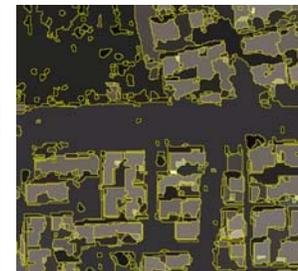
Figure 6b) Raster Segmentation + Rough Vector Segmentation

Absorption of small objects: with medium segmentation threshold and a mild triggering size for small object absorption number of objects was considerably reduced; all the objects are now larger than the equivalent of 10 pixels)

☑ processing tiles as puzzles of inner objects, not as sets of pixels; size and the relative position of the objects is taken into consideration; tiles are transformed into text as entities, then compared through a **compression algorithm**.

REFERENCES

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