# THE USE OF ORFEO TOOLBOX IN THE CONTEXT OF MAP UPDATING

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## 1. INTRODUCTION

This paper presents experiments with the ORFEO ToolBox [1] (OTB) in the context of the Brussels project ARMURS about map updating described in the next section. Depending on the availability of required functionalities, the project either considered the use of OTB or the reuse of proprietary code. Since the project includes the development of a demonstrator for map updating from image analysis, the different aspects of data format, image processing for remote sensing and graphical interface are key points for the success of the system integration. The OTB has been consequently envisaged as a possible basic component.

## 2. THE ARMURS PROJECT

The ARMURS project [2] (Automatic Recognition for Map Update by Remote Sensing) aims at updating the topo-geographical databases through the automatic or semi-automatic detection of changes in man made structures (road network and built up areas) thanks to remote sensing images and/or socio-economical data. In order to limit the cost incurred by very high resolution images, the approach first considers a regional analysis based on high resolution image (SPOT5) and socio-economical statistics like the population growth and the industrial development. Areas highlighted by the regional analysis can then be the focus of a local analysis employing VHR aerial or satellite images for precise characterization of the change (type and localization). At this level, two paradigms can be envisaged for the detection of changes: comparison image/image or image/database, depending on the available information.

## 3. IMAGE PROCESSING

The ARMURS project requires three major image processing functions: image segmentation, image classification and vector to image comparison. For those remote sensing functionalities, OTB was envisaged either to rapidly test the potential of a given solution or to offer an alternative to proprietary developments. In both cases a comparison could be made to elicit the best approach(es).

For segmentation of the VHR images for the local analysis, the mean shift algorithm appeared as a promising candidate and was rapidly evaluated thanks to the availability in OTB. However, our experiments revealed that the implementation was suffering from a limitation in the dimension of the vectors and could not handle the four multispectral bands available in Ikonos or Quickbird images. The support offered by OTB worked fine and a few weeks after our remark a new mean shift implementation was integrated in OTB, handling vectors with more dimensions. The segmentation results obtained with this new version from OTB could then be compared to a random watershed assembly implemented in C/Python [3] and results from the commercial software Definiens [4].

In the case of classification, the project aims at associating the regions of segmented images into relevant classes (e. g. road, building and rest) based on multispectral, shape and possibly 3D information. Although the literature seems to favor SVM or RVM, ARMURS intends to compare the classifier functions implemented in OTB. This kind of comparison would be prohibitive if the functions had to be first coded and tested. These classification results will also be compared to a Graph-cut approach, implemented either in OTB or Python.

For vector to image comparison, the database lines and polygons have to be read from file, translated into image coordinates and manipulated so as to be compared to image elements. OTB is here also a good candidate for development.

## 4. DEMONSTRATOR

At the current state of development, no final decision has been taken concerning the implementation details of the demonstrator. Its major functionalities are data access to possibly different image and vector file formats; data processing mainly for remote sensing; process control and decision through a human man machine interface with graphical facilities.

The use and advantages of OTB were already demonstrated in the previous section about image processing. OTB is also welcome for data reading thanks to the multiplicity of handled formats and its reference to GDAL [5] and shapelib [6]. For graphical interface possibilities, we first considered other packages but could finally shift to OTB once its functionalities have proved adequate for our application.

## 5. CONCLUSIONS

The ORFEO ToolBox has been considered as a basic component in our application of map updating. The provided image segmentation and classification functions speeded up the implementation and test of the approach. As far as the demonstrator is concerned, the integrated file formats for image access and vector read are important assets. We are currently considering the potential of OTB for graphical functionalities.

## 6. ACKNOWLEDMENTS

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