Low cost monitoring from space using Landsat TM time series and open source technologies: the case study of Iguazu park

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Up to nowadays, satellite data have become increasingly available, thus offering a low cost or even free of charge unique tool, with a great potential for operational monitoring of vegetation cover, quantitative assessment of urban expansion and urban sprawl, as well as for monitoring of land use changes and soil consumption. This growing observational capacity has also highlighted the need for research efforts aimed at exploring the potential offered by data processing methods and algorithms, in order to exploit as much as possible this invaluable space-based data source.

The work herein presented concerns an application study on the monitoring of vegetation cover and urban sprawl conducted with the use of satellite Landsat TM data. The selected test site is the Iguazu park highly significant, being it one of the most threatened global conservation priorities (http://whc.unesco.org/en/list/303/).

In order to produce synthetic maps of the investigated areas to monitor the status of vegetation and ongoing subtle changes, satellite Landsat TM data images were classified using two automatic classifiers, Maximum Likelihood (MLC) and Support Vector Machines (SVMs) applied by changing setting parameters, with the aim to compare their respective performances in terms of robustness, speed and accuracy. All process steps have been developed integrating Geographical Information System and Remote Sensing, and adopting free and open source software.

Results pointed out that the SVM classifier with RBF kernel was generally the best choice (with accuracy higher than 90%) among all the configurations compared, and the use of multiple bands globally improves classification. One of the critical elements found in the case of monitoring of urban area expansion is given by the presence of urban garden mixed with urban fabric. The use of different configurations for the SVMs, i.e. different kernels and values of the setting parameters, allowed us to calibrate the classifier also to cope with a specific need, as in our case, to achieve a reliable discrimination of urban from non urban areas.