A Comparison Between a Traditional and a Geometrical Supervised Classifier to Produce Land Cover Maps from SPOT5 Images

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The new high-resolution images, from the satellites as IKONOS, SPOT 5, Quickbird 2 give us the opportunity to map ground features which were not detectable in the past by using medium resolution remote sensed data. More accurate and reliable maps of land cover can then be produced. However classification procedure with these images is more complex than with the medium resolution remote sensing data (LANDSAT) for two main reasons: firstly because of their exiguous number of spectral bands, secondly, due to high spatial resolution, the assumption of pixel independence does not generally hold. It is then necessary to use new spectral classifiers taking into account also local information. In this view a possible approach is to combine both “spectral” and “spatial” features to optimise land use classification. Standard supervised classification techniques, so-called “per-pixel” classifications, use only spectral information of remote sensing image, whereas neglecting the relationships between neighbouring pixels.

The objective of this work is the comparison between a conventional supervised classifier, as “Maximum Likelihood” algorithm, and a spatial classifier based on a searching algorithm of a given geometrical pattern.

The study site is located along the coast of the Ionian Sea (south Italy), in an area widely cropped with water-melon. Two images from SPOT5, with a spatial resolution of ten meters and four bands in visible and near/medium infrared spectrum, have been used, dated June and July 2007.

Two supervised classifiers were used: standard “Maximum Likelihood” and Feature Analyst both implemented in ERDAS software, using the same training data set. “Maximum Likelihood” algorithm is a conventional statistical classification technique that allocates each pixel of an image to the class with the highest likelihood or ‘a posterior’ probability of membership. Feature Analyst is an approach similar to a traditional supervised classifier because the user needs to supply training sites of each feature of interest. However, the main difference is that it uses these sites to find areas in the image that are similar, not only on the basis of spectral signature but also of geometrical shape parameters.

The resulting maps have been validated using an independent data set and the goodness of classification was evaluated by calculating overall accuracy as statistics and the confusion matrix. The statistical comparison between the two approaches shows Feature Analyst to be more accurate in water-melon pattern recognition. However, it needs to test the method in more spatial contexts before declaring the better performance of this geometrical supervised classifier. We think that the main drawback of this approach is the difficulty in defining the input pattern which captures most spatial structure of the feature being classified. This representation may be relatively easy for an isolated object (for example a tree), but may be more complex for a cropped field.

In a more widespread future use of high resolution imagery, geometrical algorithms show potential to produce more accurate classifications.