# Automatic buildings extraction from hyperspectral data and its application to urban thermography

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Due to the increasing amount of remotely-sensed data, automatic classification techniques are becoming an important issue in *image processing* field. To reduce the human assistance in the data processing chain, it is necessary to automatize some operations, allowing the users to earn time on the entire process. Appreciable results in such research field seems to derive from the application of neural networks developed by Kohonen: such SOMs (Self Organising Map) can automatically form one- or many-dimensional maps of intrinsic features of the input data. These data are presented in mixed random order to the network and the self-organizing networks, with two-dimensional topology, are capable of learning complicated hierarchical relations of high-dimensional spaces through many simulations. In remote sensing, SOMs are used to identify pixels relationships and they can be re-organized in several output cluster/classes.

The algorithm developed in this paper was initially tested on a Quickbird image over Tor Vergata area in Rome and it has been successively applied to hyperspectral image from airborne sensor AHS. Kohonen map has been used to clusterize the AHS image and to extract the building signatures considering both spectral and textural characteristics (CLUSTERING procedure). Class "Building" has been recognized comparing its value to a standard building signature (LABELLING procedure). The extracted building signatures have been used as training set of a supervised neural network performing the definite feature extraction result. Finally, the importance of these methodology has been shown with its application to Urban Thermography, representing an important tool in LST (*Land Surface Temperature*) retrieval and Energy Balance Model in Urban area. Heat waves have grown in magnitude and frequency of occurrence along the last decades and remote observation of such phenomena became possible using satellite and aircraft platforms and has provided new avenues for their observation.

The developed technique contributes to connect the ancillary data of the Energy balance model to the specific reference surface (i.e., building heat transfer model parameters have to be applied on building cover class) and it adds information on the cases where extreme difference of temperature among surfaces can be measured (such between vegetation and buildings). This methodology has been applied on a AHS testing image above Madrid (acquired during summer 2008) to extract buildings, to retrieve building temperature and to spot their extreme values.

*Keywords: Kohonen, building extraction, hyperspectral, AHS, LST*

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