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# Development of a Decision Support Tree Approach for Mapping Urban Vegetation Cover From Hyperspectral Imagery and GIS: the case of Athens, Greece

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Urban vegetation represents one of the main factors directly influencing human life. Consequently, extracting information on its spatial distribution is of crucial importance to ensure, between other, sustainable urban planning and successful environmental management. To this end, remote sensing & Geographical Information Systems (GIS) technology has demonstrated a very promising, viable solution. In comparison to multispectral systems, use of hyperspectral imagery in particular, enhances dramatically our ability to accurately identify different targets on the Earth's surface.
In our study, a decision tree-based classification method is presented for mapping urban vegetation cover from hyperspectral imagery. The ability of the proposed method is demonstrated using as a case study the city of Athens, Greece, for which satellite hyperspectral imagery from Hyperion sensor has been acquired. Hyperion collects spectral data in 242 spectral bands from visible to middle-infrared regions of electromagnetic spectrum and at a spatial resolution of 30 meters. Validation of our proposed method is carried out on a GIS environment based on the error matrix statistics, using as reference very high resolution imagery acquired nearly concurrently to Hyperion at our study region, supported by field visits conducted in the studied area. Additionally, the urban vegetation cover maps derived from our proposed here technique are compared versus analogous results obtained against other classification methods traditionally used in mapping urban vegetation cover.
Our results confirmed the ability of our approach combined with Hyperion imagery to extract urban vegetation cover for the case of a densely-populated city with complex urban features, such as Athens. Our findings can potentially offer significant information at local scale as regards the presence of open green spaces in urban environment, since such information is vital for the successful infrastructure development, urban landscape planning and improvement of urban environment in general. More widely, our study also provides significant contribution towards an objective assessment of Hyperion sensor data use in obtaining urban vegetation cover, given that, to our knowledge at least, very limited record of such works is available in the literature. The potential transferability of our technique to other hyperspectral sensing systems consists a very strong advantage of it, which is also worthwhile to be explored in future studies.

KEYWORDS: remote sensing, Geographical Information Systems, hyperspectral data, Hyperion, decision tree classification, spectral angle mapper, Athens, Greece