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Detection of discrepancies in land-use classification using multitemporal Ikonos satellite data

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Abstract. Geoinformation systems (GIS) and other spatial databases containing land-use data are usually subjected to intensive change processes that impact the quality of their inherent classification and diminish its relevance. Consequently, with time, databases accumulate various types of erroneous information. The combination of the satellite data with the thematic land-use data from a core national GIS, provides an excellent case for GIS-driven analysis of land-use changes. The aim of this research was to assess the land-use changes using time-series of optical Ikonos satellite data.

An area of ~35 km² in the north of Israel served as the study case of the research. Seven land-use classes were detected in the relevant National GIS spatial database layers updated in the year 2000 and further in the year 2009. These seven type-classes were: water bodies, residential areas, agricultural fields, badlands, natural forests, build-up areas, and plantations. The Iterative discriminant analysis (IDA) algorithm was applied on both GIS datasets using corresponding Ikonos images acquired in 2002 and 2010, respectfully. The IDA process resulted with a re-classification of the initial land-use polygons. It was assessed by validating the classification of all the land-use polygons. Comparing with Ikonos image from the year 2002, the fraction of the polygons that were correctly detected as consistent with the corresponding GIS dataset (77.9%) was relatively close to the fraction of polygons correctly detected as discrepant (75.5%). Classification of Ikonos image from the year 2010 showed that 81.9% of the land-use polygons were correctly detected as consistent whereas the fraction of polygons that were correctly detected as discrepant was about (78.3%).

The main advantage of the proposed GIS-driven methodology for detection of changes in land-use classification is its analytical simplicity that allows for straightforward employment of spectral and spatial data in the classification process.

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