Fine Resolution Mapping of Urban Trees Based on Enhanced Region Growing Method and Agent-based Image Analysis Approach

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Object-based image analysis as a dominant paradigm for analysis of very high resolution optical images has shown a strong capability for enhancement of the spatial and thematical classification results in the field of remote sensing. In the context of fine resolution mapping and monitoring of urban trees for means of cadastral inventory and environmental assessment of the green resources in the city, the object-based approach has been employed over the past years extensively. Among the adopted approaches for this end, the region growing method has attracted so many attentions in area. However, the previous studies showed that in the absence of high resolution elevation data (DSM data), that tree detection and delineation results are not very promising. In this sense, the omission and commission errors in the tree detection phase of this approach when the elevation data have not been considered lead to propagate the classification errors in the urban tree mapping and delineation projects. Nevertheless, using the LiDAR data to provide DSM information is usually very expensive and not available in the case of less developed country, so developing of the image processing methods for analysis of standalone optical data seems necessary. To solve this problem, in this research the conventional region growing method is improving by adopting of Density-based spatial clustering of applications with noise (DBSCAN) algorithm in the process of seed detection to incorporate the spatial context in the analysis process for reducing the omission and commission errors in the tree detection phase. Moreover, for spatial and thematic accuracy enhancement of classification results, the developed object-based approach integrated with the agent-based image analysis paradigm, which is exhaustively investigated in software engineering. The agent-based approach facilitates the autonomous adapting of rule sets and enable image objects to adopt and adjust themselves according to different imaging conditions that brings the better classification results in the urban tree mapping and monitoring projects by optical remote sensing.