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AN IMAGE SEGMENTATION APPROACH FOR IMPROVING THE ACCURACY OF INDIVIDUAL CROWN DELINEATION

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ABSTRACT:

Isolating individual trees and extracting relevant tree structural parameters from the combination of high resolution multispectral satellite imagery and LiDAR-derived Canopy Height Model (CHM) have significant implications in a variety of forest activities. However, one of the challenges of using multispectral imagery is the effect of tree crown shadows, branches and crown cluster gaps which normally cause a lower accuracy on the result of segmentation techniques. In order to reduce this effect on the segmentation process, a novel segmentation method is presented in this study. Since, remote sensed vegetation indices are recommended to remove the variability caused by canopy geometry or soil background; our method proposes to integrate the well-known vegetation indices (i.e., Normalized Vegetation Index (NDVI)) as an ancillary data layer with LiDAR-derived CHM and multispectral layers, in order to improve the tree crown segmentation accuracy. The Marker-Controlled Watershed algorithm is applied on the integration datasets. In order to evaluate the applicability of our method, the result is compared with three different segmentation schemes: (1) segmentation based solely on multispectral layers (GeoEye-2 image); (2) segmentation based solely on LiDAR-derived CHM layer; (3) segmentation based on both multispectral and LiDAR-derived layers. The result of the combination of both datasets with NDVI layer were slightly better, especially for crowns with poor spectral contrast with their shadows which is not easy to identify by only multispectral data layer. Although the proposed scheme would provide the better definition of the object homogeneity, its implementation increases the time of processing with the number of layers because each layer must be individually segmented. The method improved the tree crown delineation accuracy by 2.8% in comparison with using either data source independently in only spares forest which consists of more crown shadows and canopy gaps.

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