DATA FUSION OF LIDAR AND CASI DATA FOR BUILDING DETAILED FOREST INVENTORIES

Paul Treitz[1], Kevin Lim[1], Valerie Thomas[1] and Art Groot[2]

[1] Department of Geography, Queen's University at Kingston, Canada
[2] Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario

Abstract:

In August 2000, airborne Light Detection and Ranging (LIDAR) data were collected for a tolerant hardwood forest in the Turkey Lakes Watershed near Sault St. Marie, Ontario, Canada. Existing empirical studies have demonstrated the ability of LIDAR to estimate forest stand parameters such as canopy height, which in turn can be used to estimate other parameters such as stand biomass and gross merchantable volume. However, management of forests for multiple uses often requires specific information on the individual trees (e.g. species and height) composing a stand. This type of detailed forest inventory cannot be derived from the vertical component of the LIDAR data alone but requires the use of the horizontal component of the data and other remotely sensed data. This paper describes how a tree crown delineation algorithm can be applied to high spatial resolution intensity data derived from the LIDAR return signal and Compact Airborne Spectrographic Imager (CASI) data to characterize stem density; species, height and crown area of individual trees; and wood volume and biomass by species for a given forest stand. Airborne data are compared to detailed mensuration and coordinate data for over 700 trees in a one-hectare study plot. Detailed crown architecture data for approximately 200 trees are used for correlating crown shape. A comparison of the crown map derived from the fused LIDAR and CASI data and the crown map created from field measurements is presented. The results of validating the estimate of total number of trees against the existing stem map are also presented.