Developing Strategies for Large Scale Forest Inventories Combining LiDAR Data, Satellite Imagery and Regional Yield Models

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Poster Abstract

The work illustrates a practical and economical way to combine airborne laser scanning data (ALS) and spectral information from Quickbird satellite imagery and digital orthophotos with regional yield models in order to assess the stand volume and other relevant forest parameters.

New methods to integrate Laser Scanning and Remote Sensing into the traditional stand wise forest taxation are shown on examples of (a) state owned and mainly even aged forests in Saxonia and Poland and (b) privately owned all-aged plenter woods (Plenterwald) in the Black Forest in Baden-Wuerttemberg.

The automatic detection of trees from Quickbird Satellite images and true-orthophotos by means of Object Based Image Analysis (OBIA) as well as the detection of trees purely based on laser point data is shown.

Tree height, location, density, distribution and tree type of each of the more than 165.000 automatically detected trees, all stored in a GIS database, are used as input information to apply different regional yield models. For even-aged forests homogenous stands and/or tree groups have been defined and the mean height of the highest 100 trees per stand and hectare have been used to assess the volume of the growing stock considering tree species, age (if known), density and stand openings.
For all-aged and nature-like plenter woods (Plenterwald) the assessment of the growing stock is based on single tree information derived from LiDAR and spectral data and on specific auxiliary yield tables for plenter woods.
The LiDAR and spectral measurements and volume estimations have been compared with the actual field taxation. The results are discussed and critical issues such as the potential of satellite and ALS data to derive relevant forestry parameters or the possible costs for such an analysis are addressed and recommendations for an economic workflow and system integration are given.