

Large Scale Forest Taxation based on Single Tree Measurements using Airborne Laser Scanning Data and Spectral Information from Quickbird Satellite Imagery and Digital Orthophotos

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Abstract

The article illustrates a practical and economical way to combine airborne laser scanning data (ALS) and colour infrared information (CIR) with the traditional stand wise forest taxation on the example of (a) state owned and mainly even aged forests in Saxonia and (b) privately owned nature-like "Plenterwald" forests in the Black Forest in Baden-Wuerttemberg.

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

Height, exact location, volume and tree type of each of the 165.000 automatically detected trees are stored in a GIS database. For even aged stands the mean height of the highest 100 trees per stand and hectare have been used to link existing regional yield models. Taking the known tree age and the stand openings into account, the wood volume of each stand has been estimated for broadleaf trees and conifers separately. The wood volume calculation for the "Plenterwald" forests is based on stand information derived from the ALS/CIR analysis and specific auxiliary yield tables.

The ALS/CIR measurements and volume estimations have been compared with the actual field taxation. The results are discussed in this paper and critical issues concerning the potential of satellite and ALS data to derive relevant forestry parameters, the accuracy of the surface models, the discrimination of different tree species and the possible costs for such an analysis are addressed. Conclusions are drawn and recommendations for an economic workflow and system integration are given.