Abstract

Estimating top height and diameter of dominant trees in forest stands, based on LIDAR data

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The development of modern techniques referred to acquisition and processing LIDAR data in conjunction with the statistics analysis knowledge caused, that these data and information contained in it, have become an important element in forestry scientific work as well as an essential component in the forestry management system. Some characteristics, such as diameter at breast height or volume, must be estimated based on features which can be directly derived from ALS data processing like height or some crown properties. Therefore when reference data exist, it is possible to create a model by which it will be possible to obtain stand characteristics based on data delivered from the cloud points.

This research demonstrates which features, provided by LIDAR data, can be used to obtain models best describing mean stand top height and mean stand breast height diameter of dominant trees. The relationships between individual characteristics were analyzed based on Principal Component Analysis, Factor Analysis and Backward Stepwise Regression Analysis. Building models was done by the Gauss-Newton estimation methods.

Models were built for mountain forests, where the dominant species were spruce or beech. The average stand, in which contour in LIDAR imaging would be 52 raster measured with the area size of 500 m^2, the top height would be estimated with double mean error about 0.75 m, whereas in diameter at breast height of dominant trees this error would be 1.25 cm. These results show the high accuracy of the models, in comparison to conventional, ground-based measuring methods. The obtained results indicate the usefulness of LIDAR data to measure important stands taxation features.

Keywords: airbone laser scanning, top height, diameter at breast height, dominant trees, regression analysis