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Model Based Automatic Segmentation Of Tree Stems From Single Scan Data

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Keywords: Forestry, point cloud, RANSAC, segmentation, terrestrial laser scanning, tree detection

Abstract. Forest inventories collect feature data manually on terrestrial field plots. Measuring large amounts of breast height diameters and tree positions is time consuming. Terrestrial laser scanning could be an additional instrument to collect precise and full inventory data in the 3D space. As a preliminary assumption single scan data is used to evaluate a minimal data acquisition scheme. To extract features like trees and diameter from the scanned point cloud, a simple geometric model world is defined in 3D. Trees are cylinder shapes vertically located on a plane. Using a RANSAC-based segmentation approach, cylinders are fitted iteratively in the point cloud. Several threshold parameters increase the robustness of the segmentation model and extract point clouds of single trees, which still contain branches and the tree crown. Fitting circles along the stem using point cloud slices allows to refine the effective diameter for customized heights. The cross section of a single tree point cloud covers only the semi circle towards the scan location, but is still contiguous enough to estimate diameters by using a robust circle fitting method.

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