Trunk section-based tree detection method in dense plantation forest using drone LiDAR data.

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Single tree detection is one of the main research topic in order to quantify the structural properties of the forest. Drone LiDAR systems (DLS) and terrestrial laser scanning (TLS) systems produce high-density point clouds that offer a lot of promise for forest inventories in limited areas. However, most researches have concentrated on the upper canopy layer and only a few have attempted to the lower forest structure. This paper described a basic tree detection method using drone LiDAR data that from a new perspective of understory structure. This method relied on trunk point clouds, with trunk sections ranging in height from 1 to 7 m being processed and compared to determine a suitable height threshold then used to detect trees. We test our method in a dense cedar plantation forest in Japan Aichi prefecture, which have a stem density of 1140 stems/ha and an average age of 42 years. The dense point cloud data was generated from drone LiDAR system and TLS with an average point density of 3100 and 5500 points/m^2, respectively. Tree detection was achieved by drawing point cloud section projections of tree trunks at different heights and calculating the center coordinates. The results show that this trunk section-based method greatly reduced the difficulty of tree detection in dense plantation forest and has a high accuracy. The root mean square error was 10% after selecting section of suitable height as parameter. This method can be extended for different forest scenarios by changing the section parameter.

Keywords: Drone LiDAR, Understory structure, Plantation forest, Tree detection