**Classification of A Terrestrial Laser Scanner Point Cloud of**

**A Conifer Forest Using Object-based Image Analysis**

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***ABSTRACT***

The Forestry Agency of Japan has promoted the use of remote sensing technology to solve forestry-related problems such as the aging of the workforce. The Terrestrial Laser Scanner (TLS) is an efficient tool for measuring the size, number and distribution of trees in artificial forests. Classification of the TLS point cloud into tree parts (trunk, branch, and leaf) plays an important role in estimating the volume of forest resources, measuring the timber growth, and the three-dimensional (3D) modeling of tree shapes. However, the accurate classification of the 3D point clouds of conifer forests is still challenging issue. One difficulty is to represent the relationships between points in 3D space. Therefore, we propose a novel approach of classification based on the two-dimensional image generated by the reprojection of the point cloud. The purpose of this study is to investigate the feasibility of this approach. The point cloud data was obtained in the Hirakura Forest of Mie University in Tsu, Mie Prefecture. All TLS points were reprojected onto the cylindrical plane centered on the TLS position based on elevation and azimuth angles. This resulted in panoramic image-like data. In this data, the grid layout corresponds to the scan geometry of the TLS. Each grid has 13 features about the point, such as 3D coordinates, reflected light intensity, distance from the TLS, distances from neighboring grids, and so on. We then classified each grid into tree parts using object-based image analysis (OBIA). In our preliminary analysis using support vector machine and random forest classifiers, permutation feature importance indicates significance of the distance from the TLS among 13 features. The outline of our approach, the results of OBIA classification, and the results of point cloud classification compared to existing methods such as DBSCAN will be presented at the symposium. (299 words)

**Keywords:** conifer forest, machine learning, Object-based Image Analysis, point cloud, Terrestrial Laser Scanner