

## Estimation of the diameter of trunk of tree using terrestrial LiDAR

Takahiro ENDO<sup>a</sup>, Hiroyuki NAKAMURA<sup>b</sup>, Yoshito SAWADA<sup>a</sup> and Haruo SAWADA<sup>a</sup>

<sup>a</sup> *Research Associate, International Center for Urban Safety Engineering (ICUS),*

*Institute of Industrial Science (IIS), the University of Tokyo*

*Ce-504, 4-6-1 Komaba, Meguro-ku, Tokyo 153-08505 Japan*

*Tel: +81(3)-5452-6846, E-mail: [tendo@iis.u-tokyo.ac.jp](mailto:tendo@iis.u-tokyo.ac.jp)*

<sup>b</sup> *President, Woodinfo corporation*

*101-1-40-7, Yoyogi, Shibuya-ku, 151-0053, Japan*

*Tel: +81(3)-6276-5637, E-mail: [maple@woodinfo.jp](mailto:maple@woodinfo.jp)*

**KEY WORDS:** Forest, DEM, DBH, Approximation, Visualization

**ABSTRACT:** A solution for improvement of the productivity of forest is an efficient management of individual tree in forest. In this paper, we proposed a new forest inventory method using a terrestrial LiDAR that used in survey field widely. By means of the terrestrial LiDAR, the shape of individual trees in wide area may be measured within short time. As the result of this approach, characteristics of each individual tree may be estimated effectively. Therefore, we developed an estimation method of the diameter of trunk of individual trees, and moreover developed a visualization system of the results for easy understanding. The details are as the follows; firstly, DEM was generated from the measured LiDAR data. Secondly, the diameter of trunk of individual trees at specific height was estimated by a fitting circle generated from an arc-shaped point cloud. Finally, the estimated diameter and DEM were visualized in 3D space. As the result of an analysis, the estimated diameters under canopy height were almost good well. On the other hand, the estimated diameters near tree crown and inside crown had errors. The reason was contamination of point cloud derived from branches or leaves. Although it needs improving the estimation method for the reduction of errors, the results indicate that the developed method was useful for the forest

inventory. Moreover, the result indicated that location of a terrestrial LiDAR was quite important for an efficient management of individual tree in forest.