ABSTRACT

Large scale topographic map is needed for detail engineering design and construction development as written in the law and government regulations. Topographic mapping using conventional technique such as terrestrial and photogrammetric techniques require relatively longer time and higher cost. Lidar full waveform Riegl LMS-Q560 technology provides high accuracy of vertical data according to ASPRS criteria and needs short time to collect and process the data. In addition, the acquired data can be used to classify land covers. The objectives of this research is to identify vertical and horizontal accuracy of the Lidar data of the DEM on the various land cover types and to improve model extraction of information on the earth surface and to classify full waveform Lidar image for land cover interpretation that distributed spatially in the horisontal and vertical direction. The location of the research is in Nganjuk-Kertosono corridor area, East Java.

The acquisition accuracy is ditermined on the trajectory of the aircraft path during direct georeferencing stage. Points clouds from acquisition stage then were classified into ground points and non-ground points. TIN filtering technique was used to separate ground points that formed MED. The accuracy of MED was computed from RMSE Lidar data and the conjugate points measured using terrestrial technique on the various land covers (low vegetation, medium vegetation, high vegetatition, build up area, wetland area as well as forest area). Lidar full waveform data was classified based on the reflected intencity, elevation due to lidar reflections have X,Y,Z coordinates and decision tree algorithm due to Lidar full waveform have differentiable amplitude and differentiable number of reflectance. The result can be classified based on the separability and its confusion matrix as well as can be interpretated based on NIIRS interpretability criteria and finally it is presented in the three dimension of *Rich Photorealistic Content* (RPC).

The result shows that in the vertical direction, it provides RMSE 11,81 cm to 14,54 cm, whilst in the horizontal direction it has RMSE 76,05 cm to 78,67 cm on the various land cover types such as paddy field, build up area, wetland area and forest area which were selected using stratified random sampling technique. The performance algorithm of the intencity classification, decision tree and elevation were analyzed using confusion matrix distributed on the case study area. The accuracy are 96,41%; 95,30 % and 95,86 % with kappa coefficient 0,92706, 0,90532 and 0,91687 respectively. The results could be viewed in 3-D with RPC. The drawn conclusion in this research is that full waveform Lidar technology can satisfies large scale topographic map in Indonesia according to ASPRS standard. Object classification of the land covers can be positioned in level 3 classification scheme (USGS modications) from Lidar full waveform and the interpretability can be improved in the 3 level according to NIIRS. Three Dimension model is visualized using fly through technique.

Key words : Full waveform LIDAR, DEM, direct georeferencing, classifications, Interpretability.