

Evaluation of Precision and Accuracy of Mobile Mapping System (MMS) Leica Pegasus Two Ultimate for Road Monitoring

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SUMMARY

The digitalization of construction is a must while working with BIM workflow. The digitalization process visually conducted by utilizing digital survey of assets in every stage from design, construction to operation and maintenance. PT Hutama Karya (Persero) as Indonesia state-owned enterprise that operate the mega project Trans Sumatera Toll Road along 2,800 Kilometers, utilizes Mobile Mapping System (MMS) Leica Pegasus Two Ultimate to conduct a digital survey in order to fulfill the minimum standard. The application of MMS for construction and operation & maintenance phases are International Roughness Index (IRI) value calculation, road subsidence monitoring, 3D as-built model, and also asset management. Therefore, PT Hutama Karya (Persero) should ensure that the precision and accuracy of digital survey using MMS is appropriate according to the standard.

The research was conducted in order to obtain the accuracy and precision value of MMS Leica Pegasus Two Ultimate by comparing 4 data surveys from a different time periods in vary of temperatures and humidity. The MMS data was acquired on the residential road along 2 kilometers with 2 tracks at speed of 40kmph. The MMS measurements were done in 4 lanes in every mission. The position obtained from PPK method with 1 receiver GNSS as a base station with a 2kilometer radius. Meanwhile, the digital survey team also collect 16 Independent Check Point (ICP) which were located mostly every 100-meter using the RTK method. The analysis is conducted to obtain the precision value lane in one mission and between 2 missions, the distribution of point cloud in order to form 2D and 3D objects and also the Z accuracy of each missions compared with the ICP data. The research also compared the precision value of 4 missions in raster elevation with 1m x 1m spacing grid.

The precision value which represents by the standard deviation value of 4 lanes in mission -

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mission 4 consecutively 0.02 m, 0.027 m, 0.019 m, and 0.022 m. The precision value between missions in 10 locations also represented by the standard deviation with minimum value of 0.007 m, a maximum of 0.012 m and an average standard deviation in 10 locations of 0.010 m. Visually with a qualitative approach, point cloud results from 4 data surveys could form road mark and public street lighting well and with minimum dispersion. The Z accuracy from 16 ICP for 4 missions resulted in an average LE90 of 0.m or 13.7 cm. The precision value for mission 1 and 2 is 0.011 m, mission 1 and 3 is 0.013 m, mission 1 and 4 is 0.008 m, mission 2 and 3 is 0.008 m, mission 2 and 4 is 0.006 m, and also mission 3 and 4 is 0.008 m. The research also showed that there are no effects of temperature in 27 o – 32 o Celsius range and humidity with 66 % – 86 % range on the precision and accuracy of MMS. Therefore, the conclusion is the MMS could be used to conduct a digital survey for engineering purposes within 1:1000 map scale product based on map accuracy standard from Indonesia Geospatial Information Agency.

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