APPLICATION OF MMS TO DETECT STRUCTURAL DEFORMATION

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In recent years, the risk of slope failure has increased caused by increase in short duration torrential rains. To prevent slope failure, inspections to extract deformations are becoming increasingly important. Currently, slope inspections in Japan are mainly conducted by close-up visual inspection which is a method of observing whether there is a deformation and its degree by approaching objects such as roads. However, the results obtained by this method are largely dependent on the experience and skill of the engineer, therefore, there is a problem is the results are not uniform. In recent years, surveying with point cloud data, which have location information in 3D coordinates, has become popular. Based on this background, this study examined a method for extracting deformations of infrastructure using vehicle-mounted photo laser survey system (Mobile Mapping System: MMS).

Mobile Mapping is the process of collecting geospatial data from mobile vehicles. Vehicles could be equipped with a range of sensors: GNSS, Cameras, Laser, LiDAR, or any number of remote sensing systems. The laser scanner mounted on the MMS in this study is capable of scanning 27,000 points per second. The object of measurement is block retaining wall 120 m long and 6 m high. Four GCPs (Ground Control Point) and specimens of plates with thicknesses of 10, 30, 50, 70, 90mm were placed on the upper and lower sections the slope. These specimens were used as deformations on the slope to evaluate the ability of the point cloud acquired by MMS. The distance between the MMS and the specimen was 6 m in the upper section and 4.8 m in the lower section.

We examined the verification of accuracy and extraction of deformations with point cloud data acquired by MMS. The accuracy of the point cloud data was compared with the center of the GCP and the total station value. Accuracy verification results show that the accuracy is approximately 160 mm in the horizontal direction and 40 mm in the vertical direction. Between the upper and lower sections of the slope the density of the laser point cloud was different because of the distance from MMS, but the accuracy was the same. The point cloud data obtained by MMS was difficult to recognize the specimen due to the small point cloud density. Therefore, we increased the density of the point cloud by superposing the point cloud acquired by running the MMS multiple times. As a result, we found that the thickness of specimens over 30 mm could be accurately determined, and the location of specimens 10 mm thick could also be determined by superposing the point cloud data.

Keywords: MMS, 3D Point Cloud Data, Deformation, ICP