Monitor Coastal Protection Facilities by Airborne LP Survey - Detect deterioration from existing data -

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(Key words) airborne LP survey, coastal protection facilities, big data

1. Grasp of microtopography by aerial laser survey

Aerial laser survey is a method of survey widely used in recent years for grasping topography with reflected waves obtained by irradiating laser pulses from an airplane to the ground surface. This survey method is considered effective for grasping the condition of coastal protection facilities since it can survey a wide area and easily survey offshore breakwaters, jetties, private facilities and other places difficult to access.

2. Grasp of microtopography by aerial laser survey

The number of footprints discharged in aerial laser survey varies according to the conditions of airplane such as altitude and speed. For example, tens of thousands footprints are discharged per second, each of which corresponds to a diameter of about 30 cm and measurement density of about 50 cm on the ground surface. These footprints discharged reflect on the ground surface, buildings, structures, trees, etc. and information of their height is included in the results of aerial laser survey. With such data, it is considered possible to identify the height of parapets about several of tens cm but how to use the data and limit of application are not established. Therefore, the study herein considered methods for grasping the condition of coastal protection facilities including parapets using the measurement data obtained from an aerial laser survey.

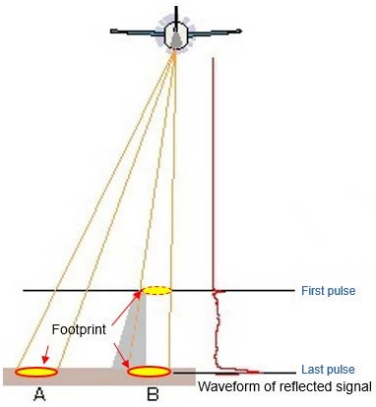

Figure 1: Image of airborne LP survey

3. Example of consideration (Jonanjima Seaside Park, Ota-ku, Tokyo)

In this study, based on the results of the airborne LP (laser profile) survey conducted by the Geospatial Information Authority ("GSI") in 2002, we overlapped Digital Surface Model (DSM) (Figure 3), which was created with the data directly obtained from the aerial photo (Figure 2) and airborne LP data (including the height of buildings and trees on the ground), and the original data (information on the positions and height of random footprints) with the simple orthoimage (photography taken in the airborne LP survey), and compared the footprints around structures that were picked and sorted by color according to height (Figure 4). The areas compared are indicated with red frames in each image.

The parapets and piers that can be recognized in the aerial photograph cannot be identified in the DSM figure (5m mesh DSM) but the positions and height of such structures could be identified from the original data.


Figure 2: Aerial photo

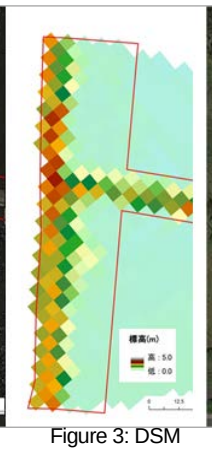
Figure 3: DSM (5m mesh)

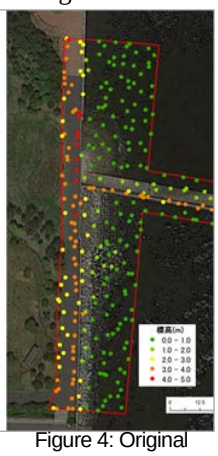
Figure 4: Original data

In addition, the height of the parapets identified from the original data was favorably consistent with the result of the ground laser survey separately conducted on the site (Figure 5).

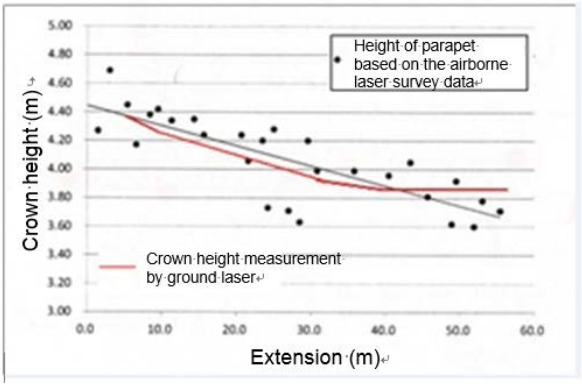

Figure 5: Comparison of parapet height based on aerial laser survey original data and local survey results
(* Figure 2: Conducted a ground laser survey for the parapet (crown width of 37 cm) located at the yellow line position in the aerial photo and compared the results)