Feature Article

Development of Method to Identify Land Shape just after Disasters Using SfM-MVS

Introduction of research

Sabo Department

1. Background

At 2024 Noto Peninsula Earthquake, several landslide dams were identified. When landslide dams are formed, it is important to identify the land shape situation just after the disaster for judging the necessity to emergency survey based on the Act on Sediment Disaster Countermeasures for Sediment Disaster Prone Areas, for determining survey route to the disaster area and for identifying such risk information as flood simulation caused by landslide dams.

However, in the affected areas, in a few days after 2024 Noto Peninsula Earthquake, it was difficult to identify immediate land shape information due to such reasons that we could not measure the reference point due to crustal deformation and that the access to the affected areas was restricted due to damages to main roads.

Therefore, Sabo Planning Division, Sabo Department of NILIM studied a method to identify the land shape information using only the limited data obtainable just after the disaster, using landslides caused by Noto Peninsula Earthquake (Ichinose machi, Wajima city) as study subject.

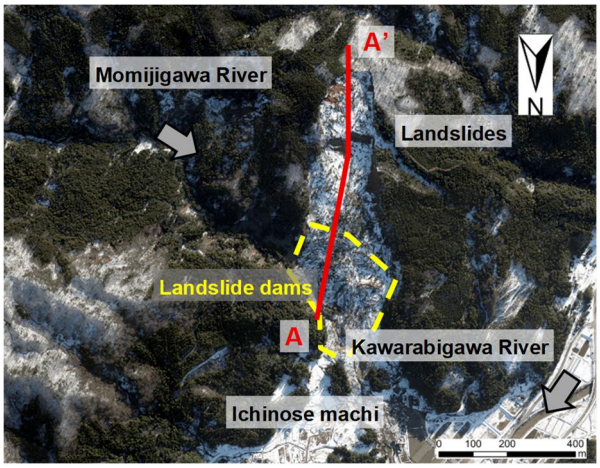

Figure-1 Location of landslide dams at Ichinose machi

2. Method

We created a three-dimensional model by making SfM (Structure from Motion) analysis using images captured from videos taken from helicopter by Hokuriku Regional Development Bureau just after the disaster (January 2nd).

As the images captured from the videos do not have location information, it is indispensable to set ground control points used as reference for absolute coordinates, however, it is difficult to make position determination at the affected areas just after the disaster.

Therefore, we estimated X,Y and Z at locations having no changes visually by comparing DSM (Digital Surface Model) data before the disaster with ortho images before and after the disaster. Then, we made ground control points on such locations and made SfM analysis.

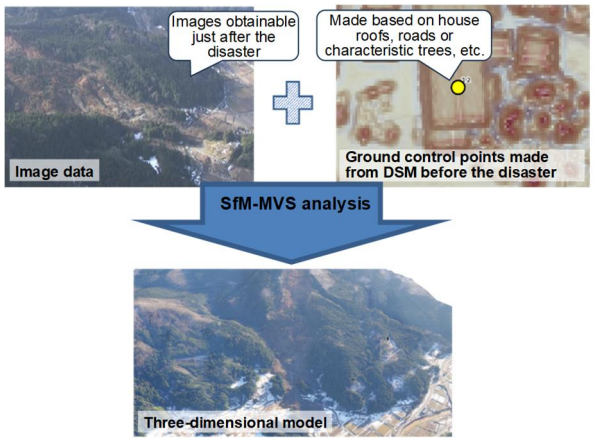

Figure-2 Creation image of three-dimensional model

3. Conclusion

We compared the three-dimensional model created for subject slope where a large-scale landslide was identified with the laser profiler measurement results conducted thereafter (DEM after the disaster) using longitudinal section (Figure-1 red line).

Though there were partial errors, the land shape mostly matched, therefore, we confirmed that it had a possibility of being sufficiently used to identify risk information just after the disaster.

Though this method has such a condition that the land shape information (DSM) before the disaster is required, we believe it will be a help to identify the disaster damage situation and the land shape just after the disaster when there is a limitation in collecting information.

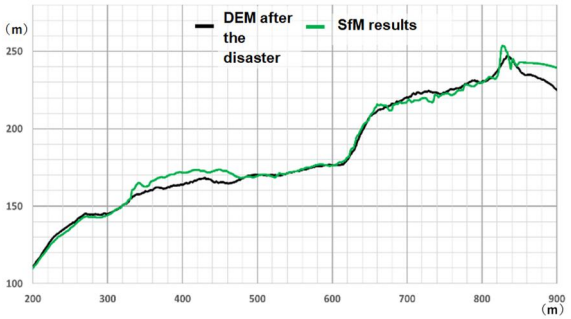

Figure-3 Longitudinal section of landslides

Introduction of activities

☞ Related information is as follows.

- NILIM material No. 1320, “Reports on damage, etc. to civil engineering facilities in 2024 Noto Peninsula Earthquake” (p8-1 ~p8-39)
- Civil Engineering Journal VOL 66 No. 7 “Survey report on sediment damage situation in 2024 Noto Peninsula Earthquake”
- Civil Engineering Journal VOL 67 No. 5 “Survey report on sediment damage situation in ”2024 September Oku-Noto heavy rain”