

The Assessment of Landslide Displacements Using Digital Photogrammetry and Numerical Analysis

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Instead of comparing remote sensing images between before and after a landslide event, this study compares aerial photographs over the years with the velocities of surface movements of landslide to evaluate the feasibility of aerial photographs as a monitoring tool. Before the total collapse of the slope of Freeway No.3, there were signs showing sliding of the slope, but no equipment was set up for monitoring. We use GIS to discriminate aerial photographs of different years to evaluate the displacements of specific objects or marks. From 2002 to 2004, the average displacement was 49.5cm, and the average displacement rate was 23.7cm/yr; from 2004 to 2007, the average displacement was 22.5cm, and the average displacement rate was 7.3cm/yr.

According to time-dependent creep behavior, the primary creep might have occurred from the beginning of the excavation in 1998 to 2004. And the secondary creep was from 2004 to 2007, so the velocity was comparatively lower than the previous stage. As for the tertiary creep, the displacement rate might rise since 2007 till the total collapse in 2010. The software Plaxis 2D based on the finite element method will be used to analyze the displacement process of the slope. The numerical model is set up according to the digital terrain model (DTM) of the slope. The numerical results will be calibrated with the results of the digital photogrammetry. We expect to obtain the creep behavior of the slope such as the slope strength reduction with time and the changes of surface displacement rate with time.

Keywords: digital photogrammetry, Freeway No.3 landslide, displacement rate, creep