

Slope Stability Analysis of Houshanyue Landslide Using STABL and PSO

Zhe-Ping Shen¹ and Walter W. Chen¹

¹Department of Civil Engineering, National Taipei University of Technology
1 Sec. 3 Chung-Hsiao E. Rd., Taipei 106, Taiwan
fishfishfishgoo@gmail.com, waltchen@ntut.edu.tw

Abstract: Most of Taiwan's area was covered by mountains and slopes, which often face the threat of typhoons and pouring rains. With the increased frequency of extreme rainfalls and other forms of extreme weather, the threat is never alleviated. Taipei is the socio-economic center of Taiwan. More people live in the greater Taipei area than any other places. In the past 40 years, more than a thousand landslides have taken place in this area. Among the numerous landslides, the authors were particularly interested in the landslide located near the Houshanyue hiking trail, and a great amount of effort has been devoted to investigating this area. For example, many high quality photos were taken and a terrestrial laser scanner was used to scan the landslide surface repeatedly to generate Digital Elevation Models (DEM). Two-dimensional profiles produced by slicing the 3D DEM were used in the subsequent analysis. Using the 2D profiles as input data, the Factors of Safety (FS) of the slope could be computed by STABL, a slope stability analysis program developed by Purdue University. To improve the precision of FS calculation, Particle Swarm Optimization (PSO) was used to tune the input files and to control the execution of STABL. The outcome was a better analysis framework that usually resulted in finding potential sliding surfaces with lower FS's. For the slope under this study, the reduction in FS ranges from 2 to 8%. Therefore, the technique is proved to be valuable and deserves further research attention.

Keyword: Slope stability, STABL, PSO, Landslide