Estimate Landslide Volume with Genetic Algorithms and Image Similarity Method from Single Satellite Image

Ting-To Yu

National Cheng Kung University, Dept. Resources Engineering, Tainan, Taiwan (yutt@mail.ncku.edu.tw)

It is important to acquire the volume of landslide in short period of time. For hazard mitigation and also emergency response purpose, the traditional method takes much longer time than expected. Due to the weather limit, traffic accessibility and many regulations of law, it take months to handle these process before the actual carry out of filed work. Remote sensing imagery can get the data as long as the visibility allowed, which happened only few day after the event. While traditional photometry requires a stereo pairs images to produce the post event DEM for calculating the change of volume. Usually have to wait weeks or even months for gathering such data, LiDAR or ground GPS measurement might take even longer period of time with much higher cost. In this study we use one post event satellite image and pre-event DTM to compare the similarity between these by alter the DTM with genetic algorithms. The outcome of smartest guess from GAs shall remove or add exact values of height at each location, which been converted into shadow relief viewgraph to compare with satellite image. Once the similarity threshold been make then the guessing work stop. It takes only few hours to finish the entire task, the computed accuracy is around 70% by comparing to the high resolution LiDAR survey at a landslide, southern Taiwan. With extra GCPs, the estimate accuracy can improve to 85% and also within few hours after the receiving of satellite image. Data of this demonstration case is a 5 m DTM at 2005, 2M resolution FormoSat optical image at 2009 and 5M LiDAR at 2010. The GAs and image similarity code is developed on Matlab at windows PC.