

Automatic landslide detection using Dempster–Shafer theory from LiDAR-derived data and orthophotos

ABSTRACT

A good landslide inventory map is a prerequisite for landslide hazard and risk analysis. In tropical countries, such as Malaysia, preparation of the landslide inventory is a challenging task because of the rapid growth of vegetation. Thus, it is crucial to use rapid and accurate technique and effective parameters. For this purpose, Dempster Shafer theory (DST) was applied in fusing high resolution LiDAR derived data products and Greenness index derived from orthophoto imagery. Two sites were selected, for the implementation and evaluation of the DST model; site A for DST implementation and site B for the comparison. For model implementation, vegetation index, slope and height were used as effective parameters for identifying automatic landslide detection. Two type of DST based fusions were evaluated; (greenness and height) and (greenness and slope). Furthermore, validation techniques were used to validate the accuracy are confusion matrix and area under the curve. The overall accuracy of the first and second evaluated fusions were (73.4% and 84.33%), and area under the curve were (0.76 and 0.81) respectively. Additionally, the result was compared with Random Forest (RF) based detection approach. The results showed that DST does not require a priori knowledge.

Keyword: Landslide detection; Dempster–Shafer theory (DST); Light detection and ranging (LiDAR); Orthophotos; GIS; Remote sensing