

應用類神經網路及模糊理論於崩塌地萃取模式建立之研究

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摘 要 崩塌地為坡地災害治理之重要課題，本研究利用多期 SPOT 衛星影像資料結合植生指標及影像相減法，建立崩塌地之光譜影像，並以自我組織圖網路將複雜之衛星影像資料分類為具有相似特性之神經元，再結合模糊理論之模糊隸屬函數概念，計算各神經元之崩塌地隸屬度，由神經元之模糊隸屬函數值選定適合門檻值，可迅速評估九二一地震後之崩塌區位。本研究以九份二山為樣區，選用地震前（1999/4/1）、初期（1999/9/27）及六年後（2006/3/11）之衛星影像資料萃取崩塌地，分析結果顯示，地震後六年內之崩塌裸露面積，已由初期之 215.68 公頃減少為 113.36 公頃，兩期崩塌地之 Kappa 精度分別為 94.53% 及 90.63%，約有 47.44%（102.36 公頃）之崩塌區位逐年復原。本研究建立之模式可精確及迅速萃取崩塌區位，作為崩塌地治理之參考依據。

關鍵詞：崩塌地萃取、自我組織圖、模糊隸屬函數。

Model Establishment for Landslide Extraction Using Self-Organizing Map and Fuzzy Theory

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ABSTRACT Landslide is an important issue in hazard mitigation on hillslope. This study developed a self-organizing map (SOM) and fuzzy theory combined model for effective landslide extraction from multi-temporal SPOT satellite images. First, landslide spectral can be derived using pre- and post-quake images coupled by NDVI-based index and image subtraction. Second, by SOM neural network, similar imagery data can be clustered as neighboring neurons. Third, the fuzzy membership value of neurons belonging to landslide can be calculated using the fuzzy membership function derived from the fuzzy c-mean algorithm. Then, after comparing with ancillary data such as aerial photos and field survey, a suitable threshold of fuzzy membership value was determined from the neurons of the SOM for landslide identification. In this study, the Chiufengershan area was chosen as the study area for landslide hazard assessment. The analyzed result shows the landslide areas had been reduced from 215.68 ha on September 27, 1999 to 113.36 ha on

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March 11, 2006. After 6 years of monitoring, about 47.44% (102.36 ha) of landslide damage had been restored. The corresponding Kappa coefficients are 94.53% and 90.63%, respectively. The established model can be used to effectively extract accurate landslides as a reference for landslide hazard mitigation.

Key Words: landslide extraction, self-organizing map (SOM), fuzzy theory.