利用 python 自動化快速繪製地震誘發山崩之山崩潛感圖

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摘要

台灣位於環太平洋火山地震帶上，一年中發生地震的次數可說是不計其數，台灣又有許多活動斷層，可能正在醞釀大地震的發生，根據統計，發生地震所奪走的生命財產損失除了地震本身外，再來就是地震所引發的山崩，因此在地震發生時能快速且準確地知道哪裡可能會發生山崩是件重要的事，除了可以盡快疏散村民，也可以提供給救難隊，讓他們知道哪裡需要救援。

本研究希望透過 python 可以即時的繪製山崩潛感圖，減少費時的人工資料處理，透過程式在數分鐘內及時發布山崩潛感圖，降低生命財產的損失，在本研究中使用了李錫堤教授 2014 年在 Engineering Geology 發表的文章作為本研究的模型，文章內使用羅吉斯回歸計算潛感值，使用了坡度、坡向、岩性…等八個因子作分析，將因子代入回歸式，得到全台灣的潛感值，最終根據統計，AUC(Area under the Curve of ROC)=0.898。

在未來希望能學習李教授的分析步驟，轉換成自動化程式，當主震發生時，在第一時間利用遙測技術蒐集山崩目錄以及強震站的地震訊號，進行羅吉斯迴歸分析得到模型，在配合現在正在發展的餘震預測技術，先行得到餘震可能的震度圖，將這些因子代入計算好的模型，就可以得到餘震可能造成的山崩分布，進而減少餘震帶來的二次傷害。

Using python to automatically draw the landslide susceptibility map of earthquake-induced landslides

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Abstract

Taiwan is located on the Circum- Pacific seismic zone. There are many active faults in Taiwan, and a major earthquake may be occurred. According to statistics, in addition to the fatalities caused by the earthquake, there are also caused by earthquake-induced landslides. Therefore, it is very important to know where the landslide may occur quickly and accurately when an earthquake occurs. In addition to evacuating villagers as soon as possible, it can also be provided to rescue teams to let them know where they need rescue.

This research hopes to draw the landslide susceptibility map in near-real time through python, reduce the time-consuming manual data processing, and release the landslide susceptibility map in a few minutes through the program. In this study, the article published by Professor Lee in Engineering Geology in 2014 was used as a model. Logistic regression is used in the article to calculate the susceptibility, and eight factors such as slope, aspect, lithology and so on are used for analysis. Substitute the factor into the regression formula to get the susceptibility of Taiwan, and finally according to the statistics, AUC(Area under the Curve of ROC)=0.898.

In the future, I hope to learn the analysis steps of Professor Lee and convert it into an automatic program. When the earthquake occurs, use the remote sensing technology to collect the landslide catalogue and seismic signals from strong motion stations in the first time, and perform Logistic regression analysis to obtain the model. Combined with the aftershock prediction technology that is currently being developed, first obtains the possible seismic intensity map of aftershocks, and substitutes these factors into the calculated model to obtain the distribution of landslides that may be caused by aftershocks, thereby reducing the secondary damage caused by aftershocks.