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Prediction of Landslide using Integration Technique

Lee Saro and Oh Hyun-Joo

Korea Institute of Geoscience and Mineral Resources (KIGAM), Geosciece Information Center, Daejeon, Republic of Korea (leesaro@kigam.re.kr)

Integrated techniques were developed, applied, and verified for analysis of landslide susceptibility in Jinbu-myeon, Korea using a Geographic Information System (GIS). Landslide locations were identified in the Jinbu-myeon area from interpretation of digital aerial photographs and field surveys. The topographic, soil, forest, geologic, lineament and land cover data were collected, processed and constructed into a spatial database using GIS data. The factors that influence landslide occurrence, such as slope, aspect, curvature, Topographic Wetness Index (TWI), and Stream Power Index (SPI) of the topography, were calculated from the topographic database. Texture, material, drainage, effective soil thickness and topographic were extracted from the soil database, and type, age, diameter and density of timber were extracted form the forest database. The lithology was extracted from the geological database and lineaments were detected from hillshade map. The structural geologist interpreted the hillshade map and detected the lineaments. The land cover was classified based on the SPOT satellite image. By using the constructed spatial database, the relationships between the detected landslide locations and the seventeen related factors were identified and quantified by likelihood ratio, weight of evidence, logistic regression and artificial neural networks models. The relationships were used as factor ratings in the overlay analysis to create landslide susceptibility indexes and maps. Then the four landslide susceptibility maps were reflected in new input factors and combined using likelihood ratio, weight of evidence, logistic regression and artificial neural network models to make better susceptibility map. All of the susceptibility maps were verified by comparison with known landslide locations, which were not used during the training of the individual models. As the result, the combined landslide susceptibility maps used landslide-related new four input factors showed the better accuracy (87.11% in likelihood ratio, 83.14% in weight of evidence, 87.79% in logistic regression, and 84.57% in artificial neural network respectively), than individual landslide susceptibility maps (84.94% in likelihood ratio, 82.82% in weight of evidence, 87.72% in logistic regression, and 81.44% in artificial neural network respectively) used seventeen factors from the topographic, soil, forest, geologic, lineament and land cover data. The difference of accuracies between the combined and individual landslide susceptibility maps in likelihood ratio, weight of evidence, logistic regression, and artificial neural network is 2.17%, 0.32%, 0.07%, and 3.13%, respectively. From the results of this study, it is concluded that the integrated models are effective in improving the prediction accuracy than the individual models. So far, the integrated model is not used widely, and therefore more case studies need to be performed for more validation purpose.

Keyword: Landslide susceptibility, Integration, GIS, Korea, Likelihood ratio, Weight of evidence, Logistic regression, Artificial neural network.