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An approach to predict the run-out distance of debris using an artificial intelligence method

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In order to predict the run-out distance of debris, this study performed detailed field survey, laboratory soil tests and analysis of run-out distance at three pilot sites composed with different lithologies in Korea. The purpose of field survey is to acquire the geometric data of debris flow such as length, width, slope angle, orientation, depth of cutting plane or thickness of deposited debris, volume and flow trajectory of debris as well as lithology. The laboratory soil tests were conducted to get physical and geotechnical properties of in-situ soil and the sliding material.

Based on the results of field survey and the laboratory test, an artificial intelligence method was applied to assess run-out distance of debris. Because the influential factors of run-out distance are too complex to analyze one by one in a deterministic manner, the back propagation algorithm was used to characterize run-out distance considered with topographic and geologic properties. The training data of run-out distances were applied using 24 landslides that were not interfered by adjacent landslides in natural terrain. The input factors were determined as follows: slope gradient, length of landslide, permeability, dry density and porosity. They were selected by the logistic regression analysis that had been utilized to develop landslide probability. As the analyses results of run-out distance using the artificial intelligence method, it was possible to determine two models with the inference accuracy lower than 5% and 2%.

This study also conducts model tests in the laboratory to understand the relationship of each influential factor among rainfall, soil properties and slope angle. The test results are verified with the data of field survey collected at the pilot sites. For the further studies, the assessment results of run-out distance will be used for the development of

quantitative risk assessment of debris flow.