Geophysical Research Abstracts
Vol. 21, EGU2019-14382, 2019
EGU General Assembly 2019

Semi-Automatic System For Backward Determination Of Landslide Soil Parameters

Giulia Bossi (1), Giacomo Titti (1,2), Gianluca Marcato (1), and Alessandro Pasuto (1)

(1) CNR-IRPI, Research Institute for Geo-Hydrological Protection, Padova, Italy (giulia.bossi@irpi.cnr.it), (2) ALMA MATER STUDIORUM - Università di Bologna, Viale Risorgimento, 2, 40136, Bologna, Italy

Back-analysis is widely used dealing with geotechnical problems. For landslide modeling, it is often used to select the most appropriate soil parameters based on monitoring data. It is generally strongly operator dependent through a time consuming trial-and-error procedure. In literature, several methods was suggested to automatize the optimization procedure but no one proposed an autonomous, objective method focused to support the operator decision making.

Therefore, the main aim of this research was the implementation of a Decision Support System to support the determination of the landslide soil parameters on the base of monitoring data.

From a group of admissible numerical solutions, representing the tri-dimensional models of the slope instability, the optimal solution was evaluated minimizing the objective function during the optimization process. To increase the interoperability between the operator and the optimization process, the problem was simplified converting the multi-objective optimization problem into a single-objective optimization problem. The objective function was reduced into consequential combination of two linear equations.

Generating a pool of possible numerical solutions through the permutation of soil parameters, the system selects the best ten configurations by the evaluation of the intensities and directions similarity between the monitored and simulated displacements.

The pool of the admissible solutions was automatically generated in FLAC3DTM as finite difference tri-dimensional models of the landslide analyzed.

In spite of the approach proposed is based on a well-known strategy, the procedure used to reach the landslide soil parameters and the scope of the system are extremely innovative.

The configuration of the method into Decision Support System allows to reduce the operator biases and avoids to provide a unique and thus questionable solution. Therefore ten best-fitting solutions are proposed by the system to allow the operator selection of the preferred solution according to geomorphological evidences.

The case study selected for the first application of the Decision Support System was located in the North East Italy. At date it is monitored by 3 GNSS benchmarks and 3 inclinometers. Therefore the analysis was based on the divergence consistency of these 6 points.

The encouraging results so far obtained demonstrate the straightforwardness, scalability and robustness of the method adopted. Moreover, the interactivity of the procedure highlights the focal point of the research to support the decision making.