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## Susceptibility assessment of shallow slides failure and run-out

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The research is focused on the susceptibility assessment of shallow slides in the region north of Lisbon (Portugal), by modelling the failure and run-out areas separately. The shallow slides failure is evaluated using a statistical method (logistic regression). The existence of shallow slides inventories occurred in distinct periods allowed the separation of data into two independent groups (training and validation) and the adoption of the temporal criterion for the independent validation. The latter revealed an Area Under the Receiver Operating Characteristic curve of 0.90, which reflects a very good predictive capacity of the logistic regression model.

For the run-out assessment, a simple cellular automata model is implemented through the following sequential steps: a) pre-processing and establishment of transition rules; b) integration of variables; and c) temporal indexing and simulation. The pre-processing step includes the creation of a database with the modelling inputs. The transition rules are directly related with the motion of the displaced mass. In this context, the likely traveling directions are identified, both horizontally and vertically. The integration of transition rules is performed using the algorithm Path Distance, from ESRI. For the temporal indexing, we use the Markov chains analysis to estimate a transition area matrix, which records the number of cells that is expected to change location over a specified time. The last stage refers to the cellular automata model simulation, i.e. to the spatial distribution of the landslide displaced mass. The run-out modelling, using the cellular automata model proposed, provided good results, with an overlap between the simulation and the real cases of 77%. Lastly, a final shallow slide susceptibility map was constructed including both failure and run-out areas. This work accomplished a combination of low-cost methodology with limited input data that allowed a good performance of the landslide susceptibility assessment and can be easily applied to other regions.

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