Structurally Controlled Slope Stability Study Using Genetic Algorithm

G. You1

1.Senior Lecturer, Federation University Australia, Ballarat, Victoria 3353. Email:g.you@federation.edu.au

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# ABSTRACT

A genetic algorithm (GA) program is developed in MATLAB, which can simultaneously analyse five random variables—three structural parameters (joint and fault location and dip angle) and two strength parameters (cohesion *c*, and friction angle *φ*)—using the limiting equilibrium method. The program is applied for a case of bench-scale slope failure published in literature. The GA results demonstrate that the slope failure is structurally controlled, with the GA successfully identifying a nearly maximal unstable block, aligning with field observations of the failure mass. The unfavourable block configurated by the GA program is characterized by *Joint 1* located at the toe with a low-end dip angle and the fault located the furthest location from the crest of the bench, along with minimal rock mass cohesion and frictional angle. It is concluded that the bench-scale wedge failure was initiated by sliding along Joint 1, where the fault intersects it at the rear of the block, and was further compounded by toppling against Joint 2, resulting in a combined sliding-toppling failure mode.