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**DETERMINATION OF THE CRITICAL FAILURE SURFACE FOR SLOPE  
STABILITY ANALYSIS USING ANT COLONY OPTIMIZATION**

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A Thesis Presented

by

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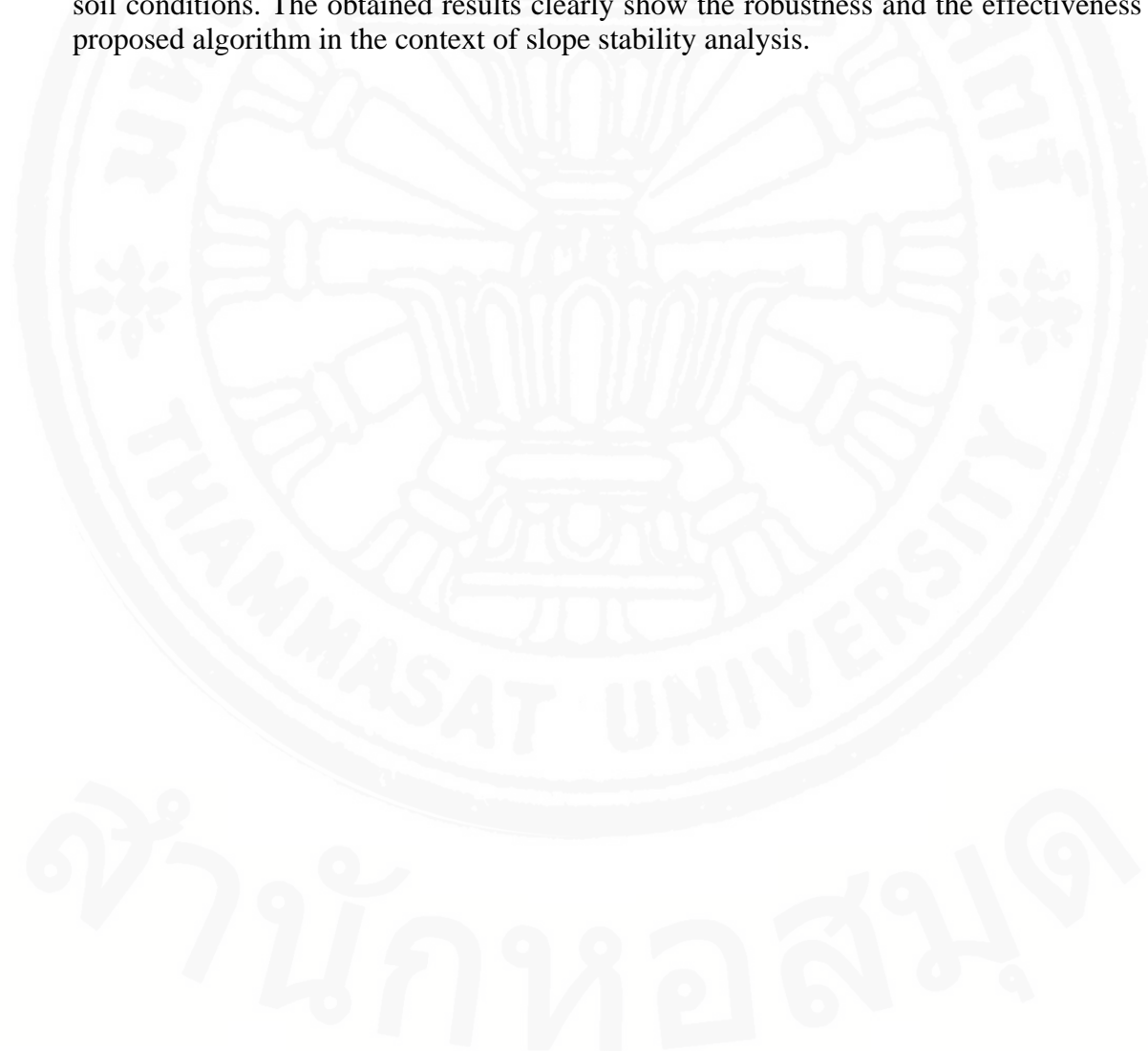
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## Abstract

The principal objective of this research is to find the critical failure surface in a soil slope by employing Ant Colony Optimization (ACO) to find the slip surface with the minimum factor of safety. Factors of safety of slip surfaces are found by using the Morgenstern-Price method, which satisfies both force and moment equilibrium. Nonlinear equations from the Morgenstern-Price method are solved numerically by the Newton-Raphson method. In this study, slope stability analysis is formulated as a combinatorial optimization problem that fits the ACO technique. Since the basic concept of the ACO technique is simple, the proposed algorithm can be easily implemented. In the proposed ACO algorithm, the starting and ending points as well as the shapes of slip surfaces are treated as variables. The proposed heuristic algorithm represents slip surfaces as piecewise linear curves and solves for the optimal curve yielding the minimum factor of safety. The validity of the proposed algorithm in solving slope stability problems is investigated by solving various examples including homogeneous and inhomogeneous soil conditions. The obtained results clearly show the robustness and the effectiveness of proposed algorithm in the context of slope stability analysis.



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