



Interactive comment on “Simplified approach for locating the critical probabilistic slip surface in limit equilibrium analysis” by Y. M. Cheng et al.

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Received and published: 13 February 2015

1. More updated references (from 2009 to 2015) are added in the revised manuscript. There are too much to cite, and the authors have only selected some references, and interested readers can read those additional references for more reference works.
2. The authors have added more literature review about the approximate methods in the revised manuscript.
3. The proposed method can be viewed as an approximate method in determining the system reliability, and the proposed method is usually better than that based on cdss. This is mentioned clearly in the revised manuscript.

The revisions have been marked in red in the revised manuscript for clarity.

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Simplified Approach for Locating the Critical Probabilistic Slip Surface in Limit Equilibrium Analysis

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Abstract: This paper aims to develop a rapid and practical procedure that can locate the slip surface for a slope with the minimum reliability index for limit equilibrium analysis at the minimum expense of time. The comparative study on the reliability indices from different sample numbers using the Monte Carlo Simulation Method has demonstrated that the results from large enough sample number are related with those from small sample number with high correlation indices. This observation has been tested for many homogeneous and heterogeneous slopes with various conditions under parametric studies. Based on this observation, the reliability index for a potential slip surface can be calculated with a small sample number, and the search for the minimum reliability index and the slip surface can be determined by heuristic optimization algorithm. Based on the comparisons between the critical deterministic and probabilistic slip surfaces for many different cases, the use of the proposed fast method in locating the critical probabilistic slip surface is found to perform well, which is suitable for normal routine analysis and design works.

Keywords : Reliability, limit equilibrium, Monte Carlo Simulation

Introduction

It is widely accepted that slopes with safety factors greater than unity are not necessarily safe because of the underlying geotechnical variability and uncertainty, as well as the simplifications assumed when using in predictive methods. Hong Kong is well-known for slope failures with an average of approximately 300 such failures per

Fig. 1.

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