

Reliability analysis of soil slope stability based on the probability density evolution method

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Abstract

It is well-known that the earthquake ground motions have the remarkable characteristic of randomness, so it's necessary to investigate the seismic response of the engineering structures from the stochastic viewpoint. The probability density evolution method(PDEM) and equivalent extreme value event method are introduced into the stochastic seismic response analysis and evaluation of the slope stability. Based on the PDEM and the finite element analysis method, this paper analyses the stochastic seismic response of the slope under the random earthquake loading. The affluent probability information is obtained, such as the second-order statistical quantities and probability density function of the seismic response. The probability density function is evolved with the time and has the obvious random fluctuation characteristic. And by means of construction of equivalent extreme value event, the reliability of the stability of the slope under the earthquake could be acquired. From the point view of reliability, we assess the stability of the slope under the earthquake. According to the safety factor of criterion, the safe probability of the slope is 80%. Compared with traditional limit equilibrium method, the reliability analysis can directly reflect the failure probability and degree of slope. Therefore, it's a new attempt for the stability of slope by the random method.

Keyword PDEM, Slope Stability, Reliability, Stochastic Earthquake Excitation