基于仿生算法的滑坡危险滑动面反演(1)——滑动面搜索

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摘要　滑坡稳定性分析中一个非常重要的问题就是其潜在危险滑动面搜索的问题。为了更好地进行滑动面搜索研究，这里以滑动面上的若干关键点作为搜索目标，从而使问题变成了一个搜索关键点坐标的问题。由于实际滑坡性质的复杂性，此优化问题非常复杂，采用常规优化技术常常不能奏效。为了有效地解决这个问题，这里以效率更高、效果更佳的仿生算法——免疫进化规划作为优化工具，以滑动面上关键点坐标作为优化参数，以滑坡稳定性安全系数作为优化目标进行研究，提出了一种进行任意滑动面搜索的新方法。最后，通过一个典型算例及一个边坡工程实例验证了方法的有效性。

关键词　工程地质；危险滑动面；搜索；优化问题；仿生算法；免疫进化规划

分类号

Abstract
Location of critical failure surface and identification of its parameters are two very important problems in slope stability analysis. At first，location of critical failure surface is studied. Here，the coordinates of some reference points are taken as searching objectives，so the problem of location of critical failure surface is transformed to a typical complicated optimization problem that can not be solved by traditional optimization methods. To solve this problem，the new global optimization method that is called bionics algorithm-immunized evolutionary programming is introduced. So，taking the coordinate of reference points as optimization parameters and safety factor as optimization objective，a new method to search critical failure surface is proposed. At last，through a typical numerical example and an engineering example，this new method is verified. The results show that this new method can solve the problem of location of critical failure surface very well and can be applied to engineering practice. But only to locate the critical failure surface with supposed parameters can not get the

suitable safety factor of slope，the better way is to search the critical failure surface and its parameters at the same time. This problem can be solved in the second part of this paper.

Key words engineering geology；critical failure surface；search；optimization problem；bionics algorithm；immunized evolutionary programming

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