■ 论文摘要

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基于模糊控制的人工神经网络模拟在
土质边坡安全预测中的应用

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摘　要：从最优化角度出发，用神经网络解决模糊控制系统的规则提取问题，给出可靠的基于BP算法的可靠神经网络模拟过程，对模糊子集个数的选取与系统复杂性、精确性之间的关系进行讨论。为获得边坡复杂工况下的安全特征，建立基于模糊控制的人工神经网络边坡安全预测模型，由大量样本进行网络训练。研究结果表明：所建立的模型预测精度较高，且实用易行；边坡的坡度、内摩擦角、凝聚力对边坡的安全系数影响较大；该预测模型可用于处理普遍存在的不确定性、非线性复杂工程问题；通过模糊控制调整模型，可对不同工程对象进行较精确的模拟分析。

关键字：模糊控制系统；神经网络；模糊子集；预测；边坡稳定

Artificial neural network simulation on prediction of
clay slope stability based on fuzzy controller

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Abstract: Based on optimal consideration, the problem of abstracting rule of a fuzzy control system by introducing neural network was solved. A reliable learning procedure for the neural network based on BP algorithm was suggested and the relationship among the number of fuzzy sets and the complexity and accuracy of fuzzy controller was investigated. Furthermore, in order to obtain safety characteristics of slope with complicated working behaviours, the prediction of the slope stability was presented on the foregoing artificial neural network under fuzzy controller, and many samples were collected to carry on the network training. The results show that the prediction models are accurate and easy to operate. The safety factor is affected largely by the parameters of the slope stability such as the slope gradient, rubbing angle inside and coagulate force. Theoretical model can be used to study the uncertainty and nonlinearity in engineering. With the help of fuzzy controlling system which is applicable for model's adjustment, it is of convenience to simulate the working behavior of diverse cases accurately.

Key words:fuzzy control system; neural network; fuzzy sets; prediction; slope stability