

中文力学类核心期刊  
中国期刊方阵双效期刊  
美国《工程索引》(EI Compendex)核心期刊(2002—2012)  
中国高校优秀科技期刊

黄诚,任伟中. 抗滑桩与滑坡相互作用分析的常微分方程组边值法[J]. 计算力学学报, 2012, 29(3): 421-426

### 抗滑桩与滑坡相互作用分析的常微分方程组边值法

Boundary value method of ordinary differential equation system for analysing interaction between landslide and stabilizing pile

投稿时间: 2010-11-29 最后修改时间: 2011-10-19

DOI: 10.7511/jslx20123022

中文关键词: [边坡稳定性](#) [抗滑桩](#) [滑坡推力](#) [控制微分方程](#) [边值定解问题](#) [边值法](#)

英文关键词: [slope stability](#) [landslide stabilizing piles](#) [land-slide thrust](#) [governing differential equation](#) [boundary-value problem](#) [boundary-value method](#)

基金项目: 国家自然科学基金青年基金(51008298); 国家科技支撑计划(2009BAK53B03); 岩土力学与工程国家重点实验室重点(SKLZ08064); 国家重点基础研究发展规划(973)(2010CB7321助项目).

作者	单位	E-mail
<a href="#">黄诚</a>	<a href="#">中国科学院 武汉岩土力学研究所 岩土力学与工程国家重点实验室, 武汉 430071</a>	<a href="mailto:tjhuangcheng@163.com">tjhuangcheng@163.com</a>
<a href="#">任伟中</a>	<a href="#">中国科学院 武汉岩土力学研究所 岩土力学与工程国家重点实验室, 武汉 430071</a>	

摘要点击次数: 263

全文下载次数: 177

中文摘要:

将抗滑桩与滑坡的相互作用抽象为一阶常微分方程组在特定边界条件约束下的定解问题,通过龙格-库塔(Runge-Kutta)差分法求解该方程组可得桩身内力与变形及滑床抗力,不同于常规的基于桩体挠曲四阶微分方程的级数解法、差分法及有限元法,可以一次性解出桩身内力及变形值,无需进行二次换算;可对全桩进行整体分析,无需像传统方法那样以滑界将桩身分成受荷段和锚固段分别计算;该方法一改传统的求解高阶微分方程为解低阶微分方程组,符合计算力学的优化思想,并且可以方便地考虑桩身的剪切变形,为抗滑桩的计算提供了一种切实可行的新思路,可作为传统抗滑桩内力分析方法的有效补充。本文还编写了基于该法的全桩内力计算和图形处理程序。工程算例表明,该方法与传统方法的计算结果吻合,且程序运行效率更高。

英文摘要:

The interaction between stabilizing pile and landslide is abstracted as the first order differential equation system problem constrained by specified boundary conditions. The Runge-Kutta differential method is used to solve this system of equations to obtain the pile's internal forces and displacement. This approach is quite different from the traditional methods based on the fourth order deflection differential equation solved by power series, finite difference method and FEM. The pile's internal forces and displacement can be calculated directly. So, the second variable conversion is not needed. The pile can be analyzed as a complete entity. So, it is not necessary to divide the pile into loading segment and anchoring segment by the sliding surface like the traditional methods. This method coincides with the optimization idea of computational mechanics because of its use of low order differential equation system rather than high order differential equation. And it is easy to take the pile's shear deflection effects into account. In short, the proposed approach is a practical new idea for analyzing landslide stabilizing pile as a useful supplement to traditional methods. The program for pile internal forces analysis and graphics edit is developed. The verification and comparison with the traditional method were performed by an engineering example calculation. The results show that its solution agrees well with the traditional method and the computer program can improve the efficiency of traditional design of landslide stabilizing piles.

[查看全文](#) [查看/发表评论](#) [下载PDF阅读器](#)