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基于典型断面雨量-水位函数的中小桥水害预测

李整¹, 文雨松¹, 罗艺², 赵尊焘¹

(1. 中南大学 土木建筑学院, 湖南 长沙, 410075;
2. 衡东县交通局, 湖南 衡阳, 421400)

摘要: 基于推理公式法和均匀稳定流概念, 借助模糊相似优先比理论, 提出一种针对既有中小桥的水害预测新方法。将实际中小桥河床断面归纳为10类典型断面, 建立各类典型断面的雨量-水位函数模型; 利用模糊相似优先比理论确定与实际断面最相似的典型断面, 选取雨量-水位函数模型; 借助可靠的墩台水痕和对应的雨量资料, 求解常量参数 K , 确定雨量-水位函数, 再利用现时或预报雨量资料对桥梁抗洪能力进行评估和水害预测。研究表明: 该方法的理论基础可靠, 只需要桥址处河床糙率系数和一组历史雨量及对应的水痕标高数据, 当地质情况已知时, 还可以进行冲刷程度预测; 避免了收集汇流方式、雨量损失、流域平均坡度、流域面积和主河槽长度等水文参数, 减少了大量的野外勘测工作和繁琐的计算量; 实例桥梁检测表明本方法使用方便, 精度满足实际要求。

关键字: 水害预测; 雨量-水位函数; 模糊相似优先比; 水痕

Flood forecast method for middle & small bridges based on rainfall-water level functions of representative riverbed sections

LI Zheng¹, WEN Yu-song¹, LUO Yi², ZHAO Zun-tao¹

(1. School of Civil and Architectural Engineering, Central South University, Changsha 410075, China;
2. Hengdong Communication Bureau, Hengyang 421400, China)

Abstract: Based on rational formula, homogeneous flow and fuzzy similar-priority comparison theory, a new flood forecast method for existing middle and small bridges was presented. Firstly, according to shapes of actual riverbed sections, riverbed sections were reduced to 10 types of representative riverbed sections, and rainfall-water level function model of every representative riverbed section was established. Then, using the fuzzy similar-priority comparison theory, the most similar section with actual section was found, so the function model could be got. Finally, by dint of reliable water marks on piers and the corresponding rainfalls, constant K was solved. Sequentially, rainfall-water level function could be fixed and instantaneous or forecast rainfall data could be used to assess flood-resistance performance and predict flood of bridges. The results show that this new method has credible theoretic foundation. Once roughness and a couple of rainfall and water mark at bridge sites are provided, prediction can be made. Besides, when geologic condition is known, scouring can be predicted too, avoiding fussy calculation and troublesome field reconnaissance in order to collect parameters, such as ways of runoff confluence, loss of rainfall, average gradient and area of drainage basin, length of main river course, and so on. This method is easy to use and its degree of accuracy can meet the actual demand.

Key words:flood forecast; rainfall-water level function; fuzzy similar-priority comparison; water marks

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地 址：湖南省长沙市中南大学 邮 编： 410083

电 话： 0731-88879765 传 真： 0731-88877727

电子邮箱： zngdxb@mail.csu.edu.cn 湘ICP备09001153号