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Integrate simulated annealing algorithm and WASH123D to develop an automatic identification system for Chuoshui River in

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Taiwan is located in the subtropical areas and often suffers from typhoons and heavy rains. In order to reduce the threat caused by typhoon, it is necessary to accurately estimate the water level of a river for flood disaster prevention and mitigation. Hydraulic analysis of a river is important in river management planning and engineering design. The identification of hydraulic parameter has huge impact on the water level estimation of a river during the hydraulic analysis. Manning ′ s roughness coefficient is usually used to describe a river ′ s surface roughness and sinuosity in hydraulic modeling. This coefficient is usually determined empirically in the past, which is tedious and time-consuming. Therefore, the optimization algorithms become an effective tool for engineers to select the Manning ′ s roughness coefficient.

The concept of simulated annealing algorithm (SA) is based on an analogy to crystallization process of the physical annealing from a high temperature state. Since SA has the Metropolis mechanism to escape local optimum trap, it has been applied to various types of optimization problems. In addition, the hydraulic model plays a crucial role for flood simulation and the WASH123D, an integrated multi-media, multi-processes and physics-based computational model suitable for various spatial-temporal scale, is selected in this study to simulate the water level. The purpose of this study is to integrate SA and WASH123D to develop a system for automatically identifying the optimal Manning ′ s roughness coefficients of the reach according to the given upstream and downstream boundary conditions of the river. Firstly, the cross sections and related hydrological data of the river are collected for flood hydrograph simulation in WASH123D and make sure the model can be executed for the reasonable range of the Manning ′ s roughness coefficient. Then, the system incorporates SA with WASH123D to identify the optimal Manning ′ s roughness coefficient according to the objective function for minimizing the difference between observed and simulated water level. The system is applied to the Chuoshui River in Taiwan. Flood in two typhoon events is simulated and the flood hydrograph is analyzed in this study to find the optimal Manning ′ s roughness coefficient. Results demonstrate that the system proposed in this study has feasibility to automatically identify the Manning ′ s coefficient.

キーワード: Simulated annealing algorithm, WASH123D, Manning's roughness coefficient, Automatic identification system
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