A novel seed spread algorithm–based approach for the simulation of rainstorm water logging in urban area

Qiuwen Zhang[a,*], Fei Yan[a], Ji Shen[b], Song Ye[a], Bo Ren[a], Xike Zhang[a]

[a]*School of Hydropower and Information Engineering, Huazhong University of Science and Technology, Wuhan 430074, China,*
emails: qwzhang@hust.edu.cn (Q. Zhang), ceiba_yan@hust.edu.cn (F. Yan), yesong@hust.edu.cn (S. Ye),
15803437755@163.com (B. Ren), koko@hust.edu.cn (X. Zhang)
[b]*School of Information and Safety Engineering, Zhongnan University of Economics and Law, Wuhan 430073, China,*
email: shenbx1987@163.com (J. Shen)

ABSTRACT

Rainstorm water logging simulation is an important support for the flood disaster losses assessment and flood control in urban area. In this paper, according to the characteristics of urban rainstorm water logging, a novel seed spread–based calculation model for the simulation of rainstorm water logging in urban area is proposed. In this model, the urban area is firstly divided into many different calculation units on the basis of digital elevation model data, and the hydrological parameters of all these units are collected and stored in the form of spatial and attribute data with the help of geographical information system (GIS). The internal rainstorm water logging of each unit is simulated by simplifying the irregular topography of the calculation unit as a cone. In order to simulate the water spread between different calculation units, a new seed spread algorithm, which is based on the classical Direction 8 (D8) model, is adopted as well. Finally, with the supports of GIS, the improved urban rainstorm water logging simulation approach is implemented and applied to the city of Wuhan, China. It is shown that the proposed novel seed spread–based approach can provide more precise and more efficient simulation for the rainstorm water logging in urban area.

Keywords: Rainstorm; Water logging; Seed spread algorithm; Urban area; Simulation; Calculation unit; DEM; GIS