

A MODEL FOR FLOOD INUNDATION ANALYSIS IN URBAN AREA: VERIFICATION AND APPLICATION

○ Nguyen Tat THANG • Kazuya INOUE • Keiichi TODA • Kenji KAWAIKE

1. Introduction

The mathematical model developed by Kawaike K. et al. 2000 is applied to analyze flood inundation in urban areas. The model is first verified by using experiment data provided by Ujigawa Laboratory Group, DPRI, Kyoto University. Additional verification is carried out by using some rough measured data of flood inundation caused by heavy rainfall in Hanoi city of Vietnam in 2001. The model is then applied to predict the flood inundation processes when assumed exceptionally heavy rainfall or river dike break happens in Hanoi.

2. Model verification and application outlines

- (1) The 2-D unsteady flood flow is modeled by the system of shallow water equations. The finite difference technique based on unstructured meshes is used. The finite difference equations are fully explicit.
- (2) The experiment model is shown in Fig. 1. The computation mesh system for the model verification is shown in Fig. 2.

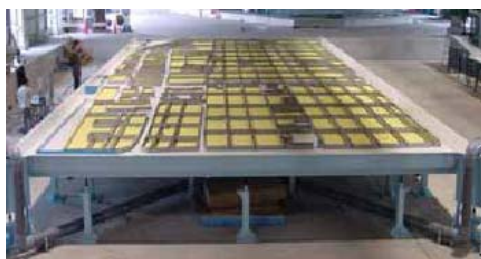


Fig.1 The experiment model

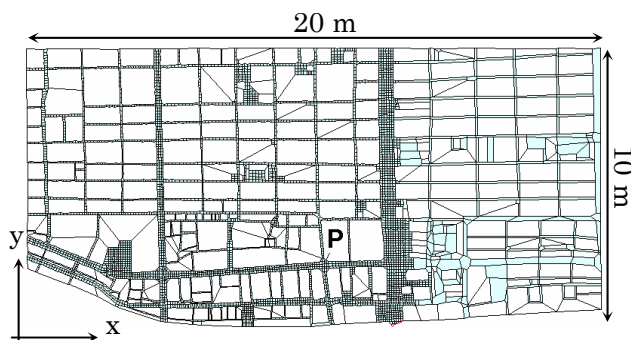


Fig.2 The computation meshes

The area is divided into 4996 unstructured meshes. The meshes of streets are very fine. Meshes of building blocks are kept almost the same as original shapes of these blocks.

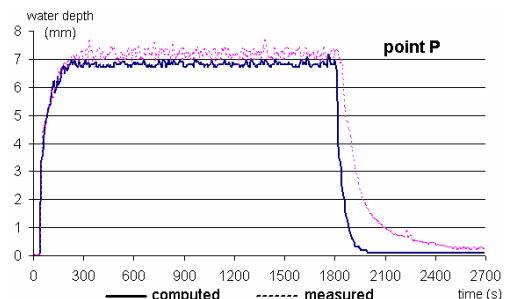


Fig.3 Computed water depth and measured one at the point P in Fig. 2

- (3) The study area of a real urban area is shown in Fig. 4. The area is divided into 5060 unstructured meshes as shown in Fig. 5.

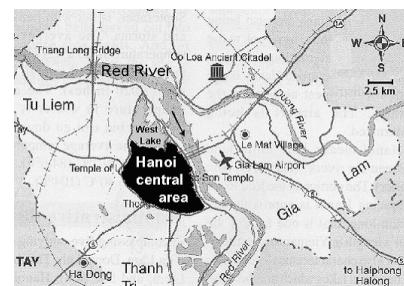


Fig.4 Study area (Hanoi central area)

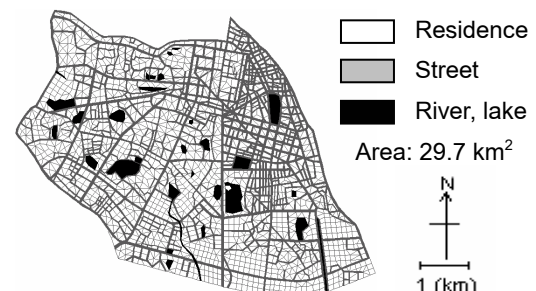


Fig.5 The unstructured mesh system

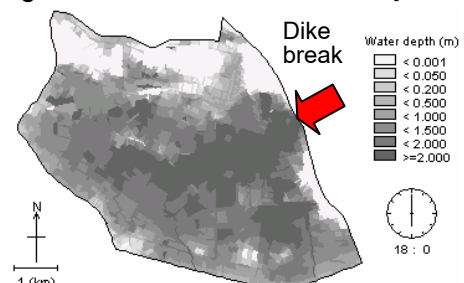


Fig.6 Water depth distribution (18 hours after dike break)

3. Conclusion remarks

- (1) The simulation results are acceptable.
- (2) The model is very effective in treating complicated topography of urban areas.