KEY TECHNOLOGIES OF FLOOD DEFENSE IN URBAN AREAS

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Abstract

This paper is concerned about the following problems: ①Flood simulation for urban areas based on compound models of 1-D and 2-D hydraulic models; ②Flood losses estimation and assessment by applying hydrological and hydraulic approaches; ③Application of advanced information technologies in flood simulation, information visualization and system integration, such as GIS, WEB, Database and Flash, etc. Case studies have been done for some Chinese cities, such as Shanghai, Hangzhou, Beijing etc.

Flood control and disaster mitigation in cities has become an important issue due to several factors: ①New cities will be mostly located in areas subject to flooding; ②Construction and expansion of cities will change the environment conditions and affect flooding regime tremendously; ③The flood control principles in the urban and suburb areas should be modified accordingly due to city development; ④Flood control in urban areas must be conducted together with water resource utilization, environment protection and city's overall planning.

The supporting technologies for flood control have been developing rapidly in recent years, such as flood forecasting, flood simulation, flood losses estimation, flood risk assessment and management, database, network, GIS and remote sensing, etc. In order to improve accuracy in flood simulation, it is necessary to have models, which can take spot (inundation location), line (river), surface (lake, park) and network (drainpipe) into consideration.

The hydraulic model was built based on the continuity equation and momentum equation. In this model, the water depth variable is placed in the center of cells and the velocity variables are placed on the borders between cells.

The flood risk map is made by means of labeling the basic flood factors, such as, inundated area, water depth, inundation time, flow velocity, etc. on the map of the studying area.
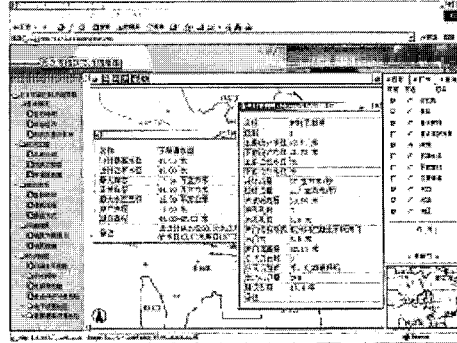
An information query system based on GIS is developed by using Microsoft Visual Basic 6.0 and MapX of MapInfo, Microsoft Access. The module is made up of three parts: information maintenance and visualization; calculation, results output and query; system files management. By using various charts, such as regional distributing chart, grading chart, point density chart, column chart, and square chart, all necessary information about social, economic conditions as well as inundation situation can be displayed and so flooding losses analysis can be made.

A flood contrl decision support system (FCDSS) has been developed, which has the following functions: information service; flood simulation; flood regulation scheme optimization and assessment; visualized display of flood regulation. Advanced information technologies are integrated into the system such as: WEB, Data Base and GIS.

A Flood Management Map in urban area of Beijing City has been developed to visually display the results in different flood scenarios by integrating GIS and cartoon showing(FLASH) into the system. Various Databases are built-in as background platform. The system provides several visualization approaches. The end-users can easily access their needed data in any emergent cases and make decisions on various issues by analyzing and summing-up of information provided.
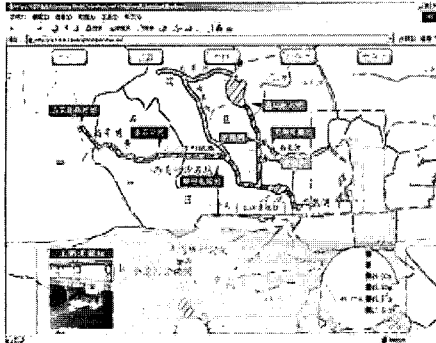
Information query based on GIS for Beijing City.   Flood management in Beijing City.