Chapter 39
Online Flood Information System:
REST-Based Web Service

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ABSTRACT

This chapter implements a cyber-platform which visualizes and analyzes spatial patterns of flooding with a user-oriented spatial intelligence. The chapter is organized from three perspectives: first, why representation and modeling of flooding data set is vital; second, how the design of flooding analysis involves spatial intelligence; third, why flooding analysis should be integrated into Cyber-infrastructure. The flood is one of the most common and devastative disasters. Flood disasters bring huge damages to the affected communities and beyond. Hence, a fast and effective flood information inquiry system is critical to reduce the loss. REST-based Web Service illustrates its great advantages in web map re-rendering, attribute information retrieving, and advanced GIS functions. This research introduces how to use REST-based Web Service to build a user-friendly online flood information inquiry system.

INTRODUCTION

The flood is a common, devastating, and frequently-occurred disaster (International Federation of Red Cross and Red Crescent Societies - IFRCRCS, 1998). It has catastrophic and devastating consequences on the community and economic development "in the form of natural resources, lives, properties, and other physical infrastructure" (Rahman et al., 2005). The communities affected by floods can be as small as local communities or as large as multi-states/multi-provinces. Floods have huge impacts on regional development. Severe floods often inundate a large area of farmland and destroy crop. Once floods occur in urban area, the loss is even more serious due to the concentration of population and economic activities. Besides, floods can also influence other regions by damaging the transportation system (e.g. airport,

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railroad, highway) and blocking the flows of people and goods. Throughout human history, floods have caused tremendous environmental damage, tragic loss of life, emotional suffering, and financial crisis. A better understanding of the nature and mechanism of flooding will contribute to predict and prepare for disaster and therefor to minimize the loss.

In flood-prone areas, the flood happens several times at different levels of severity every year. Under most circumstances, floods are predictable because they are always associated with huge amount of rainfall in a short time period. Floods often cause huge damages and destructions to human lives, infrastructures, and communities located close to water bodies, although the flood is predicable.

There are two types of responses to floods (Hyde, 2010): the flood control and floodplain management. Floodplain management is extremely important in practice since floods can't be completely controlled (Miller & Miller, 2000). This research aims to introduce a better approach of floodplain management. Floodplain management is "the operation of a community program of corrective and preventative measures for reducing flood damage" (FEMA). This operation takes a variety of styles which generally include zoning, subdivision, and special-purpose floodplain ordinances.

Among floodplain management operations, the first step is to identify the areas that are most vulnerable to flooding. Information about that floodplain is very useful and important to inform people the degree of flood risk and to help them make right decisions. For example, floodplain managers, insurance agents, developers, real estate agents, local planners and citizens all need the relevant information to protect properties and themselves. The information includes whether a site is within the floodplain, which level of damage the flood could cause, among other related factors. This information can help the individuals to assess the risk of flood hazards of an identified location. The research questions of this research are: How can the supply side provide the information to the demand side effectively and efficiently? How can the demand side access the information easily and ubiquitously?

A geographical information system (GIS) is powerful on spatial data management, spatial data visualization, and spatial analysis. Since 1960s, GIS has been extensively used in floodplain management. Spatial flood data, including floodplain, floodway, and flood hazard area, can be managed effectively and efficiently in the context of GIS.

This research builds a cyber-infrastructure based interactive flood information system. It seeks to improve the online mapping performances and display flooding maps to users much faster by employing REST-based web services. The online geoprocessing capabilities will provide users the more complicated spatial analysis function. By integrating distributed data into a single and simple online system featured with Desktop-GIS-style functionalities, the proposed online flood inquiry system can help users make decisions effectively and efficiently. The conceptual model includes three components: Presentation Component, Data Acquisition Component, and Geoprocessing Component (See Figure 1).

The paper is organized as follows: the next section introduces the new technologies investigated in the research, followed by a discussion of, including data and map preparations, RESTful geospatial web services preparations, and an online map viewer. Then we illustrate the implementation of the proposed system. Finally the paper concludes with major findings.

GEOSPATIAL TECHNOLOGIES FOR FLOOD MANAGEMENT

GIS has been widely used in flood plain management. Nowadays, GIS has evolved from standalone system to distributed system, and from workstation system to web system. As the development of web