Design of Flood Control Hydrological Information Measurement and Forecast System in a Certain Area

Dacan Li, Yuanyuan Gong*, Dezheng Li*, Shufei Shen and Lei Wang
Shiyuan College of Nanning Normal University, Nanning, Guangxi, 530226, China
*Corresponding author’s e-mail: pkugong@126.com

Abstract. In recent years, hydrological information in this area has played an important role in flood control and drought relief, and achieved good social, economic and ecological benefits, but there is still a certain gap with the latest requirements of the state in hydrological. With the rapid expansion of hydrological information collection stations and the rapid increase of station network density, considering the current needs of local hydrological information management, hydrological management departments and flood control and Drought Relief Command departments, this paper uses software engineering method to design a hydrological information measurement and reporting system. The system realizes centralized management of water information, real-time information query and analysis, dynamic monitoring and alarm, auxiliary decision-making, remote data collection and other hydrological business functions and provides decision support for leaders of all departments. It plays an important role in the success of flood control and drought relief work to minimize the loss of disasters and ensure the safety of people's lives and properties with the least human and material resources.

1. Introduction
Digital technology is changing the traditional mode of water regime observation and data analysis and processing. At the same time, it will greatly promote the process of water regime modernization, which is the only way to achieve water regime modernization. The existing water regime information collection methods mostly adopt manual monitoring and reporting of flow. Because the collection location of water regime information is mostly field or remote gate station, the manual collection is limited and restricted by many factors, and there are many problems. Because of the shortage of manpower, narrow observation range and other reasons, the flow data can not be reflected in time and accurately, and the water resources can not be fully and effectively utilized, resulting in time delay and economic waste.

Water and rain data is an important basis for the water conservancy department in the flood control decision-making process. Whether the flood control decision-making of the water conservancy department is scientific and reasonable depends on whether the data of each water and rain measurement point in the area can be obtained timely, completely and accurately. Based on the fact that there are a large number of these measuring points, and the geographical location is scattered, and the location is remote (part of the measuring points), choosing the appropriate communication mode becomes the key to the success of the flood control decision-making system. Through the study of the hydrological information measurement and reporting system, the unattended hydrological station will be realized and all-weather timing transmission and other functions will be realized, which will accumulate rich and detailed hydrological data for the region, and lay an important foundation for
regional reservoir management, hydropower generation, rational allocation of industrial and agricultural water.

2. Research status at home and abroad
Some developed countries have decades or even hundreds of years of history in hydrological monitoring, with different levels of monitoring equipment. In the 1980s, R200 water level telemetry system was produced by the U.S. Hydrological Instrument Center, and DSC water level observation system was introduced by Oyo company. Now, American hash, German Seba, German Ott, German hydrological technology company, and American GW environmental meteorological instrument company have advanced sensors and self recording or telemetry systems. German water monitoring equipment supplier HT Company and software supplier ribeka company jointly developed the water monitoring system. Miero diver "water level automatic monitor" in the Netherlands can record water level and temperature by itself. The instrument integrates temperature and pressure sensors, memory and battery inside, and is made of sealed stainless steel outside. It can be used in any monitoring station.

The developed countries, represented by the United States, are far more advanced in station density and transmission means than China. The density of hydrological station network in the United States is about 18 stations/10000 square kilometers, while the total number of hydrological station network in China is small (4.8 stations/10000 square kilometers), and the development is unbalanced. China's hydrological work is characterized by many stations, wide distribution, remote location and difficult conditions. Due to the lack of long-term investment in hydrology, there are many historical debts, imperfect station network, weak infrastructure, low monitoring capacity, relatively backward prediction means, which are far from meeting the needs of current flood control and drought relief work.

3. Research status at home and abroad

3.1 System requirements analysis
Any system does not exist independently. The system can complete tasks according to the needs or expected behaviours of different customers. The system can be divided into three types of users: station staff, system administrator, and general staff. The system provides different services for different users according to their different permissions. System use case diagram is shown in Figure 1.

3.2 Overall system architecture
In order to make full use of spatial analysis and positioning technology of geographic information system, combined with the characteristics of hydrological information industry, and based on the design principles of reasonable structure, complete function, stable and reliable system operation, convenient system management and maintenance and strong practicability, the overall structure of the system is designed as shown in Figure 2.
3.3 System function structure

According to the functional requirements of the system, the functional structure of the overall system is designed as shown in Figure 3.

1) Site work management. The working point of water regime collection in this area generally adopts the combination of self-reporting and timing self-reporting.

2) Hydrological information collection. Hydrological information collection must ensure the integrity of the received information, and the processing software shall have the function of automatic discrimination and interactive modification of the error message, process and process all kinds of hydrological elements according to the requirements, and store them in the real-time hydrological database.

3) Hydrological information processing. Hydrological information processing is a process of collecting, processing, storing, analyzing and using information. The hydrological information stored and processed in the hydrological data base is a dynamic work, and the amount of information increases year by year.

4) Hydrological information release module. The system adopts SMS function in mobile communication network, which can send real-time water information data to the designated user's mobile phone through SMS. At the same time, users can also send the query code specified by the system to realize real-time and historical data query.

5) Hydrological query module. The subsystem can query all kinds of water information.
6) GIS management. In the process of system integration, GIS technology is used to provide the system with functions such as map browsing, spatial data management, graphic editing, spatial query, and spatial analysis and view jump, so that users can query hydrological real-time information more realistically according to the map.

7) System management and maintenance module. This module provides the most basic data for flood control and drought relief command and decision-making, and is an important part of flood control and drought relief system.

4. Summary
The hydrological information measuring and forecasting system constructed in this paper can display the real-time rainfall, water level, flow and all kinds of characteristic information of different periods of hydrological stations in this area intuitively and in real time. Combined with the data of levee, reservoir and other projects, it can develop the function of water information release and early warning, which can release real-time flood information for the public and provide multi-directional reference data for flood control command and operation and finally provide decision support for flood control and disaster reduction.

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