Design of a new intelligent water conservancy system

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Abstract. Through the Internet, computers, software and hardware, intelligent water conservancy aggregates all kinds of water affairs information, provides ubiquitous information services for the government, enterprises and citizens, and can gradually realize comprehensive and perceptible green intelligent water affairs in continuous optimization and research. With the improvement of economic development level, environment and resources put forward higher requirements for intelligent water conservancy system. This paper analyzes the application environment and existing problems of intelligent water conservancy project. Based on the traditional intelligent water conservancy project, a new intelligent water conservancy project with high efficiency and environmental protection is designed by introducing new network technology

Keywords: Intelligent water conservancy, High efficiency and environmental protection, Intelligent scheme design.

1 Introduction

Smart water refers to aggregating all kinds of water information through the Internet, special networking, wireless network, software and hardware, providing ubiquitous information services for the government, enterprises and citizens, and realizing comprehensive and perceptible green intelligent water. With the improvement of economic development level, the requirements of environmental protection and intensive utilization of resources are becoming higher and higher. Traditional water affairs have serious waste and low efficiency. It is necessary to develop intelligent water affairs to better meet the needs of economic and social development.

During the 13th Five Year Plan period, China's planning, land and meteorological departments have successively invested heavily in promoting information construction. The planning and Land Commission has implemented the "golden earth project" and geospatial basic information platform. The comprehensive management of land and resources has realized "viewing from the sky, searching on the ground and managing on the Internet", and provided the country with geospatial basic information sharing Exchange and business application integration into services.

The design of intelligent water conservancy project needs specific analysis. This paper takes the best Pearl River Delta Project in China as the research object.

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2 Design ideas and engineering framework

2.1 Analysis of design difficulties

The project consists of one trunk line, two sub trunk lines, one branch line, three pump stations and a new regulation reservoir. The project takes water from liyuzhou in Xijiang River, pressurizes it through liyuzhou, gaoxinsha and Luotian pump stations, and delivers water to gaoxinsha reservoir in Nansha District, songmushan reservoir in Dongguan City and Gongming reservoir in Shenzhen city. The designed diversion flow of the project is 80 cubic meters per second, and the total length of the water transmission line is 113.2 kilometers, including 90.3 kilometers of trunk line, 3.6 kilometers of Dongguan sub trunk line, 11.9 kilometers of Shenzhen sub trunk line and 7.4 kilometers of Nansha branch line.

It can be seen that the difficulties faced by the smart water conservancy project mainly include dense river network, complex hydrogeological conditions, high difficulty in steel pipe installation and high maintenance pressure. In view of this situation, we make a specific analysis and design the smart water conservancy project described in this paper

2.2 Engineering mode

In order to build smart applications with strong expansion, high efficiency, good reliability and convenient maintenance, this paper selects the distributed micro service technology architecture for the construction of smart water conservancy projects, and makes use of the advantages of BIM + GIS integration technology, AR, vr virtual reality technology, big data analysis technology, 5g communication technology, satellite positioning technology, underwater robot patrol technology and UAV remote sensing technology, Improve the overall system architecture capability to provide support for engineering smart application, engineering smart middle platform, engineering big data, engineering two clouds, engineering information network and engineering Internet of things. The engineering mode adopted is shown in Fig. 1

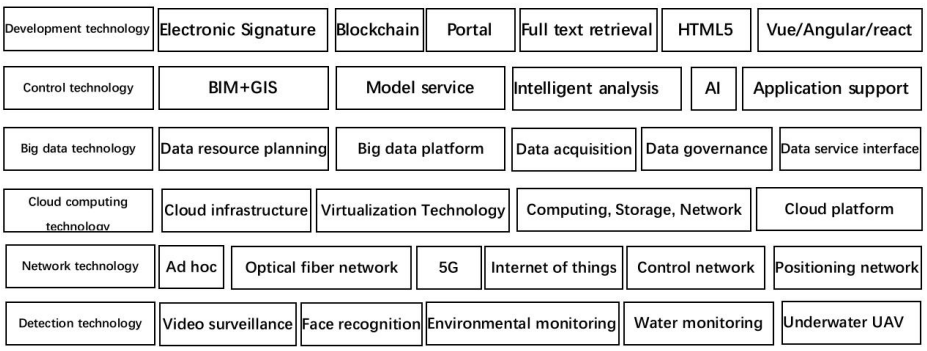

Fig. 1. The engineering mode.

3 Technical analysis and expected results

3.1 Engineering mode

Microservice technology makes each service component, which can be developed, expanded and deployed independently. There is no need to coordinate the impact of other service deployment on deployed services. It provides fault handling design, increases fault tolerance mechanism, reduces the difficulty of service construction, deployment and operation and maintenance, and adopts methods such as continuous integration and continuous delivery, According to the requirements of phased implementation of the overall plan, the Pearl River Delta smart project is divided according to the business needs of the construction period and operation period, and the construction content is divided according to the time. Each service can be developed by a special development team and rapidly deployed in stages, so as to realize the rapid development, sustainable deployment and convenient maintenance of services.

3.2 BIM + GIS fusion technology

Integrate BIM panoramic digital model, landform around the project, tilt photography data, project business management data, etc., conduct multidimensional comprehensive analysis and calculation by using big data, artificial intelligence and other technologies in the whole life cycle of project construction, and find development trends and problems in progress, quality, investment, water scheduling, project emergency and so on, Get important details through information correlation and find out the internal law. Using the accurate geographic coordinate information, overlay display and other capabilities of GIS, we can realize problem positioning, visual monitoring and tracking processing, realize dynamic visual control throughout the life cycle of the project, and provide practical and effective support for major decisions of the leadership.

3.3 VR virtual reality technology

Using the technical features of virtual reality such as high simulation, roaming, traceable and repeatable modeling, create virtual scenes of building construction and engineering equipment area according to the ratio of 1:1, so that participants can view each component of engineering equipment structure in detail and experience the operation process of engineering equipment as in the real environment; Experience the scenes and personal feelings when danger occurs, realize large-scale escape in dangerous situations through repeated use of escape skills, provide new convenient and effective ways for safety and training through VR, improve the safety awareness, escape skills and business training effect of construction personnel, and provide guarantee for construction safety, production safety and operation safety of the project.

3.4 Big data analysis technology

Making use of the statistical analysis, entity recognition, predictive modeling, data mining, machine learning and other capabilities of big data to improve the deep mining and comprehensive analysis capabilities of big data. Combine the engineering construction, engineering scheduling, equipment maintenance and safety monitoring in the whole life cycle of the Pearl River Delta smart water conservancy project construction with big data analysis technology to realize the real-time control and management information of "human, machine, material, method, environment and measurement" digital site information, safety information, progress status, quality problems, investment and use, and integrity construction; Based on the integration of project operation monitoring information such as water regime, water quality, pump station, gate, safety monitoring and equipment status, advance judgment of safety, progress and quality during project construction period, optimization of dispatching scheme during project operation and maintenance period, prediction of project health status and intelligent dispatching of the project are realized.

3.5 Internet communication and location technology

5G communication technology application: make use of the advantages of 5g network to further improve the utilization of space wireless resources, improve the poor application of high-frequency spectrum resources in the process of mobile communication, realize the scientific allocation of resources, and ensure to meet the needs of intelligent security, intelligent patrol inspection, positioning management, Internet of things monitoring, safety production control, etc. during the operation of the pump station, Realize the continuous coverage, mobile access and positioning management of aboveground and underground electromechanical equipment and metal structure equipment of the pump station, so as to realize the construction goal of "few people on duty and unattended" smart pump station and low-cost operation of the pump station system.

Application of satellite positioning technology: use satellite technology to carry out high-precision positioning of engineering construction personnel, construction vehicles and other construction objects all day and all day, understand the personnel distribution of each type of work in real time, master the vehicle driving track, judge the number allocation of construction personnel at each working face, analyze and count the traffic density of vehicles on each construction road, Timely find out the unreasonable allocation of human resources in each working face and the current situation of traffic congestion during the peak period of civil construction, so as to create conditions for on-site traffic dynamic joint scheduling, personnel attendance management and authority control, and improve construction efficiency.

3.6 Robot patrol Technology

Based on the characteristics of long underwater pipeline network, deep buried depth, crossing the sea and poor pipeline environment of the project, the underwater robot inspection technology is adopted to avoid the problems that the traditional detector

can not detect every part in an all-round way and can not further collect data at the damaged part of the pipeline, resulting in the wrong judgment of the damage by technicians. The inspection cycle, inspection range and inspection route of the underwater robot are set. The robot enters the pipeline to complete daily inspection, maintenance inspection and other tasks, so as to realize the intelligent inspection of the underground pipeline of the Pearl River Delta intelligent water conservancy project, such as visual inspection, nondestructive inspection, siltation cleaning inspection and so on.

3.7 UAV Remote Sensing Technology

According to the needs of monitoring and perception, UAV monitoring means are used to shoot remote sensing images to expand the perception range, and combined with existing video monitoring, equipment monitoring, mobile monitoring and other means to realize the integrated dynamic perception of all elements of heaven, earth and air, and improve the dynamic perception ability of the whole life cycle of project construction. Through the interpretation and processing of remote sensing data, dynamic monitoring and early warning are carried out for project construction, soil and water loss, river and reservoir water regime, project ground patrol, etc., so as to realize the full coverage of perception range and full life cycle monitoring perception, and provide comprehensive data support for leadership decision-making.

3.8 Blockchain Technology

In view of the massive, fake and untraceable digital archives of water conservancy projects, and the electronic archives cannot be used as the legal basis for project management, supervision and acceptance, the blockchain and electronic signature are combined by taking advantage of the characteristics that any node in the blockchain exists independently and the hash value cannot be tampered with and irreversible, It is implemented according to the logic of "the owner sends a single document - > the document forms a block on the Internet - > the relevant units in the network receive the notice - > electronic signature confirmation - > the blockchain is placed in the block - > stored in the database", so as to realize the legitimacy, uniqueness and tamperability of digital documents and electronic signatures, and ensure the legitimacy, security and traceability of electronic files, Ensure that the project construction organization is scientific, the quality is controllable, the construction is efficient, the process is traceable and the operation is safe and reliable after completion.

4 Conclusion

Smart water has mature solutions in many fields, such as reservoir information management system, reservoir dynamic supervision system, dam safety monitoring system, reservoir flood discharge early warning system, urban waterlogging three-dimensional monitoring and waterlogging simulation system, urban drainage and

waterlogging prevention facility command and dispatching system, urban inspection well water level monitoring system, urban sewage pipe network flow online monitoring system Mountain flood disaster monitoring and early warning system, hydropower station discharge ecological flow monitoring system, groundwater monitoring and management system, water quality online monitoring system, hydrological monitoring system of small and medium-sized rivers, real-time monitoring and management system of water resources, monitoring, early warning and prediction system of small and medium-sized rivers, sponge City sensing system (SCSS), overall solution of river governor system, online monitoring and early warning system of border landslide safety Landslide and debris flow monitoring and early warning system, geological disaster monitoring, prediction and early warning system, and Shenzhen Hongdian intelligent water have developed rapidly on the basis of infrastructure construction and water informatization.

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