Application of Traceability System for Dumping Garbage of North Canal Embankment Based on Ai Artificial Intelligence Recognition

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Abstract. Based on the analysis of the process of retrospective management of dumping garbage in the North Canal embankment, the AI artificial intelligence technology is proposed for image recognition of the retrospective system of dumping garbage in the North Canal embankment. The developed system can accurately obtain the photo information, and analyzes the design and implementation process of the river dike dumping traceability system by taking the dumping of the North Canal River Dike as an example.

1. Introduction
In recent years, the water sector has made full use of modern technology to vigorously promote the transformation of traditional water resources to modern water resources and intelligent water resources. In the area of network security and information technology, it has compiled the Water Resources Business Needs Analysis Report and the Intelligent Water Conservancy General Plan. And the use of satellite remote sensing, big data technology, AI artificial intelligence+Internet of Things technology to support the “four chaos” of rivers and lakes, water conservancy supervision and other work, focusing on top-level design of smart water conservancy, strengthening the deep integration of new generation information technology and water conservancy business, accelerating the upgrading of information infrastructure, strengthening the industry regulatory information support [1-2].

The North Canal Basin is one of the five major watersheds in Beijing. It undertakes 90% of the flood discharge tasks in the city. It not only plays the functions of urban ecological landscape and recreation, but also serves as an important link and ecological corridor connecting Beijing-Tianjin-Hebei region and the location of Beijing's deputy center. After years of development, the overall information construction of the North Canal has been steadily improved. The three large-scale hydraulic structures in the main river channel have been automatically rebuilt, and the gate information can be returned in real time. The main river channel nodes and some main branches have flowed into the main stream. With the flow collection facility, some gate stations have been installed with automatic collection of rain gauges. However, most of the automation facilities in the North Canal Basin currently follow the construction of the project, and the data and data display instruments are scattered among the projects, lacking an integrated display system.

At present, most data display systems in the market only display the data they have acquired. The modules are independent of each other and it is difficult to match the business needs. The article takes the Beijing Canal as the research object, and combs the business process in detail to integrate the decision support data into the satellite. Data integration for hydraulic building operations. At the same time, the artificial intelligence system is integrated into the monitoring and acquisition system to
analyze the information collected by the video image station, provide image analysis and classification screening in the closed environment, and provide support for water administration law enforcement and water environment management while completing the original security work. On this basis, the traceability system of river rubbish dumping is constructed, which provides Beijing with important support for the operation of many operations of the North Canal Management Office [3-4].

2. Requirement Analysis of Traceability System for Dumping Garbage in River Embankment

The North Canal Digital Business Management System based on AI (Artificial Intelligence) identification is mainly applied to the application fields related to the water conservancy informatization industry. It is mainly a comprehensive platform constructed by Internet of Things, AI artificial intelligence technology, data model, monitoring analysis and other technologies. The system includes functions as shown in Table 1.

| Function name         | Detailed functional analysis                                                                 |
|-----------------------|---------------------------------------------------------------------------------------------|
| One-stop service      | End-to-end provision of one-stop services such as water conservancy management data access, data analysis, alarm automatic management, management and decision-making |
| Real-time monitoring  | Provide real-time data access and real-time data analysis, and provide fault alarms in case of failure |
| Intelligent model     | Develop the model and algorithm of image recognition and the calculation model of water level and discharge to realize the intelligent analysis of data. |
| Traceability management | Artificial intelligence technology is adopted to realize waste dumping traceability management |

Non-functional requirement analysis of the system is as follows: (1) The system is simple and easy to use, providing system configuration and guided analysis of typical application scenarios. (2) detection sensitivity: 1 ~ 8 levels adjustable; Continuous shooting speed: No less than 10 sheets / sec. Number of consecutive photographs: 2 or more photos have a total effective rate $\geq 99\%$; license plate readable rate $\geq 95\%$; photo file format: JPEG format.

3. The Design of the Tracing System for Dumping Rubbish on the River Bank

3.1 System Structure Design

The data of riverbank dump garbage traceability system can be collected automatically. The system is composed of digital business management system platform and information acquisition system. The system acquisition system consists of a river flow monitoring station, monitoring capture and automatic image recognition, and a global navigation satellite system (GNSS) dam safety monitoring station. Figure 1 shows the system structure design.
As can be seen from fig. 1, the system is divided into application system, data center and acquisition system. In the application system, information collection and monitoring management, GIS information management, decision support management and data sharing can be carried out. Users can directly operate the interface in the Web interface to complete the corresponding functions. Data center functions for data management include application server middleware, functional components, and business logic components. The system acquisition system includes channel flow, dam safety monitoring station, monitoring and capture management.

3.2 Design and Application of Key Module of System Function
Information acquisition system includes real-time rainfall monitoring, real-time water level monitoring, real-time flow monitoring, real-time image storage, real-time video monitoring and so on. The main function of the system is to provide information service for the management of the North Canal Administration. With the support of comprehensive database and GIS, it provides various related information inquiry services and early warning information, and provides timely and accurate online information inquiry and other information services. At the same time, the receiving process of monitoring information is realized. As shown in Figure 2, the information acquisition interface is displayed.

Data such as water level and flow information collected by the on-site monitoring station are transmitted to the data center through GPRS wireless transmission network and stored in the real-time
monitoring database. The main monitoring data include water level, flow and other information. Figure 3 is a frame diagram of the information acquisition system.

Figure 3 Information Collection System Framework

1) Real-time rainwater monitoring

The system includes real-time water level/velocity/rainfall information of monitoring points, early warning information of monitoring points and terminal status information; data analysis: online analysis function, including historical data analysis of monitoring contents and real-time water regime data comparison; data query: real-time display of monitoring data of monitoring points on the map, or intuitive display of the history of monitoring information data in the form of charts. Change process and current state; Forecast and warning: real-time analysis and interpretation of each monitoring data, and timely send early warning information to the administrator or regional responsible person terminal; user management: multi-user management platform, which can realize monitoring and early warning information online monitoring center station, regional administrative departments multi-level management and Information Sharing. Figure 4 shows the real-time rainwater monitoring interface.

Figure 4 Real-Time Rain Monitoring Interface

2) Image capture and intelligent recognition

The intelligent AI image recognition technology adopts YOLO algorithm. Based on depth learning and computer vision original algorithm, it can effectively detect common objects in video, carry out intelligent analysis and manually label for correlation detection. The directional development is carried out on the basis of computer vision recognition algorithm to realize the application of computer video image recognition technology in vehicle license plate and vehicle-mounted object condition recognition. Based on the actual application requirements, the system developed an intelligent analysis model for illegal vehicle dumping according to the above algorithm. By comparing the data images returned on the scene, the shape, color, and carrier changes, etc., to locate the vehicle dumping garbage
vehicles. And license plates provide effective technical support for the treatment of the river embankment environment. Figure 5 is a flow chart of image capture processing.

Figure 5 Like Analysis Flow Chart

3) Global Navigation Satellite System (GNSS) dam safety monitoring station

Based on the global navigation satellite system (GNSS) dam safety monitoring, when using GNSS for positioning, there is no requirement for the view between the stations. As long as the station signal is well received and the points are easy to save, the GNSS monitoring network is selected. The point is more flexible and convenient, avoiding the workload of observing the transition point and the turning point in the conventional measurement. The deformation monitoring is mainly based on the observation data of a large number of long-term deformation monitoring, and the difference between the coordinate data of the deformation monitoring point in different periods is calculated. The value, i.e., the shape variable, is not required for the three-dimensional coordinates of the deformation monitoring point. Using GNSS for positioning monitoring is essentially a passive navigation positioning, that is, the user equipment does not need to transmit any signals, but only receives GNSS satellite signals to obtain positioning information and navigation data. This positioning form not only can accommodate a large number of users, but also has good concealment. In addition, the application of pseudo noise code technology makes the data security and anti-interference very good.

4. Conclusion

AI artificial intelligence technology provides more and more services for river management. The key technology of the dumping system in the canal river bank is image recognition. The YOLO algorithm in AI artificial intelligence technology can effectively identify the image information, provide information source for the dumping of the canal river bank, and accelerate the data collection efficiency. The application shows that the developed system can quickly complete the tracing management of garbage dumping at canal embankment.

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