Exploration of Intelligent Traffic Control Network Strategy for Large-scale Traffic in Xiongan New Area

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Abstract—Aiming at the low integration of the large-scale traffic control network in Xiongan New District and the current demand for intelligent traffic development, this paper designs an intelligent traffic control network communication model by integrating various traffic control terminal devices. The model combines relevant documents such as the urban planning outline of the Xiongan New District, and is based on the concept of smart city development. The designed intelligent traffic control network strategy can be effectively applied to large-scale traffic flow scenarios and provides a powerful tool for the realization of intelligent traffic control in Xiongan New Area.

1. INTRODUCTION
The purpose of establishing the Xiongan New Area is to defuse Beijing's non-capital functions and hope to build it into a comprehensive modern city. According to the concept of innovation and development, the construction of Xiongan New Area needs to address the problems of modern cities[1]. The sustainable development of a city is closely related to transportation. Urban traffic congestion, scarcity of traffic land, and urban pollution caused by traffic noise affect the health, harmony, and rapid development of the city. With the continuous advancement of the planning and construction of Xiongan New Area, the new district's positioning as a “new” breakthrough-driven innovation-driven district is constantly being demonstrated[2]. Traditional traffic control methods use traffic signals, traffic broadcasts, and other forms of traffic control. They lack the collaborative processing of information, and they have weak processing capacity in the face of emergencies[3]. In response to the demand for large-scale traffic control, research on intelligent control networks has become a research hotspot[4].

2. DEVELOPMENT STATUS AND LITERATURE REVIEW
Smart cities originated in the field of media. It uses various information technologies or innovative concepts to open and integrate urban systems and services to improve resource utilization efficiency, optimize city management and services, and improve the quality of life for citizens.

A smart city is a high-level form of urban informatization based on the next generation of innovation in a knowledge society based on a new generation of information technology in all walks of life. Improve the quality of urbanization, realize refined and dynamic management, and improve the effectiveness of urban management and improve the quality of life of citizens.

The research and promotion of smart transportation are still in its infancy in China, but the...
importance of ITS as a cross-century economic growth point and the construction of transportation systems is highly valued by the relevant national departments. In the “Twelfth Five-Year Plan”, the status of intelligent transportation of the Internet of Things was highlighted. In the “13th Five-Year Plan”, the necessity of constructing and developing intelligent green transportation systems was systematically emphasized. Currently, Beijing and Guangzhou are at the forefront of China in the field of urban intelligent transportation.

Faced with urban diseases and the transformation and development of the urban economy and society, more and more cities choose to build smart cities. By the end of 2018, more than 600 cities nationwide had planned or were building smart cities. These include municipalities directly under the Central Government, sub-provincial cities, prefecture-level cities, and county-level cities. It is worth mentioning that in recent years, more and more cities in the central and western regions have joined the ranks of new smart cities. As a new direction of urban development, smart cities are being valued by more and more city leaders. For example, Cai Qi, secretary of the Beijing Municipal Party Committee, proposed to build smart cities carefully, providing strong support for the construction of an effective mega-city governance system. Li Hongzhong, secretary of the Tianjin Municipal Party Committee, proposed to comprehensively promote the construction of smart cities, deepen "Internet + government services", resolutely break down data barriers, adhere to the benefit of information, and open up the "last mile" of convenient services[5].

Studies have shown that through the use of wireless sensors, traffic lights and bayonet joysticks can be connected to achieve unmanned processing[6]. On this basis, an integrated control platform is obtained by combining vehicle positioning information and road condition monitoring[7]. By modeling complex roads, the use of big data technology can realize the prediction of traffic flow[8,9]. Combined with neural network algorithms, dynamic control of traffic signals can be achieved[10]; combined with vehicle networking technology, effective tracking and information interaction of vehicle terminals can be achieved, providing ideas for intelligent traffic control[11].

Aiming at the research needs of intelligent traffic control network strategies for large-scale traffic, this paper designs the communication model of the intelligent traffic control network and plans the components of the intelligent traffic control network system. At the same time, an intelligent traffic control and monitoring scheme based on information collaboration are designed.

3. INTELLIGENT TRAFFIC CONTROL NETWORK MODEL

The key to the design of the Xiongan New District's intelligent traffic control network strategy plan for large-scale traffic is that it must have the characteristics of availability, reliability, and scalability. Therefore, the intelligent traffic control network strategy designed for the Xiongan New District in this article follows the following design principles:

1) Availability: Intelligent traffic control network terminals need to be deployed in various traffic sections. Radio frequency identification technology can be used to network a series of systems such as traffic lights, video surveillance systems, etc.

2) Reliability: The designed control network must have a certain burst processing capacity, which can effectively ensure the reliable operation of the system without human intervention. The system design should have strong robustness to ensure that the intelligent traffic control network can have a longer service life.

3) Scalability: Intelligent traffic control network strategies must have future-oriented expansion capabilities. The system must have strong portability and functionality, and can be flexibly configured. At the same time, the system can also adapt to future large-scale traffic flow control needs.

3.1. Communication model of intelligent traffic control network

The intelligent traffic control network strategy for large-scale traffic needs to jointly network the existing traffic control subsystems. According to the actual needs and the composition of the existing traffic control system, the composition of the intelligent traffic control network system designed in this paper, such as shown in “Fig. 1”.
Figure 1. Composition of intelligent traffic control network system

Intelligent traffic control network strategies need to effectively connect modules such as traffic monitoring systems, terminal display systems, traffic signal control systems, and alarm systems, and effectively implement communication between different subsystems through wireless connectivity and radio frequency identification technology.

The terminal server mainly includes a monitoring system, a road condition display system, and an alarm system. The terminal subsystem server and traffic signals communicate with the signal controller through the terminal communication server and receive various signals sent by the signal controller. The signal controller interacts with the central control server through the switch and sends signals to various types of terminal equipment. The central control server can be divided into the data server, user server, and control server. Among them, the data server is mainly used to store and call data; the user terminal server is responsible for the related services and data collection of the vehicle terminal; the control server is the core server of the intelligent traffic control network, which is mainly aimed at the collected traffic condition information and vehicle distribution information Collaborative optimization.

3.2. Information collaboration scheme for intelligent control network terminal
In the traffic control network, vehicle intelligent terminals are also an important link. The intelligent terminal provides vehicle data information to the central control server, which is convenient for the central server to process and realize coordinated information traffic control.
As shown in “Fig. 2”, intelligent traffic control realizes the intelligence of traffic control through vehicle information optimization and vehicle terminal networking planning. The vehicle terminal information mainly includes factors such as the optimal driving route planning, vehicle driving safety status, and other factors. By combining the regional vehicle traffic efficiency provided by other traffic control terminals, the central processing server is optimized. At the same time, the optimal traffic control plan and vehicle traffic plan are given and sent to the vehicle and traffic control equipment through the control network.

Intelligent traffic control needs to obtain area information and vehicle information. This requires the first implementation of intelligent detection technology, and the use of intelligent control networks to achieve coordinated control of road condition monitoring and traffic information. Among them, road condition monitoring is mainly responsible for monitoring traffic flow and abnormal events to facilitate system alarm processing. The coordinated control of traffic information is mainly based on monitoring and feedback of regional traffic signals and regional traffic status information, and then combining with vehicle terminal data for collaborative optimization, as shown in “Fig. 3”.

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Figure 2. Intelligent transportation network control model

Figure 3. Intelligent transportation network detection model
4. CONCLUSION

Xiongan New Area is another new area of national significance after Shenzhen Special Economic Zone and Shanghai Pudong New Area. This is a Millennium Plan and a national event. The development of the smart transportation system in Xiongan New Area has important practical and far-reaching historical significance for exploring, optimizing and developing populated areas, and adjusting and optimizing the new model of Beijing-Tianjin urban layout and spatial structure. In order to meet the actual needs of intelligent traffic control network strategy deployment for large-scale vehicle traffic, this paper designs an integrated network deployment scheme and communication model. The intelligent traffic control network strategy studied in this paper can have better applicability to large-scale traffic scenarios, and it has a certain significance for future intelligent integrated traffic control. Green water and green mountains are the Jinshan and Yinshan. The smart green transportation system of Xiongan New Area will be a great practice for this statement, becoming a benchmark project for building smart cities and providing a reference for other cities to build smart green transportation systems.

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