Research about the construction of intelligent transportation system under the big data of vehicle networking

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Abstract. In recent years, the number of motor vehicles in China has been increasing, but the construction of road traffic system is still relatively backward, and traffic jams and traffic safety problems often occur. At present, the concept of vehicle networking technology has gradually emerged. We can collect the position, status and surrounding environment information of vehicles by the technology, and then use big data method to analyse and process the information, so as to effectively manage and control the road traffic system and provide comprehensive services for drivers. In this paper, based on vehicle networking and the big data technology, the construction method of the Intelligent Transportation System will be further discussed, and the design scheme of the Intelligent Transportation System of a certain area will be provided.

1. Introduction
With the rapid development of social economy, the continuous improvement of people's living standards and the steady development of transportation, more and more residents have begun to use motor vehicles to travel, and more and more enterprises have begun to use motor vehicles to freight goods. Tourism and logistics has become more convenient and efficient. However, at the same time, Chinese road traffic system construction is still relatively backward. With the popularity of personal vehicles, transportation systems are facing many problems, including traffic congestion, environment pollution, increasing energy consumption, etc.[1]. Due to the rapid increase in the number of cars, the current road infrastructure has not been able to meet its needs, thus causing serious traffic congestion and traffic safety problems[2].In order to cope with the difficulties of the current road traffic system, the concept of vehicle networking has gradually emerged in recent years. GPS, OBD and other related technologies are used to collect the location, status and surrounding environment information of vehicles, and the collected data is transmitted to the server through the Internet, then the big data method is used to analyze and process them, so that the road traffic system can be effectively managed and controlled. Finally, it provides comprehensive vehicle information to drivers. Through the construction of vehicle network, people, vehicles and roads in the whole transportation system can be closely linked to achieve perfect information, exchange and sharing among the Three. Vehicle networking technology can reduce the cost of vehicle management[5]. With the continuous popularization of vehicle networking technology, it can also greatly improve the efficiency of driving, supervision, maintenance and other links.

The construction of vehicle networking cannot be separated from the support of big data method. Big data method means that using artificial intelligence technology such as information mining, information classification and deep learning thoroughly analyses the massive low-value density
information collected in the network system and extracts valuable results from the massive information. Combining the huge amount of information generated in the vehicle networking system with the method of large data analysis can effectively enhance the effect of data utilization, and has a very broad development prospects. In recent years, many scholars at home and abroad have begun to study the construction of ITS with large data from both theoretical and practical aspects. The application value, feasibility, realization ways, development direction, strategic significance and legal and policy support of ITS are discussed. Rashid et al. successfully used the vehicle networking technology in urban transportation[3]. Wang et al. put forward an intelligent transportation plan based on big data[4]. In this paper, the construction method of ITS system is further discussed, and the design scheme of ITS system in a certain area will be provided.

2. Classification of big data in vehicle networking

2.1. Vehicle data
Vehicle data includes the initial vehicle data such as vehicle model, size, configuration, and vehicle accessories data such as service life, wear status, replacement status, and driving data such as vehicle routing, driving direction, whether parking or not. By applying vehicle networking technology to collect and sort out these data in an all-round way, the basic state, functions and changes of vehicles can be effectively reflected. After analysing the data through big data technology, the intelligent level of software on vehicles, vehicle management and vehicle production progress will be improved.

2.2. Driver data
Driver data includes basic information such as name, gender, age, physical condition, use record and so on. Driver's fingerprints and iris are identified by related technologies. In addition, driving habits data and driving methods data can be obtained by large data analysis technology. Through the comprehensive analysis and use of driver information, we can provide targeted services for drivers. Developing digital and personalized driving software and a safe and effective identity authentication system can realize the integration of vehicles and drivers and reduce the incidence of vehicle stolen.

2.3. Road traffic data
Road traffic data includes the basic data such as road route, road surface, road width, traffic signal, and the data of public transport facilities and urban traffic information platform. Through satellite positioning system, traffic flow, speed, traffic accidents and congestion on the road can also be monitored. After obtaining results of large data analysis method, the vehicle networking system can provide users with the best route to travel and make real-time adjustments of driving strategy according to the changes of road conditions. In addition, once a traffic accident or congestion occurs, traffic managers can be reminded to rush to the scene at the first time and deal with related affairs quickly.

3. Design framework of intelligent transportation system for vehicle networking with big data
The system includes four subsystems: data acquisition subsystem, data application subsystem, data analysis subsystem and management subsystem. Among them, the data acquisition subsystem is the foundation of the whole system, collecting all kinds of information and data within the whole vehicle network, and exchanging information with the application subsystem and data analysis subsystem to provide basic information support for the system. The data application subsystem is the core part of the system, which can be divided into three parts: intelligent driving, intelligent vehicle and intelligent road, providing targeted services for people, vehicles and roads in the vehicle network. Data analysis subsystem is responsible for storing all kinds of information generated by data acquisition subsystem, and analysing them by using large data method, while interacting with data application subsystem. System management includes government departments, enterprises and third-party organizations. Among them, government departments are responsible for building the entire intelligent transportation
system and formulating relevant policies and standards. Enterprises are responsible for installing and maintaining all kinds of infrastructure in the system and ensuring the daily operation of the system. Third-party organizations, including scientific research institutions and financial institutions, provide relevant technology and financial support for the system.

4. Design of application subsystem

The core part of ITS is the data application subsystem. The three parts in the data application subsystem are summarized.

4.1. Intelligent driving system

Intelligent driving system mainly analyses driver's behavior in the vehicle networking, and provides related services such as driving suggestion, accident compensation suggestion and so on.

At first, the system can analyse and evaluate the driving behavior. The driving time, driving distance, driving state, braking and acceleration of all drivers collected in the vehicle network system will be transmitted to the intelligent driving subsystem, and clustering analysis will be carried out by big data method to sort out the driving behavior characteristics of different types of drivers and extract effective analysis results. For the accident vehicle, it can also analyse the situation in the accident, summarize the behavior characteristics of the accident driver, and then get the quantitative model of the risk of different driving behavior.

Secondly, according to the quantitative model, some suggestions are put forward to improve the driver's driving behavior, so as to help drivers reduce high-risk behaviors and choose safer driving methods. In addition, large data method can also be used to warn drivers of possible dangers and reduce the incidence of accidents and the degree of loss. After the accident occurs, the driver can also provide compensation suggestions according to the specific circumstances of the accident.

4.2. Intelligent vehicle system

Intelligent vehicle system mainly monitors and analyses the running status of vehicles in the vehicle network, and provides relevant maintenance, management and production suggestions.

Firstly, the real-time monitoring of vehicle running status is carried out. All vehicle design, production and operation state parameters collected in the vehicle network will be transmitted to the intelligent vehicle system. Then the vehicle with abnormal parameters will be alarmed by abnormal value analysis technology and control chart theory, so as to early take necessary safety measures.

Secondly, the operation parameters of each vehicle are reasonably analysed to provide specific vehicle maintenance and management suggestions for the owners, so as to improve the operation status of vehicles, enhance the service life of vehicles and enhance the level of road safety.

Finally, big data analysis technology is carried out for different types of vehicles to find various potential safety problems, so as to provide production improvement suggestions for vehicle manufacturers. For individual vehicle models with more serious problems, manufacturers should also be urged to recall such vehicles in order to avoid more traffic accidents.

4.3. Intelligent road system

Intelligent road system is mainly aimed at the analysis of road conditions in vehicle network, providing drivers with a reasonable road choice scheme, so that the whole road traffic system can operate more scientifically and optimally. Vehicle speed data, road satellite map data and road congestion data collected in the vehicle network will be transmitted to the intelligent road subsystem. Through data analysis method, the most convenient driving route between different starting points can be calculated. While shortening the driving time, it can also quickly evacuate traffic from congested sections to other sections to improve road congestion.

In addition, through the intelligent road system, traffic jams and accidents can be quickly found on each road. After receiving relevant information, government departments can rush to traffic jams and accident sections as soon as possible to complete the work of traffic guidance and accident treatment,
thus effectively improving work efficiency and preventing further expansion of traffic jams and safety accidents.

5. Development prospect of intelligent transportation system with big data and vehicle networking

With the continuous progress of artificial intelligence technology, the vehicle network intelligent transportation system will continue to add new functions, become more automated, intelligent and efficient. In the next 20 years, the technology of automatic driving will be gradually popularized in China, and it will cooperate with the vehicle network intelligent transportation system to automatically provide safe and efficient driving routes for car owners. In addition, the big data information provided by the vehicle network can also be used in insurance, advertising and other fields, according to the specific characteristics of drivers, to provide targeted vehicle insurance business and commodity advertising push. At present, the big data technology of China is gradually mature, the relevant policies and regulations are increasingly perfect, and the data security and privacy of ITS are constantly improving. It can provide users with more personalized traffic information services and make users more confident to use the various functions of ITS.

6. Conclusion

In recent years, the number of motor vehicles in China has been increasing, and the load of road traffic system has been increasing. The use of big data based vehicle network intelligent transportation system can effectively reduce road congestion, provide drivers with more efficient and faster route and reduce the occurrence of traffic safety accidents. The intelligent transportation system should include data acquisition subsystem, data application subsystem, data analysis subsystem and management subsystem. It can collect the information of pedestrians, vehicles and roads in the vehicle network comprehensively and use big data method to analyse, providing the data conclusions for drivers, government departments and enterprises. The comprehensive and adequate information will comprehensively improve the efficiency of the road traffic system in China.

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