Research on Path Optimization of Urban Traffic Guidance System

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**Abstract:** With the rapid development of economics and technology; the number of vehicles has largely increased. In this paper, traffic guidance and traffic control systems were researched as well as the Internet of Things (IOT). The author tried to combine these three parts to send traffic data to road users so as to let them choose the best route to travel. Meanwhile, traffic network optimization has been realized to reduce traffic congestion areas. This paper has optimized regional traffic signal control systems based on IOT, traffic guidance as well as traffic assignment, involved data sources, IOT design patterns, data collection as well as the relationship between guidance obeisance rate and traffic jam. It also involved the definition of ideal traffic shortest routes, planning and designing of traffic control systems. Results and researches could hope to combine with reality in order to reduce traffic congestion.

**Theoretical Introduction of Internet of Things**

The nature of Internet of Things is the physical infrastructure and IT infrastructure integration, which can achieve things and things, things and people between information acquisition, transmission, storage, integration and use. The characters include perception of things perfect convergence of identification, communication transmission and intelligent control. The meaning of things and the development process showed that: all kinds of technical things is a highly integrated network, all kinds of complex and technical principles involved in many areas, has not yet formed a unified technical standards system in the world.

Internet of Things as an aggregation of complex systems, mainly composed of three parts: sensing control layer, using RFC, two-dimensional code, sensors perceive the object recognition; network transport layer, the data from the sensing layer identification information through the Internet, radio and television transmission network, mobile communications network and other infrastructure bearer network to the application service layer; application service layer, the use of cloud computing, data mining and other computational intelligence techniques to complete the control and management of intelligent objects, and apply it to specific areas of the industry\(^{[1]}\).

Technical characteristics of things determines Internet of Things in all walks of life will have a very broad application space factory, in respect of the transport sector, the introduction of Internet of Things technologies can achieve intelligent transportation. Intelligent Transportation Systems (ITS) fusion RFID, sensors, wired/wireless communication, data mining, data analysis and processing, GPS location, status monitoring, automatic control, information dissemination, and other advanced technologies to achieve the intelligent management of the entire transportation system, will become mainstream in the future development of the transport system. Internet of Things in the transport sector currently typical applications include: intelligent traffic signal control systems, traffic guidance systems, intelligent parking systems.
Needs Analysis of Urban Traffic Guidance System

Urban traffic guidance system is currently accepted to fully and effectively alleviate the transport sector to solve problems, especially traffic congestion, one of the best ways to traffic jams, accidents, and traffic pollution and a series of traffic problems. The so-called intelligent transportation systems, is to people, vehicles, road and environment through communication, information, and other high-tech means to organically combine to achieve road safety, smooth, low pollution and low power consumption of software systems is a promotion of harmony between man and the environment of road transport integrated technology development [2].

Urban traffic flow guidance system is based on the theory of dynamic traffic assignment, real-time traffic conditions on the road network to analyze complex, integrated use of 3G technology, advanced communications and computer technology. Currently appear overwhelming concept of things, in the face of real-time urban traffic flow guidance system complexity can be considered through the use of Internet of Things technology to achieve secondary traffic flow guidance system, the perfect solution to promote traffic-induced problems. The use of on-board computer, radio and other facilities dynamic, real-time optimal path to provide guidance to travelers instruction and real-time traffic information, and ultimately achieve the purpose of balancing network traffic flow, thereby reducing the length of stay of vehicles on the road, effectively preventing traffic congestion occurs, and ultimately achieve optimal allocation of traffic on each link in the network.

This paper briefly discusses Internet of Things based urban intelligent traffic flow guidance system and the needs of the system analysis and system functions and so on. The goal of building this system are: establishment of the Internet of Things system based on traffic flow guidance, a user through the car system shortest path analysis, geographic information query, vehicle location and bus route search functions, real fast, green, safe, and comfortable traffic environment and promote sustainable development of cities [3]. Fig.1 shows the intelligent traffic under Internet of Things.

![Fig. 1. The intelligent traffic under Internet of Things](image)

Functional Analysis of Guidance System

In China, the use of traffic management working information technology, communications technology, computer technology back in the late 1980s began, after various years of effort, intelligent transportation systems research has achieved initial success, and has been widely used. Real-time control and scientific decision-making capabilities of intelligent traffic guidance systems make traffic management more scientific and standardized [4].

According to historical information recorded in the database, the status information through the appropriate conversion processing to convert the predicted value of the future to provide services for scientific decision-making traffic management. In the management process, by calling the historical record of the parties, such as accident, illegal conditions and transferred out from other departments, such as residence, criminal records and other information, combined with the current information, and then determine the parties most reasonable and effective education and control methods. The biggest advantage of computer network information processing technology is data
sharing, communication and data exchange, which allows multiple units to work together to become possible across multiple departments. Fig.2 shows the functional analysis of guidance system.

Traffic police department, through its various functional office automation network construction, making enforcement and administrative procedures are carried out in strict accordance with the flow of information, and real-time monitoring, is to enhance the efficiency and reduce the various aspects of the human factor, truly embodies the strict law enforcement, hospitality. Traffic information collection system through electronic monitoring, traffic detection system, real-time road information search, concentrated using a variety of media in a timely manner to the higher authorities, the best route choice, so as to achieve a balanced traffic organization purposes, and enhance rapid response capacity difficulty police team. Cases have been detected escape the traffic police work. Once equipped with fully functional intelligent transportation systems, you can pass the vehicle information, driver information, and demographic household registration information, vehicle information, such as robbery and field evidence, clues linked, filter, narrow detection range.

**Optimization Design of Path under Internet of Things**

Urban traffic flow guidance system needs to interact with the hardware and software implementation. Urban traffic flow guidance system induced by the information center, vehicle guidance information system composed of two parts. Traffic flow guidance information center induces traffic flow completing the acquisition of data, processing and publishing. In-vehicle information and communication system to complete guidance information, route optimization and information query. The hardware side Internet of Things is to be designed as a precondition. Fig.3 shows the overall system structure.

Urban traffic flow guidance system is built on the basis Internet of Things, and detailed planning and design for software development in some cities traffic guidance systems. The advantage is that you can integrate things together online resources together to achieve shared resources, the use of
data. Basic data traffic guidance information module is a real-time road travel time travel time prediction by the software based on the acquisition of road transport infrastructure and traffic generation. Final Guidance Information System client software is released by the data communication from the information center to the client\textsuperscript{[6]}.

Optimal path search module uses resistive multi-objective-based database constrained optimal path algorithm to dynamically road resistance to the weight of each section, and calculate the optimal route starting and destination, and are stored in a variable way by road. Optimal path display module will search to find the optimal path corresponding to the above geographical entity object sections, so it is highlighted on the screen. When updating the optimal path, the program will automatically call the latest optimal path, re-displayed on the screen. Route guidance module: This module can guide the driver along the route the vehicle path planning module provides traveling. This module is performed in real time in the case of the road in the driver's steering commands to provide real-time in the form of an arrow point. This module uses the path planning module and positioning subsystem to guide motor vehicle.

Conclusions

The information technology, the communication, the electronic control technology and the system integration technology and so on applies effectively in the transportation system by researching rationale model. In this paper, Traffic Flow Guidance System is one of keys of Intelligent Transportation Systems. It is based on modern technologies, such as computer, communication network, and so on. Supplying the most superior travel way and the real-time transportation information according to the beginning and ending point of the journey. The journey can promptly understand in the transportation status of road network according to the guidance system, then choosing the best route to reach destination. Path optimization is based on urban transport networks, which can plan best travel route in the pre-trip or the travel. The key technologies of is shortest-path searching. We can rapidly improve the path-searching time if carries on the optimization to the road network structure.

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