From "Passive Congestion" to "Active Scheduling" — Rebuilding Travel Experience and Resource Allocation for Intelligent Transportation Networks

Baochao Liang

Chang'an University,xi'an City,Shaanxi Province

Email Address

18590937919@163.com

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Abstract

Along with the acceleration of urbanization, traffic congestion becomes an important factor restricting urban development and improving residents' quality of life. In order to cope with complex traffic requirements, traditional traffic management models seem to be inadequate, often falling into passive congestion. The emergence of intelligent transport networks brings new hope to the solution to this problem. In this paper, the theory basis, technology structure, key technology and application practice are deeply discussed. The aim of this paper is to achieve a transition from passive congestion to active dispatching. In this paper, by constructing a framework of intelligent traffic system, analyzing each level design, analyzing main functional applications, it reveals that intelligent traffic network plays an important role in alleviating traffic congestion, improving traffic safety and promoting sustainable traffic development. Finally, it looks forward to its future development..

Key words

Intelligent traffic reconstruction Travel experience Resource allocation Traffic congestion Active scheduling

Introduction

In today's rapidly developing urbanization process, traffic problems are always a major problem plaguing major cities all over the world. Along with population growth and economic development, urban traffic flow increases continuously, traffic congestion becomes serious day by day, brings great inconvenience to people traveling, brings negative influence to city environment, energy consumption and economy efficiency[1]. Traditional traffic management model mainly depends on manual experience and fixed traffic rules, so it can't adapt to complicated traffic requirements. After traffic congestion occurs, it can only take passive countermeasures, which leads to low efficiency and unreasonable resource allocation. However, along with the rapid development of information technology, especially artificial intelligence, big data, Internet of Things, Cloud Computing, Intelligent Transportation Network comes into being. The intelligent transportation network can achieve real-time monitoring, analysis and control by integrating several advanced information technologies[2]. They will actively optimize traffic resource allocation so as to improve traffic efficiency and enhance travel experience. The transition from passive congestion to active dispatching is a new concept for traffic management and a necessary trend for intelligent traffic development. In this paper, we will further discuss the overall framework of ITS design, key technologies as well as its application practices, in order to provide useful reference and inspiration for ITS research and application, as well as promoting its further development and application.

1.Intelligent Transportation Networks Development Background and Research Significance

1.1Traffic Congestion's Current Situation and Challenges

On a global scale, traffic congestion has become an important factor restricting urban development and improving residents' quality of life. In many large cities, traffic congestion not only increases the travel time significantly, but also causes environmental pollution, energy waste, traffic accidents and so on[3]. Statistics show that the economic losses caused by traffic congestion account for a certain proportion of city GDP each year, and this proportion continues to increase year after year. There are many limitations in the traditional traffic management model in handling traffic congestion. For example, the fixed timing of traffic lights can not adapt to dynamic change of traffic flow, so that driver can not plan optimal route ahead of time. All these factors together result in inefficient operation of traffic system, making traffic congestion more and more serious.

1.2The Rise of Intelligent Transportation Networks and its Development

Intelligent Transportation Network (ITS) has become a necessary choice to solve traffic congestion problem in transportation department. With the continuous development of IT technology, especially Artificial Intelligence, Big Data, Internet of Things, Cloud Computing, Intelligent Transportation Network is becoming more and more popular in transport field. The intelligent transportation network can achieve real-time monitoring, analysis and control by integrating several advanced information technologies[4]. They will actively optimize traffic resource allocation so as to improve traffic efficiency and enhance travel experience. In recent years, a lot of countries and regions actively promote intelligent traffic network construction. For example, the United States' Intelligent Transportation System (ITS), Europe's e-mobility project, China's Intelligent Transportation System demonstration project. These projects can improve transportation efficiency, reduce traffic accidents, reduce environment pollution, and lay the foundation for further development of ITS[5].

1.3 Intelligent Transportation Networks' Research Significance

It is significant both in theory and in practice to research travel experience reconstruction and resource allocation under intelligent transport network. From theory point of view, intelligent transportation network is related to traffic engineering, computer science, control theory, operation research, etc. The study of intelligent transportation network is helpful to promote the development and innovation of relevant subjects, as well as to provide a new idea and method for transportation theory research. From practical point of view, ITS application can alleviate traffic congestion effectively, improve traffic efficiency, enhance residents' travel experience and promote urban sustainable development[6]. Moreover, intelligent transportation networks provide decision-making support to traffic management departments, which helps them to plan and manage transportation resources better and improve their overall performance. Therefore, it is very important to study the reconstruction of travel experience under intelligent transportation network to solve traffic congestion problem, to improve transportation management level and to promote sustainable traffic development[7].

2. Intelligent Transportation Network's Overall Framework Design

2.1The System Architecture

The overall framework of intelligent traffic network is the base of realizing its function. A complete Intelligent Transportation Network System consists of four layers: Perception, Transmission, Processing, and Application, as illustrated in Figure 1. Perception layer collects information such as vehicle position, speed, traffic flow and road condition[8]. Transport layer transmits information collected through perception layer to process layer. Processing layer processes, analyses, and generates corresponding control strategies. Application layer applies the control strategy generated by processing layer to actual traffic system, achieves optimal allocation of traffic resources and reconstruction of travel experience.

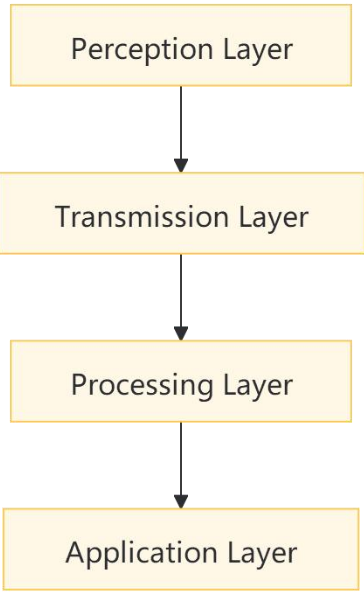

Figure 1: Schematic diagram of the structure of the intelligent transportation network

2.2Description of functions at each level

2.2.1Perception Layer

Perception layer is the foundation of intelligent transport network. Its main function is to collect all kinds of information from traffic system. A large number of sensors and monitoring devices such as vehicle detector, camera, GPS positioning device, weather sensor, etc[9]. These devices are capable of real-time perceiving vehicle location, speed, traffic flow, road condition, weather condition and so on, and transmit it to transport layer. Vehicle detectors, for instance, can monitor traffic flow and speed in real time and provide data support for traffic signal control. The camera is able to capture traffic conditions in real time and provide visual image information to the traffic administration[10]. The GPS positioning device can track the vehicle position and driving track in real time to provide navigation service. The performance of sensing layer directly influences the performance of intelligent traffic network. Therefore, the precision and reliability of sensing devices must be guaranteed.

2.2.2Transmission Layer

A transport layer's primary function is to quickly and accurately transfer information collected by perception layer to process layer. On transport layer, various communication techniques such as wireless communication, wire communication and satellite communication are used. Wireless communication technology is characterized by high flexibility and convenient deployment, which can be applied to vehicle communication, vehicle and infrastructure[11]. Wire communication technology can be used to communicate with monitoring equipment because of its high speed and high stability[12]. Satellite communication technology is widely used to transmit traffic information in remote areas. In order to meet the need of real-time and reliability of intelligent transport network, it is necessary to ensure timely and accurate transmission of information to processing layer.

2.2.3Processing Layer

Processing layer is the core of ITS. Its main function is to process, analyze, and generate corresponding control strategies. Many advanced information technologies such as Artificial Intelligence, Big Data and Cloud Computing are used in processing layer. The AI technique could be used in traffic flow prediction, route planning and traffic signal control[13]. By studying and analyzing large amounts of traffic data, it is possible to make intelligent decision for transportation system. Using big data technology to process and analyze large amount of traffic data, mine valuable information, and provide decision support for traffic management. Cloud computing provides powerful computing and storage capabilities to support smart transport networks. Processing level has a direct impact on intelligence level of intelligent transportation network. Therefore, algorithm optimization should be carried out continuously in order to increase computing power[14].

2.2.4Application Layer

Application layer is used as an interface for direct interaction between intelligent transport networks and users. Its primary function is to apply the control strategy generated by processing layer to actual traffic system so as to optimize traffic resource allocation and reconstruct travel experience. At the application level, it usually provides various application services such as Smart Traffic Signal Control, Travel Information Service, Electronic Toll Collection Service and Traffic Management Service[15]. The intelligent traffic signal control is able to automatically adjust the timing according to the traffic flow in real time so as to improve the traffic capacity. Travel Information Services provide real-time traffic information and optimal route planning for travelers to avoid traffic congestion. The Electronic Toll Collection Service facilitates vehicles to pass quickly and improve traffic efficiency. Traffic Management Service provides decision-making support to the traffic management department, which helps them to plan and manage the traffic resources. Application layer's performance directly influences user experience and system promotion effect. As a result, we need to focus on optimizing user experience and diversification of application services.

3.Realization of Intelligent Transportation Networks Main Functions

3.1Real-time monitoring and accurate traffic flow forecast

Traffic flow prediction is a key technique in ITS. The purpose of this model is to forecast traffic flow at certain moment or period in future by analyzing and modeling historical traffic data. Accurate forecast of traffic flow provides important decision basis for traffic signal control, route planning and traffic management. There are three main methods for prediction of traffic flow: statistical methods, machine learning methods and deep learning methods. Statistical analysis method is used to analyze traffic data statistical characteristics and establish mathematical models, such as time series analysis and regression analysis. This method has advantages such as simplicity, easy comprehension, fast computation speed, but low precision. Based on machine learning, machine learning models can be used to model traffic data such as support vector machines and random forests. Its advantage lies in its high prediction precision, but high training data and computation resources are needed. Deep learning methods based on deep neural networks such as convolutional neural networks and recurrent neural networks have been widely used in recent years. Its advantage lies in its high prediction precision and complex traffic data processing capability. However, there is great demand for training data and computing resources, and this model is poor in interpretation. It is necessary to select appropriate traffic flow prediction methods based on specific requirements and data characteristics in practice.

Real time monitoring and accurate forecast of traffic flow in intelligent transportation networks is the foundation to achieve optimal allocation and active dispatching of transportation resources. Through real-time monitoring of traffic flow, we can get information such as distribution, speed, density, etc., which provide data for traffic signal control and path planning. Accurate traffic flow forecast helps traffic management department to formulate response strategy ahead of time so as to alleviate traffic congestion effectively. Traffic flow monitoring mainly depends on advanced sensor technology and data collection system. A wide variety of sensors such as loop coil detector, microwave radar detector and video detector are used in intelligent transportation networks. A circular coil detector is used to detect vehicle speed and flow information through detecting the change of magnetic field caused by vehicle passing. It has high detecting precision and high stability, but its cost of installation and maintenance is high. Microwave radar is used to measure vehicle velocity and distance by utilizing the reflection characteristic of microwave signal. It has the characteristics of wide detecting range and strong anti-interference ability, so it can be used to monitor traffic flow in complicated traffic environment. A video detector is used to extract traffic flow information from traffic monitoring videos. Not only are they able to obtain vehicle speed and flow information, but they are also able to obtain detailed information such as vehicle type and license plate number, which provides powerful support to traffic management and law enforcement. These sensors provide real-time data to traffic control center via wireless or wired communication networks, forming an integrated real-time traffic monitoring network.

Traffic flow forecast is a complicated process that needs large amount of historical traffic data to be analyzed and modeled. The traditional traffic flow forecast method mainly adopts the method of time series analysis and regression analysis. These methods can be easily calculated, but they have limited prediction precision when processing complicated traffic data. With the development of machine learning and deep learning technology, data-driven prediction models are becoming more and more popular. For example, Support Vector Machine (SVM) is an effective way to deal with the nonlinear features of traffic flow data and to improve the precision of prediction. Deep learning models such as Long Short-Term Memory network (LSTM) and convolutional neural networks (CNN) have shown remarkable performance when dealing with time-series data and spatial correlations. LSTM is able to capture long term dependencies in traffic flow data, so it is very useful for predicting periodic traffic flow. CNN is able to extract spatial features from transportation network.

Combined with LSTM model, it is possible to predict traffic flow in space and time. These advanced prediction models allow intelligent traffic network to predict the time and location of congestion ahead of time so as to provide scientific evidence for traffic signal control and route planning.

3.2 Intelligent traffic signal control and optimization

Intelligent traffic signal control is another key technology of ITS. The main purpose of the system is to improve traffic capacity and reduce traffic congestion by adjusting traffic signals in real time. Traditional traffic signal control method mainly adopts fixed timing method, so it can not adapt to dynamic change of traffic flow. On the other hand, intelligent traffic signal control achieves optimal traffic flow control through real-time monitoring of traffic flow, integrating traffic flow forecast technology to dynamically adjust traffic timing. At present, intelligent traffic signal control techniques are mainly based on rules, optimization and artificial intelligence. A set of rules and thresholds for automatic timing adjustment according to traffic flow change is proposed in this paper. This method has the advantage of easy comprehension and implementation, but poor adaptability. In order to solve this problem, the optimal timing scheme of traffic signal is obtained by solving the optimization problem. Its advantage lies in its ability to get global optimum solution, but its computational complexity is high and its application is difficult. Based on artificial intelligence, intelligent decision model is built by learning traffic data characteristics and patterns, and timing timing is automatically adjusted. Its advantage lies in its adaptability to dynamic changes in traffic flow. However, a lot of training data and computation resources are needed. In practice, multiple methods are often combined to improve the efficiency of intelligent traffic signal control. The code examples are as follows.

```
class TrafficEnvironment:
    def __init__(self):
        self.num_actions = 4
        self.state = [0, 0, 0, 0]
        self.max_cars = 10
        self.max_wait = 5
    def reset(self):
        self.state = [random.randint(0, self.max_cars) for _ in range(4)]
        return self.state

    def step(self, action):
        reward = 0
        for i in range(4):
            if i == action:
                self.state[i] = max(0, self.state[i] - 1)
            else:
                self.state[i] = min(self.max_cars, self.state[i] + random.randint(0, 1))
```

Traffic signal control plays an important role in achieving optimal traffic resource allocation in ITS. Traditional traffic signal control adopts fixed timing scheme. It can not adapt to dynamic change of traffic flow and cause traffic congestion frequently. The intelligent traffic signal control enhances road traffic capacity through real-time monitoring of traffic flow, combined with traffic flow prediction technology, and dynamically adjusts the timing of traffic lights.

In order to achieve intelligent traffic signal control, multiple factors including traffic flow, traffic capacity and vehicle type are considered comprehensively. Based on rules and thresholds, Rule Based Signal Control is used to adjust the timing of signal lights based on traffic flow. This method has the advantage of easy comprehension and implementation, but poor adaptability. By establishing mathematical model, the optimal timing scheme of signal light is obtained by solving the optimization problem. Its advantage lies in its ability to get global optimum solution, but its computational complexity is high and its application is difficult. Recently, artificial intelligence based signal control methods have attracted attention gradually. For instance, reinforcement learning algorithms enable agents to learn optimal control strategies for traffic flow, so they have strong adaptability. In addition, deep reinforcement learning algorithms combine deep learning and reinforcement learning. Deep neural networks are used to learn the state and action mapping relationships of traffic environments in order to achieve more accurate signal control. Furthermore, multi-agent systems are applied to traffic signal control as well. Through collaboration and communication among multiple agents, multiple intersections are controlled in a coordinated manner so as to improve traffic efficiency in the whole traffic network.

Implementation of intelligent traffic signal control should be considered in coordination with other traffic management measures. For example, coordination with traffic guidance system may lead traffic flow dynamically and reduce traffic congestion. Coordination with public traffic priority control will improve efficiency of public transport, encourage more people to choose public transport, thereby alleviating traffic pressure. Through these cooperative measures, intelligent traffic signal control system could better improve traffic resource optimization and improve its overall operating efficiency.

3.3 Travel Routes Dynamic Planning and Optimization

Path planning is an important technique in ITS. The main purpose of this system is to provide passengers with optimal travel routes so that they can avoid traffic congestion and improve their travel efficiency. Traditional path planning based on static traffic information mainly uses shortest path algorithm or shortest path algorithm. However, there are significant limitations in the handling of dynamic traffic environments. The path planning technology of intelligent transportation network should consider real-time traffic flow, road condition, traffic signal and so on. At present, there are three main methods of path planning: graph theory method, artificial intelligence method and multiobjective optimization method. Based on graph theory, the path planning problem is transformed into shortest path problem or shortest path problem of graph theory. The algorithm of Dijkstra is used to solve this problem. Its advantage lies in its quick computation speed, but difficult to deal with dynamic traffic environment. Based on AI method, we build intelligent decision model by studying traffic data features and patterns to provide optimal route planning for travelers. Its advantage lies in its adaptability in dynamic traffic environment. However, large amount of training data and computation resources are needed. In this paper, multiple objectives such as travel time, travel cost and congestion are taken into account. Finally, we obtain optimal path planning plan based on multiple objectives. Its advantage lies in its comprehensive consideration of multiple targets, but its computational complexity is high and its application is difficult. It is necessary to select a suitable path planning method based on specific requirements and data characteristics in practice.

Travel route planning plays an important role in enhancing travel experience in intelligent transportation networks. Traditional path planning based on static traffic information mainly uses shortest path algorithm or shortest path algorithm. However, this method of static path planning has obvious limitations under the dynamic traffic environment. The path planning technology of intelligent transportation network should consider real-time traffic flow, road condition, traffic signal and so on. Dynamic route planning also needs to consider travelers' personalized requirements. Different travelers may have different preferences when it comes to travel time, cost, comfort, etc. The intelligent transportation system provides personalized route planning services to the travelers through the collection of their preferences. For example, for time-sensitive passengers, the system may recommend the quickest route. For cost-sensitive travelers, the system is able to recommend the most economical route. Moreover, intelligent transportation system is able to dynamically adjust route planning suggestion according to traveler's real-time location and destination to ensure travelers always select optimum route. Through these personalized route planning services, intelligent transportation network is able to significantly improve travelers' travel experience, reduce travel time and reduce travel costs，code examples are as follows：

```
import heapq
import random
class TrafficNetwork:
    def __init__(self):
        self.graph = {
            'A': [('B', 5), ('C', 3)],
            'B': [('D', 2), ('E', 4)],
            'C': [('F', 6)],
            'D': [('G', 1)],
            'E': [('G', 3)],
            'F': [('G', 2)],
            'G': []
        }

    def get_neighbors(self, node):
```

```
        return self.graph[node]
    def get_real_time_data(self):
        for node in self.graph:
            for i in range(len(self.graph[node])):
    self.graph[node][i] = (self.graph[node][i][0], random.randint(1, 10))

    def display_network(self):
        for node in self.graph:
            print(f"{node}: {self.graph[node]}")
```

3.4 Traffic Management Decisions Supported and Optimized

Traffic Management Decision Support plays an important role to realize traffic resource optimization allocation and active scheduling in ITS. Through mining and analyzing massive traffic data, intelligent traffic system provides scientific decision support to traffic management departments, which helps them to plan and manage transportation resources better.

Traffic Data Mining is one of the key technologies to realize the decision support in traffic management. Traffic data has the characteristics of big volume, variety of data types and strong data dynamics. The traditional data analysis method can not satisfy the requirement of ITS. The statistical data analysis method is mainly based on statistical analysis of statistical characteristics such as mean, variance, correlation, etc. This method has advantages such as simplicity, easy understanding, fast computation speed, but complex data relations are hard to deal with. Based on machine learning data analysis methods learn features and patterns of traffic data, establish data mining model, extract valuable information such as cluster analysis, classification analysis, association rule mining etc. This approach has the advantage of dealing with complicated data relationships. However, it requires a lot of training data and computational resources. Recently, deep learning based methods of data analysis have attracted much attention. By constructing deep neural networks, this method can automatically learn traffic data features and patterns, and extract valuable information. Its advantage lies in handling complex data relationships, which is highly adaptable. However, there is great demand for training data and computing resources, and this model is poor in interpretation.

Traffic Management Decision Support System is able to provide a variety of decision support functions by mining traffic data. By analyzing traffic flow data, for example, it is possible to predict when and where traffic congestion occurs, and to formulate a response strategy. By analyzing traffic accident data, it is possible to recognize sections with high accident rate and to take appropriate preventive measures. By analyzing public traffic data, we can optimize public traffic routes and operation times so as to improve public transport service level. Moreover, DSS provides various services such as traffic facilities maintenance management and traffic planning evaluation, providing comprehensive management support for traffic management.

The implementation of DSS needs to consider coordination with other traffic management measures. For example, coordination with a traffic signal management system can dynamically adjust traffic flow and increase traffic capacity. By cooperating with travel information service system, travel information and travel advice can be provided to travelers in order to make reasonable choice of travel route. Through these cooperation measures, traffic management decision support system will be able to make better use of traffic resources and improve overall operation efficiency.

4. Intelligent Transportation Networks' Application Practice

4.1. Intelligent Traffic Signal Control Application

Intelligent traffic signal control is of great importance to alleviate traffic congestion. Through real-time monitoring of traffic flow and combining traffic flow forecast technology, intelligent traffic signal control system is able to adjust traffic timing dynamically so as to improve traffic capacity. For example, Intelligent Traffic Signal Control Systems have been adopted in some cities. Vehicle detectors are installed on roads to monitor traffic flow in real-time. In combination with traffic flow forecast model, this paper makes dynamic adjustment to traffic light timing. The intelligent traffic signal control system is capable of automatically adjusting the green light duration according to traffic flow change, reducing vehicle waiting time and improving traffic capacity. Moreover, this intelligent traffic signal control system is combined with electronic police system in order to monitor and punish traffic violations in real time so as to improve traffic order.

4.2 Service Application for Travel Information

Travel Information Service plays an important role in ITS. It aims at providing real-time traffic information as well as optimal route planning so they can avoid traffic congestion and improve their travel efficiency. At present, travel information services such as Autonavi Maps, Baidu Maps, etc. are widely used. These travel information service platforms collect real-time traffic data, combine them with route planning technology, provide optimal travel route planning for travelers. Through mobile apps or in-car navigation devices, travelers can get real-time traffic information and travel advice, and choose the best route based on actual situation. In addition, the travel information service offers a wide range of public transportation information and parking information, providing comprehensive travel support for travelers.

4.3 The Electronic Charging Service Application of Charging

The electronic toll collection service is another important application of ITS. The main purpose of the system is that it allows for rapid passage of vehicles and increases the efficiency of transportation. Electronic Toll Collection System is used to collect tolls automatically through the installation of electronic tags on vehicles and the reading and writing equipment of toll stations. The Electronic Toll Collection System reduces the waiting time in toll stations, and improves traffic efficiency. For example, the Electronic Toll Collection System (ETC) is widely used in China. The installation of ETC equipment in vehicles and the ETC reading and writing devices in toll stations make it possible for vehicles to complete toll collection without stopping, which significantly improves traffic efficiency. Furthermore, electronic toll collection system can combine with intelligent traffic signal control system to adjust traffic flow dynamically to improve traffic efficiency.

4.4 Traffic Management Services Deployment

Traffic Management Service plays an important role in Intelligent Transport Network. Their main function is to provide decision-making support to the traffic management department so that they can better plan and manage the traffic resources. Traffic management services can extract valuable information from traffic data mining technology in order to provide decision-making support to the traffic management department. For example, with traffic data mining and analysis technology, traffic management departments can analyse traffic flow trends, predict locations and times of congestion, and take preventive measures to alleviate traffic congestion. Furthermore, traffic management services provide various services such as maintenance and management of transportation facilities and assessment of traffic planning, providing comprehensive management support to traffic management departments.

5. Future trends in Travel Experience

5.1 Innovation and Technological Integration

The future development of Smart Transport Networks will focus more on technology integration and innovation. With Artificial Intelligence, Big Data, Internet of Things, Cloud Computing, Intelligent Transportation Networks will increasingly integrate advanced technologies in order to realize intelligent traffic management and services. For instance, AI technology will be combined with big data technology to achieve more accurate traffic flow prediction and route planning. The Internet of Things (iot) technology will combine with cloud computing technology in order to transfer and process traffic data more efficiently. Moreover, ITS will continue to explore new technologies such as autonomous driving technology and internet of vehicle technology, which provide new impetus for intelligent traffic system development.

5.2 Collaboration and System Integration

The future development of ITS will put more emphasis on system integration and cooperation. ITS will not only be a separate system, it will integrate deeply with other urban systems such as energy system, environment system and logistics system. For example, Smart Transport Networks (ITS) can be integrated into energy systems to save energy and reduce emissions in transport systems. Integrate environmental system, reduce environmental pollution; Integrate with logistics system, improve logistics efficiency. Through system integration and collaboration, intelligent traffic network will provide comprehensive support to urban sustainable development.

5.3 Service Optimization and User Experience

The future development of ITS will focus more on user experience and service optimization. Intelligent transport networks will improve user experience through continuous optimization of application services. For example, travel information services allow users to obtain more accurate real-time traffic information as well as optimal route planning. The electronic toll collection service will provide users with convenient and quick transit services. Traffic management services provide efficient traffic management support to users. Furthermore, ITS will continue to explore new service modes such as shared transport service and customized transportation services for customers.

5.4 Policy Support and Better Regulation

The future development of ITS will depend on policy support and regulatory improvements. A series of policies will be put in place to support ITS construction and development, including financial support, technology research and development support, as well as infrastructure construction. At the same time, the government will improve related regulations and standards in order to standardize the management of ITS. For example, the government will formulate relevant data protection regulations in order to guarantee users' privacy and security. Work out relevant traffic management rules to regulate traffic behavior. Through policy support and regulatory improvements, ITS will achieve a healthier, more sustainable development.

6. Conclusion

Intelligent Transportation Network provides a new way to solve traffic congestion problems, improve traffic efficiency and improve travel experience. Through system framework design, key technology research and application practice, intelligent transportation network can change from passive congestion to active dispatching, optimize traffic resource allocation, enhance intelligence level of traffic system. However, there are still many challenges in ITS development, such as complex technology integration, system integration synergy, user experience optimization and policy improvement. As technology advances and policy support, ITS will play an even more important role in wider transport scenarios and make greater contributions to the modernization and sustainable development. We look forward to continuous improvement of ITS functions, optimization of traffic management and service mode, providing convenient, efficient and safe traffic environment.

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