Research on the Development and Construction of Smart Transportation in China

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Abstract

With the continuous development of the new normal of economy, the mode of transportation in China has also been constantly innovated. The integration of data information technology has gradually formed a traffic management system integrating monitoring and control, and the transportation in China is gradually moving towards the direction of smart technology, standardization and order. With the improvement of urbanization construction standards, China has higher requirements on the transportation environment and the quality of transportation. How to improve the efficiency of transportation and ensure the safety and ecological stability of transportation is the fundamental goal of intelligent transportation in China at this stage. Intelligent transportation is the full integration of information data and transportation management. Through the use of multimedia equipment and monitoring equipment, big data and information of transportation are collected and analyzed, so as to realize the convenience and standardization of transportation. Transportation information development is the application of information collection, processing, processing, transmission and other processes, and the realization of advanced and convenient transportation. With the continuous development of information technology, its functions become more and more diversified, and its forms are also divided into many kinds. It has a strong ability of self-judgment and self-adaptation. This paper takes intelligent transportation as the research topic, hoping to provide some basic theoretical thinking for the development and construction of intelligent transportation in China and promote the continuous progress of urban intelligent transportation.

Keywords

Intelligent Transportation; Data Information Technology; Development Status.

1. Introduction

In 2013, Minister of Transportation Yang Chuantang put forward the development concept of "integrated transportation, smart transportation, green transportation, and safe transportation " at the National Transportation Technology Innovation Conference. The construction of smart transportation has become one of the key strategic tasks of the national transportation industry. In the "Thirteenth Five-Year" development plan launched by the Ministry in 2016, all regions are required to actively develop smart transportation demonstration projects.

With the support of the state, China has made some gratifying achievements in the construction of smart transportation. For example, Beijing completed the traffic operation monitoring and dispatch system (TOCC), Shanghai built the Hongqiao hub integrated intelligent system, China Railway built the Railway Intelligent Transportation System (RITS), and Xiamen established Xiamen Intelligent Traffic Control Center (ITCC), in addition to the electronic non-stop toll collection system (ETC) built on some expressways. However, due to differences in the construction subject, management area, organizational framework, and transportation methods, there are still many problems in the construction of smart transportation in China.

Understanding the connotation of smart transportation and clarifying the development goals and construction ideas of smart transportation in China are important for the development of China's urban transportation. important meaning. The further upgrade of urban transportation requires a complete top-level design. Only when the development direction of smart transportation is clearly defined can various transportation modes be closely connected and the rapid, healthy and sustainable development of smart transportation can be promoted [1].

1.1. Development Status at Home and Abroad

1.1.1. The Status Quo of Foreign Smart Transportation Development

At present, ITS is valued all over the world, and each country has formulated its own traffic improvement measures for different traffic conditions in its own country. The United States and Japan are countries with a relatively advanced level of ITS construction.

The United States began the construction of smart transportation systems as early as the late 1960s. In the 1980s, the PATHFINDER system was successfully developed, and then various researches on smart transportation were fully launched. In the "Five-Year Plan for Transportation System", Maine has involved a series of laws and ideas related to smart transportation. Fourth, it is clear that smart transportation has a pivotal position in the national development strategy. At the same time, a lot of funds have been invested to support the construction and development of smart transportation. Among them, from 1998 to 2003, Congress needed to allocate 1.280 billion US dollars for the construction and development of smart transportation. From 1991 to 2010, the total investment for the construction and development of smart transportation is estimated at 40 billion U.S. dollars. In 2009, the U.S. Department of Transportation emphasized smart driving and car-to-vehicle interconnection in the "Strategic Research Plan for Smart Transportation Systems" released by the U.S. Department of Transportation., That is, through wireless communication, the road infrastructure, vehicles and passenger portable equipment are connected to each other to form a network-wide, multi-style intelligent transportation environment. In 2015, the U.S. Department of Transportation fully launched the Internet car project (including three stages of concept car development, manufacturing test design, and operation and maintenance) [2].

Japan began research on smart transportation systems as early as 1973. In 1995, it formally formulated and implemented the "Information Implementation Guidelines for Roads, Transportation, and Vehicles" that included 9 development areas and 11 promotion measures. In 1996, using Osaka, Nagoya and other places as pilots, the vehicle information and communication system began to be used, and it was promoted in the whole range in 1998. At the same time, a special plan for the financial investment of smart transportation was formulated, which is expected to be between 1996 and 2015 , The funds used for the construction and development of smart transportation are approximately 780 billion yen. In 2001, Japan included the construction and development plan of smart transportation in four priority policy areas, which were embodied in the "E-Japan Priority Policy Plan" released in the same year. In 2011, in order to effectively alleviate traffic congestion and improve the traffic environment, a safe and convenient smart transportation system site was introduced and applied to the national highway network, so that users can check and receive a large amount of traffic base in time through the car navigation system Information and images guide the user's driving direction and route.

1.1.2. Development Status of Domestic Smart Transportation

The research on smart transportation is still in the preliminary stage, and the research results and the degree of advancement are still in the backward stage. However, the importance of the inevitable choice of transportation system construction has been highly valued by the country.

Shanghai became a pilot demonstration city for the construction and development of smart transportation applications in 2002, and began to develop a number of demonstration projects (including systems, technology, management and operation, etc.), during this period, including traffic signal control adaptive A number of intelligent transportation systems, including the system, traffic monitoring system, and traffic violation monitoring system, have also been built and put into use. In 2008, Shanghai built a comprehensive transportation information platform. Based on the ArcGIS platform in the United States, this platform realized the country's first comprehensive, real-time integration and processing of multi-source heterogeneous basic information data resources (including the city's roads and public transportation, and traffic flow in the external transportation field). And transportation infrastructure, etc.), a smart transportation platform that shares, exchanges and integrates transportation information resources across industries. In addition, in order to strive to achieve unimpeded urban traffic, Shanghai has taken the lead in launching traffic radio stations and traffic websites, aiming to provide drivers with the latest traffic information and travel guides in a timely manner, guiding them to choose appropriate driving routes, and effectively alleviating traffic congestion[3].

Xiamen City integrates public transportation through a big data platform. People can formulate exclusive bus travel plans on the "Handy Bus" app according to their travel needs, and check the real-time operating information of the vehicles that need to be taken through the APP, so that passengers can make reasonable arrangements Own travel time. At the same time, the self-driving smart app developed by Xiamen Information Group Co., Ltd. has gradually become a beacon for users in their daily life. Users can query the real-time traffic conditions through the self-driving smart app, so that users can know the traffic situation before they travel ; It can also solve some of the problems encountered in the process of traveling and driving, such as providing services for moving vehicles and violation inquiries.

2. Principles, Goals and Contents of the Construction of Urban Smart Transportation Systems in China

2.1. The Basic Principles of China's Urban Smart Transportation System Construction

(1) Demand orientation

The construction of China's urban smart transportation system should fully consider the constraints of public travel growth and the development of the logistics industry, and focus on the needs of diversified travel modes, travel safety, efficient traffic management, and smooth urban traffic information to meet the needs of urban economic and social development. , The integration and improvement of regional traffic and urban traffic require scientific planning.

(2) Overall synergy

The construction of China's urban smart transportation system involves multiple departments and multiple entities, including not only multiple government departments and related fields, but also many enterprises. Therefore, it is necessary to comprehensively consider the coordination between the smart transportation system and various government departments, between enterprises and government departments, the overall synergy between new and existing systems, the synergy of short-term, mid-term and long-term construction, urban areas and subordinate administrative The regional, regional and the province and even the country's synergy.

(3) Forward-looking design

The construction of China's urban smart transportation system should have a moderately advanced awareness, adopt advanced and mature methods and technologies, and have a certain forward-looking system design, with reserved interfaces to ensure the completeness and

scalability of the system, and meet The short-term, medium-term, and long-term development requirements of cities must also consider the current economic development capacity of different cities in China.

(4) Technical reliability

The construction of China's urban smart transportation system must not only be supported by powerful, advanced, and mature technologies, but also must consider technical reliability. Start with system structure, technical measures, equipment performance, system management, manufacturer's technical support and maintenance capabilities, etc., to ensure Reliability and stability of system operation. At the same time, while sharing information resources, consider the protection and isolation of information, and pay attention to preventing system security issues.

(5) Planning dynamics

The construction of China's urban smart transportation system should pay full attention to the utilization, integration, transformation and upgrading of existing systems to avoid repeated construction. At the same time, with the construction and development of urban social economy and urban transportation, transportation planning, construction and management requirements continue to increase, The intelligent transportation system is constantly adjusting and adding new content according to the situation.

2.2. The Content of China's Urban Smart Transportation System Construction

(1) Building a smart transportation network

Focusing on the configuration of infrastructure sensing equipment, starting from the design of new roads, bridges and stations, etc., configure traffic intelligent sensing equipment, install traffic flow automatic observation equipment, video monitoring and guidance systems and other intelligent traffic devices to form a more complete traffic route Web perception system. Continue to promote the construction of the electronic non-stop toll collection system on highways, and guide the local vehicles in our cities to install and use smart cards for the electronic non-stop toll collection system on highways. Install traffic flow guidance display screens at traffic sites such as highway entrances and exits and busy sections to provide real-time road condition information and improve road utilization and traffic capacity. Establish a socialized information sharing linkage mechanism to accurately and timely release traffic information through media such as TV, radio, website and mobile terminals. Improve the online level of element resources such as infrastructure, transportation tools and operation information, and promote the online integration of transportation resources. Using technologies such as the Internet of Things and mobile Internet to further strengthen the collection of operating status and traffic information of key facilities in transportation networks such as roads, railways, and civil aviation [4].

(2) Development of smart transportation equipment

Intelligent security management devices such as geographic information systems, satellite positioning systems, and radio frequency automatic identification systems will be gradually extended to all vehicles. Actively promote the application of two-dimensional code, radio frequency identification and other Internet of Things perception technology and big data technology, handling robot system, automatic guided vehicle system and high-speed sorting (merging system and other intelligent devices in the scope of application in warehouse management, construction depth Perceived intelligent warehousing system to realize real-time tracking of warehousing facilities and goods, network management and high-level sharing of inventory information.

(3) Realize smart transportation and travel

Improve the passenger transportation network ticketing platform, realize the whole road passenger transportation network ticketing, and develop the "one-stop networked ticketing" among transportation modes such as roads, railways and aviation. Relying on payment intermediaries such as Alipay, online banking and UnionPay, promote online ticketing payment and settlement. Promote the construction of a comprehensive information service platform for regional road passenger transportation, and realize the networking between urban areas, cities and counties.

Make full use of the Internet to integrate information resources such as transportation portal travel information, transportation networked ticketing systems, intelligent traffic flow guidance systems, electronic maps, taxi e-admissions, etc., and build a three-dimensional public travel service platform based on the Internet platform to achieve a variety of Travel mode information service docking and one-stop service.

(4) Develop smart logistics

Increase the business technology linkage between the logistics park and the freight car networking and Internet of Things technology service providers, promote the efficient matching of personnel, cargo sources and vehicle sources, and improve the information, network and automation level of the logistics system. Taking the depots and logistics parks as the main body, accelerate the internal information construction of different logistics nodes, form the interconnection between the various functional areas within the nodes, improve the comprehensive perception and real-time monitoring level of the internal logistics operation process of the logistics nodes, and enhance the internal logistics enterprises of the nodes The ability to execute operations in a timely manner.

Apply advanced logistics organization methods and standard software to accelerate the integration to both ends of the logistics chain, gradually shift from providing a single service to providing a humanized service, and support the development of comprehensive smart logistics enterprises.

Applying information network technology to integrate customs clearance information, port information, corporate credit information and inter-provincial and municipal combined transportation information, improve the information transmission and exchange capabilities between logistics nodes, and finally realize the positioning, tracking, monitoring and management of the whole process of supply A supply chain integration and decision service platform with central decision-making functions, collaborative resource utilization functions, and process reengineering functions.

Carry out demonstration and pilot construction of enterprise logistics e-commerce platforms, and continuously guide logistics enterprises to build personalized and professional logistics information service platforms, and promote the interactive development of industries. Develop new community-based distribution models such as community self-pickup cabinets, cold chain storage cabinets, and collection service points, and promote the construction of four-level logistics distribution networks at the city, county, township and village levels and village-level distribution outlets to solve the "last mile" of logistics distribution Question [5].

3. Ideas and Suggestions for the Construction of Smart Transportation in Chinese Cities

3.1. Ideas for the Construction of Smart Transportation in Chinese Cities

(1) Top-level planning for urban smart transportation construction

The top-level design of smart transportation is related to the resource and data sharing of each subsystem, the integration of the original system, the overall performance of the system, the

degree of satisfaction and sustainability of system functions to demand, and the control of financial investment in system construction, etc. We must not only consider its advanced nature, but also pay attention to the practicability of the system.

The construction of smart transportation must take the top-level design of smart cities as the framework, link urban transportation needs and planning, and formulate careful planning and construction plans with the needs and services of smart transportation as the core, so as to determine the construction project and future construction and The development direction should be tried step by step according to the classification of each subsystem, policy-oriented, technology-centric, and under the condition of satisfying capital control, the implementation of the plan should be solidly and properly promoted.

(2) Analysis of user objects and business needs of the system

At present, the users of smart transportation systems are mainly divided into three categories: government departments, business operation organizations, and the public. Government departments mainly perform their supervisory functions. There are many applications of administrative affairs in business formats, involving traffic operation monitoring, traffic management and service functions, traffic emergency management, traffic operation analysis and policy formulation, etc. Enterprise operation organization involves all aspects of enterprise operation services. There are many enterprise-level applications, which are more complicated and complicated. Generally, directional development is carried out according to the needs of operating companies, such as scheduling systems, payment systems, cargo logistics information and control systems, etc., designed to the company's daily operation monitoring, daily affairs management and exception handling, and scientific decision-making and support for operation strategies and strategies .

The public is the service target of smart transportation and the foundation of the development of smart transportation, including public travel access, public travel information services, travel infrastructure, consultation and complaints, etc. Common ones include bus schedules, rental calls, bicycle service systems, high-speed charging policies, payment of related services, consultation and complaint systems, etc.

Under current technical conditions, government departments pay more attention to the collection of information and data, enterprises pay more attention to the contribution of information data analysis to operating costs and performance appraisal, and the public pays more attention to the effectiveness, practicality and convenience of information [6].

(3) System development and system construction of smart transportation

The ultimate goal of the development and construction of the smart transportation system is to provide information services for all kinds of users. Common external interfaces for providing information and services include websites, mobile APPs, drive test fixed facilities, call centers, desktop clients, dedicated smart terminals, etc. The website is an earlier way to achieve traffic information release and query, and can provide a wide range of information services, such as different traffic routes, schedules, transfer points and transfer methods, freight distribution outlets, service prices, service quality evaluations, etc. Mobile APP needs to rely on different application systems for customized development, which can target specific users and improve service efficiency. Common ones include transportation government APP, enterprise management APP, and public travel-related applications such as smart bus APP, taxi APP, freight APP and so on. Fixed road test facilities are dedicated information service settings in key areas of transportation hubs and road test settings, such as electronic bus stop signs, information release screens in transportation yards, and information query terminals.

Call centers generally implement information release and communication by means of phone calls, text messages, etc. Desktop clients are generally dedicated desktop clients for government managers and corporate managers to facilitate management services or operation organization

supervision. Special smart terminal devices are generally targeted at specific Transportation tools and application scenarios, such as on-board special equipment such as buses, taxis, bicycles, and ETC special charging systems.

Different information service methods generally also require different technical support, involving the construction and installation of networks, system software and hardware, special equipment, support platforms, and venues.

Due to the continuous update and development of technology, new technologies of the transportation system continue to appear, and the update cycle is greatly shortened. In order to ensure the life cycle of the system, generally speaking, the construction and development of the system should consider advanced practical technologies as much as possible[7]. The service of the intelligent transportation system involves multiple types of users, and the integration is continuously enhanced, but the user's ability and level are uneven. Therefore, the system must not only have the capability of diversified services, but also make the system services easy to use. The user interface is as friendly as possible, and the operation is simple, and strive to be able to serve everyone involved in the transportation[8].

In the construction of the system platform, the openness of public information of the system, the reliability of data and information, the security of system operation, and the confidentiality of collected individual information must also be ensured.

3.2. Suggestions for the Development of Smart Transportation in China

Drawing on the practical experience of smart transportation development in foreign countries, homes and cities, I put forward the following suggestions for the direction and trend of smart transportation construction and development:

(1) Continue to improve the strategic positioning level of smart transportation development

For the construction and development of smart transportation, many developed countries and regions have taken it as an important strategic direction for transportation development, and increased government policy support and capital investment. Of course, China's transportation development in the "Twelfth Five-Year Plan" The plan clearly proposes to focus on the development of core technologies for smart transportation, and the "13th Five-Year" development plan also further clarifies the importance and core position of smart transportation. However, these are not enough. In terms of the management system, China should establish a national-level smart transportation. The construction and development leading group is responsible for the overall guidance and coordination of the construction and development of the national smart transportation system. At the same time, it establishes a sound smart transportation development special fund investment mechanism. And mobilizes social forces to obtain multi-channel financing.

(2) Promote information sharing and coordinated law enforcement in smart transportation systems

Break down the interest barriers of various departments and create an environment for interconnection and sharing of resources between various departments, thereby promoting the improvement of the work efficiency of various departments, and accelerating the pace of building smart transportation. Establish an information and data sharing platform, develop a national network of transportation information, and promote Coordinated law enforcement, joint prevention and control among various departments, innovated coordinated joint law enforcement mode, and increased remote coordinated law enforcement. Develop a real-time transportation monitoring system, implement a network-wide tracking and evasion notification system for major traffic violations, and realize all departments across the network Sunshine law enforcement to improve the credibility of the linkage law enforcement.

(3) Strengthen the research and development of key information technology for smart transportation

With the development and wide application of science and technology such as the Internet of Things and cloud computing, urban transportation planning and management is becoming smarter. The integration of the Internet of Things + transportation technology, cloud computing and information processing, and traffic information security are the key core of smart transportation. Technology also needs to increase research and development and breakthroughs. Therefore, the state should adopt various incentive policies and economic measures to vigorously promote the development of key core technologies of smart transportation, and establish a correct concept of talents. Pay attention to the core of talents in the research and development of key technologies of smart transportation Dominant position to ensure the level and trend of research and development of key technologies.

(4) Advocate the "people-oriented" smart transportation development purpose

Judging from the experience of foreign smart transportation development, many developed countries are based on the purpose of "serving the people's livelihood and benefiting the people's livelihood", and strive to provide people with comprehensive and convenient transportation services. Therefore, in the development of China's smart transportation, it should be established and improved. Convenient information service system, incentivizing the rational use of social resources and technology, using cloud computing, Internet of Things and other high-tech key technologies to develop a convenient transportation service system, effectively improving public travel experience satisfaction, so that the public can truly enjoy the smart transportation construction belt The convenience of coming.

4. Conclusion

With the continuous development and progress of science and technology, the technology of smart transportation can be further realized and enhanced, and the smart transportation system will be more adapted to the development of our country, and achieve the goal of sharing the traffic pressure for the capital. I believe that in the near future, smart life will become more and more common, and the application of smart transportation will become more and more refined. Let the smart transportation system based on the Internet of Things realize the connection between the network and urban traffic, and interact with user systems through the network, so that our country The green transportation system in China is becoming more and more perfect, radiating to the whole country, creating a first in China's transportation.

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