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Research Article

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Study on the Advantages and Problems of Urban Intelligent Transportation

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Abstract The construction of intelligent city involves various systems of urban operation and management such as transportation, security, government affairs management, safety emergency response, public services, medical care and education. Among them, intelligent transportation is not only an important part of intelligent city construction, but also an important means to improve the government's ability to effectively govern traffic. Therefore, the study of intelligent transportation has become a hot topic in urban traffic governance and construction in China. In this paper, we study the influence of intelligent transportation on the economic situation of Henan Province by regression analysis, obtain the status of intelligent transportation and provide the improvement measures.

Keywords Intelligent transportation, intelligent city, regression analysis, improvement measures

Introduction

The intelligent transportation system is currently recognized internationally as the fundamental way to effectively solve the problems in the field of transportation [1-6]. It is produced under the background of the full development and progress of modern science and technology. Since the 1980s, developed countries have invested a lot of manpower, material resources and financial resources to conduct extensive research and development in many fields of intelligent transportation systems, and have achieved significant phased results. The research and development of intelligent systems in my country started relatively late, but governments at all levels have a clear understanding of the importance and role of the development of intelligent transportation systems. The modern transportation system, based on network and information technology, accelerates the development of intelligent transportation." Intelligent transportation systems use modern scientific systems to establish a functional connection between road vehicles and drivers. Optimize and adjust the time and space distribution of road traffic flow, make full use of existing resources, and realize the harmony and unity of people, vehicles and roads. While improving transportation efficiency, fully guarantee traffic safety, improve environmental quality and increase energy efficiency.

With the vigorous development of emerging information technology, cities that undertake important goals for the development of modern economy and social life have gradually become a modern, digital, and intelligent complex system. In response to the global informatization development trend and the needs of a new urbanization strategy, China has proposed the construction of a new type of intelligent city. China's economy has gone through a period of rapid growth, and now more attention is paid to the improvement of economic quality. The construction of a new type of intelligent city contains infinite vitality and space for economic and social development, and is an important strategic arrangement for economic and social development [7-11]. The "Thirteenth Five-Year Plan for National Economic and Social Development" points out that it is necessary to deploy information infrastructure and information services for the people. Supported by relevant policies such as pilot demonstrations, comprehensively promote the digital transformation and innovative development of

various fields in my country's economy and society. The construction of a new type of intelligent city is not synonymous with urban informatization and digitization. The use of intelligent technology is only a means to shape and build a city. The construction of a new intelligent city is a system engineering that promotes urban innovation and development with a new generation of technology. It emphasizes the overall planning, deployment and utilization of element resources on the basis of the integration of technology, data and business, and promotes the flexible use of new technologies such as the internet of things and cloud computing.

Literature Review

In the past few years, the topic of urban intelligent transportation has been studied by some authors [12-21]. For example, Alam et al. [22] provided an overview of intelligent transportation systems and their applications. Guerrero-Ibáñez et al. [23] discussed how sensor technology can be integrated with the transportation infrastructure to achieve a sustainable Intelligent Transportation System (ITS) and how safety, traffic control and infotainment applications can benefit from multiple sensors deployed in different elements of an ITS. Sumalee and Ho [2]4 given the benefits of a connected environment and let people understand how the current intelligent transportation system could be adapted to the connected environment. Gaber et al. [25] designed a trust model to compute a trust level for each node and used the Bat Optimization Algorithm (BOA) to select the cluster heads based on three parameters: residual energy, trust value and the number of neighbors. Din et al. [26] presented a novel concept for enhancing the capabilities of ITS via the newly proposed 5G-based SDN architecture for ITS. Ganin et al. [27] conducted a study of network efficiency and resilience in response to random and targeted disruptions of ITS systems in 10 urban areas. Jin et al. [28] systematically reviewed the development of nanogenerators, including piezoelectric nanogenerators and triboelectric nanogenerators, for self-powered technology in land-, water-and air-ITS, such as automobiles, trains, vessels and aircrafts, along with bridges, tunnels, highways and tracks. Qiu et al. [29] proposed a deep learning method based on neighbors for travel time estimation (TTE), divided the entire trajectory into multiple disjoint segments and used the historical trajectory data approximated at the time level. Audu et al. [30] presented an intelligent system designed for transportation analytics on open data such as bus delay data. Cai et al. [31] investigated and framed an intelligent cloud based transportation cluster model for effective and efficient delivery of transportation and management data to the server and client.

Moreover, some authors have studied intelligent city and intelligent transportation together in recent years. For example, Ye [32] discussed the monitoring of the intelligent city’s pipeline network to ensure its healthy development. Li and Cao [33] studied establishment and application of intelligent city building information model based on BP neural network model. Li and Zhou [34] proposed the trafc locality quantization index based on the trafc characteristics of the backbone link to quantitatively analyze the trafc locality characteristics in the backbone link and a key-frame abstraction and retrieval of videos based on deep learning to improve the efficiency and accuracy of video retrieval. Boukerche and Wang [35] built up a clear and thorough review of different machine learning-based models and analyzed the advantages and disadvantages of these models. Saharan et al. [36] presented an extensive literature review and analysis of dynamic pricing techniques used in the literature for ITS. Mollah et al. [37] presented a contemporary survey on the latest advancement in blockchain for IoV and the future opportunities and explore further research directions of IoV as a key enabler of ITS. Sirohi et al. [38] reviewed different types of CNN models used in modern ITS for traffic sign recognition, traffic light detection, vehicle classification and pedestrian detection. Chavha et al. [39] proposed a privacy and security management scheme for ITS depot staff in a metropolitan area. This scheme provides privacy and security management in the transportation industry during the exchange of information regarding vehicle allocation, dispatch, revocation, financial, and maintenance. Guerrero-Ibañez et al. [40] discussed some of the challenges that need to be solved to achieve seamless integration between ITS and deep learning methods. Sodhro et al. [41] proposed 5G-based self-adaptive green algorithm, a novel 5G-driven reliable algorithm and a novel joint energy efficient and reliable framework. Qiao et al. [42] proposed a distributed trustworthy storage architecture with reinforcement learning in ITS, which also promotes edge services. Lv et al. [43] used the deep learning algorithm to solve the safety problems of intelligent transportation system and analyzed the data transmission performance, accuracy prediction performance and path change strategy of the system. Wan et al.

[44] proposed a long video event retrieval algorithm based on superframe segmentation. Kaffash et al. [45] provided a bibliography, a comprehensive review of the application of ITS and a review of most recognized models with Big Data used in the context of ITS.

Although the intelligent transportation and intelligent city have been studied by some authors, the content is single and the method is simple. In this paper, the influence of intelligent transportation on the economic situation of Henan Province is discussed by regression analysis, the status of intelligent transportation is obtained and the improvement measures is provided.

Modelling and Analysis

The innovation of new intelligent transportation construction mode should be carried out centered on urban transportation. It should be integrated with urban construction, urban operation and urban service to better serve urban residents, and finally achieve the goal that intelligent transportation design can be implemented and operated. With the rapid development of transportation in recent years, a new type of intelligent transportation has been established, and the development of transportation will surely bring the economic development of the whole city and even the whole country. This paper will comprehensively reflect the economic development of Henan Province with the gross regional product of Henan Province. This paper studies the influence of five indicators such as highway length (ten thousand kilometers), passenger volume (ten thousand people), civilian automobile ownership (ten thousand people), private automobile ownership (ten thousand people) and newly registered civilian automobile ownership (ten thousand people) on the GDP of Henan Province, and then explores the influence of intelligent transportation on GDP of Henan Province.

Let X_1, X_2, X_3, X_4, X_5 denote highway length (ten thousand kilometers), passenger volume (ten thousand people), civilian automobile ownership (ten thousand people), private automobile ownership (ten thousand people) and newly registered civilian automobile ownership respectively and Y denote GDP of Henan Province.

In Table S1 and Table S2, the correlation coefficient between GDP of Henan Province and civilian automobile ownership is 0.921, correlation is significant. Then, the linear regression model is:

$$Y = 6692.735 + 30.975X_3$$

Table S1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.921[a]	0.848	0.813	3.2582

a. Predictors: civilian automobile ownership

b. Dependent Variable: GDP of Henan Province

Table S2: Coefficients

Model	B	Std. Error	t	Sig.
Constant	6692.735	1094.41	6.115	0.000
Civilian automobile ownership	30.975	1.479	20.945	0.000

In Table S3 and Table S4, the correlation coefficient between GDP of Henan Province and private automobile ownership is 0.936, correlation is significant. Then, the linear regression model is:

$$Y = 8976.368 + 32.618X_3$$

Table S3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.936[a]	0.876	0.825	3.1659

[a]Predictors: private automobile ownership

[b]Dependent Variable: GDP of Henan Province

Table S4: Coefficients

Model	B	Std. Error	t	Sig.
Constant	8976.368	1146.36	7.83	0.000
Private automobile ownership	32.618	1.765	18.484	0.000

In Table S5 and Table S6, the correlation coefficient between GDP of Henan Province and newly registered civilian automobile ownership is 0.962, correlation is significant. Then, the linear regression model is:

$$Y = 5326.336 + 220.614X_3$$

Table S5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.962[a]	0.925	0.913	3.3706

[a]Predictors: newly registered civilian automobile ownership

[b]Dependent Variable: GDP of Henan Province

Table S6: Coefficients

Model	B	Std. Error	t	Sig.
Constant	5326.336	1705.517	3.123	0.007
Newly registered civilian automobile ownership	220.614	14.944	14.762	0.000

Based on above analysis, there is a significant linear relationship between three indicators of civilian car ownership, private car ownership and newly registered civilian car ownership and Henan Province's regional GDP. From this, we can see that a multiple linear regression model can be established between them. This means that the number of civilian cars, the number of private cars and the number of newly registered civilian cars have an important contribution to the GDP of Henan Province. It further reflects that the development of intelligent transportation will also promote the economic development of the entire Henan Province.

In Table S7, the values of P for five indicators are all smaller than 0.05. This means that estimators pass the hypothesis test. Thus, we obtain the model as follows:

$$Y = -744.341 + 214.674X_1 + 0.055X_2 + 2.848X_3 + 24.819X_4 + 9.357X_5$$

Table S7: Coefficients

Model	B	Std. Error	t	Sig.
Constant	-744.341	1258.865	-0.591	0.565
Highway length	214.674	67.187	3.195	0.008
Passenger volume	0.055	0.013	4.195	0.001
Civilian automobile ownership	2.848	15.571	0.183	0.005
Private automobile ownership	24.819	16.103	1.541	0.002
Newly registered civilian automobile ownership	9.357	17.053	0.549	0.006

This paper conducts linear regression and multiple linear regression analysis on the regional GDP and private car ownership in Henan Province from 2000 to 2019, and finds that there is a strong linear correlation between the private car ownership and the regional GDP in Henan Province. After the reform and opening up, especially since the beginning of the 21st century, China has conformed to the development needs of the times, centered on the goal of "improving urban congestion and facilitating people's travel", and clearly proposed "to promote modern information technology and comprehensive transportation management and services based on informationization and intelligence. The policy of "integration" has enabled smart transportation to "emerge" in China. After more than 20 years of development, the construction of intelligent transportation has achieved significant results. It has realized the transformation from scratch, from offline to online, from strong management to strong service, from a single element of transportation to all sectors of society, but it is still in the initial stage.

Advantages of intelligent travel

Under the development of intelligent transportation, it can effectively promote the development of transportation industry, high-end equipment manufacturing industry, information service industry and automobile manufacturing industry, which can well promote the overall development of society and realize the development of all mankind. In smart transportation, important links such as smart road network vehicles, warehousing, environment and management are included. The development of these smart systems will definitely be applied to emerging technologies such as sensing technology, control technology and prediction technology, according to different needs, Can make the smart system more practical. In the development process of these intelligent technologies, not only the transportation infrastructure has been improved, but also the equipment capabilities have been improved to a large extent. The transportation production and service modes have been innovated in an all-round way, and the transportation development mode has also changed. The development of transportation has promoted the rapid development of related industries such as transportation, information service, and automobile manufacturing.

Comprehensive development of intelligent transportation, through intelligent control, can ensure the safe operation of traffic, and through intelligent command, can alleviate traffic congestion, in addition, good transportation can realize the healthy development of energy saving and emission reduction. From the experience of some developed countries, the application of smart transportation has brought great results. Taking the application of the European Vehicle-Road Cooperation System as an example, according to relevant statistics, the accident rate is largely reduced. Although the number of motor vehicles in my country accounts for about 15% of the world's total, traffic accidents account for 25%, occupying the first place in the world's traffic safety accidents. Especially in Beijing, Shanghai and other cities, traffic congestion has become the norm. The development of smart transportation, which can effectively alleviate these problems, has been recognized by more and more people.

Problems and improvements under intelligent travel

The construction of intelligent transportation forms a joint force from top to bottom, which not only requires the overall deployment of the construction direction, but also requires the active implementation of governments at all levels. Cities actively responded to the country’s call for the development of intelligent transportation and invested in the construction of smart cities. However, the current smart transportation construction in Henan Province has only proposed a preliminary construction framework, and the specific implementation process of its construction has not yet been formulated with a perfect top-level design. At the same time, the lack of top-level design has also caused the phenomenon that related parties are independent and cannot share information.

The construction of a intelligent transportation system is the comprehensive application of a new generation of information technology, sensor technology, artificial intelligence and other smart technologies in transportation, service control and vehicle management, so that vehicles, roads, and users are more coordinated and orderly. First of all, key technical issues such as information data security and traffic information platform construction need to be innovated and broken through. On the one hand, traffic data contains some sensitive personal information, and the collection of a large amount of data will cause potential attack risks. At present, the big data security protection capability of Henan Province needs to be strengthened; on the other hand, the data collected by relevant units is large and fragmented, which is not convenient for macroeconomics. The coordination department understands the overall situation of smart transportation, and the transportation platform should improve interconnectivity and compatibility in all aspects. Realize resource integration and data standardization. Second, there is a contradiction between the construction cost of smart transportation and the high technical cost. In 2018, the special fund for informatization construction in Henan Province increased to 80 million yuan, but the construction of ETC lanes alone cost about 35 million yuan, accounting for 43% of the total funds. Therefore, it is necessary to reduce construction costs in the process of promoting smart transportation in order to use the special funds rationally and efficiently.

Conclusions

The aim of this paper is to study the influence of intelligent transportation on the economic situation of Henan Province. The status of intelligent transportation has been obtained by regression analysis and the improvement measures has been provided.

There are many possibilities for intelligent transportation based on big data. Intelligent transportation is the general trend. Based on the data collected in the Statistical Yearbook, we have obtained data on the traffic road mileage, passenger volume, civilian vehicle ownership, private vehicle ownership, and newly registered civilian vehicle ownership in the past 10 years. On the one hand, the transportation department has real-time access to shared car flow, passenger flow information and various road environment information on the road, so as to formulate evacuation and control measures scientifically and rationally, early warning and divert traffic; on the other hand, the real-time data provided by the terminal or data acquisition system can almost grasp the traffic conditions of all major roads, and then formulate their own driving routes scientifically and reasonably.

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