Impact and Application of Block Chain Technology on Urban Traffic Based on Artificial Intelligence

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Abstract. In recent years, with the development of artificial intelligence, blockchain technology has been used in many industries. The development of the financial industry is the fastest and most mature. Now in the transportation field, blockchain technology and big data technology are combined; it can solve some of the pain points in traffic. Blockchain technology is a decentralized technology. Decentralization means that each node in the network is independent of each other and carries out point-to-point information data transmission. In this process, there is no organization or individual pairing and transmission process. Using blockchain technology in traffic scenarios can put information and data on the chain to ensure that information and data will not be tampered with and can be traced back at all times. This article proposes a method to build a big data platform for urban intelligent transportation using blockchain technology. The method takes data as the core, eliminates the centralized computer management of multiple organizations, changes the methods of data collection, data processing and analysis, completes the data storage modules and methods, and realizes the complete platformization of the urban intelligent transportation system. The results show that the urban intelligent transportation big data platform architecture using blockchain technology overcomes the limitations of multiple organizations, discovers urban intelligent transportation data, and further solves the problem of insufficient data in existing network archives.

Keywords: Artificial intelligence · Blockchain technology · Urban transportation · Transportation big data platform

1 Introduction

With the rapid development of modern information and communication technologies, big data, Internet of Things, cloud computing, etc. have been widely used in modern urban rail transit. Among them, blockchain technology provides a basic guarantee for the intelligent and intelligent construction of urban rail transit through data collection, access, processing, analysis, mining and modeling [1]. At present, the intelligent development of urban rail transit involves a wide range of data sources and a huge amount of data, with the characteristics of multi-source, heterogeneous, and self-organizing. With the explosive growth of data volume in the later period, traditional data storage methods, data storage volume, data types and hardware architecture restrict the use of data value, and can no longer meet the needs of urban rail transit for the

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development of intelligence and intelligence [2]. More importantly, traditional data storage uses a centralized architecture. Once the data information center is destroyed, the entire information system will be paralyzed, seriously threatening the operational safety of urban rail transit [3]. Therefore, how to improve data sharing, storage and security has become a hot topic in the development of urban rail transit.

Blockchain is the supporting technology of Bitcoin. It has the characteristics of decentralization, non-tampering, and traceability. It is gradually applicable to the fields of finance, digital copyright, document storage, Internet of Things, and notarization, and has achieved great results. Technology comparable to artificial intelligence, big data, cloud computing, etc. [4]. Artificial intelligence is based on huge data and powerful computing power. The characteristics of blockchain technology are well integrated into artificial intelligence applications to promote the development of artificial intelligence. The blockchain is a distributed storage structure, all nodes of the blockchain are the same, there is no central manager, all users can upload the data information of the next node through the protocol process [5]. The biggest feature of blockchain is decentralization and uniform openness. Once the link is successful, the data is difficult to modulate, and the data of all nodes are consistent, which has a wide range of application prospects in the field of intelligent transportation [6].

Although there are a large number of people trying to reduce the traffic load, the situation will continue to deteriorate [7]. Now, thanks to the technology of the fourth industrial revolution, experts are optimistic that cities can eventually eliminate the traffic load [8]. According to a report from the World Economic Forum, there are two technologies that make the transformation of urban transportation possible: driverless cars and Bitcoin's blockchain technology. According to Thomas Birr and Carsten Stöcker, in order to realize this dream, blockchain technology is decisive: Travel expenses will be automatically withdrawn from passengers' digital blockchain wallets or loaded into their credit cards, and payments will immediately flow to the car [9]. Passes, ID cards and P2P transactions will make it easier and safer to share vehicles and infrastructure, such as charging stations, toll stations, and parking lots. Each user's identity, age proof, insurance and payment will be blocked ability to identify, while protecting the security of passenger names, travel information and payment mechanisms. Smart contracts that control such transactions are based on standard shopping malls. Tax records and visual reports can ensure accuracy no matter where the trip takes place sex [10].

2 Method

2.1 Data Statistical Algorithm

Statistical algorithms are used to obtain the main components of the signal matrix Y. In short, it is the process of decomposition and sampling:

The first is to decompose the covariance matrix, that is, the decomposition formula (1):

$$E(yy^H|G) = \rho GE\left(xx^H\right)G^H + E\left(nn^H\right) \tag{1}$$

The above formula can be decomposed into:

$$E(yy^H|G) = \rho UD^2U^H + I_M = [U_s \quad U_N]\begin{bmatrix} \rho D_S^2 + I_L & 0 \\ 0 & I_{M-L} \end{bmatrix}\begin{bmatrix} U_S^H \\ U_N^H \end{bmatrix} \tag{2}$$

When T is large, $\sum \approx E(yy^H|G)$ decomposes $\sum$, then:

$$\sum = [\hat{U}_S \quad \hat{U}_N]\begin{bmatrix} \hat{D}_S & 0 \\ 0 & \hat{D}_N \end{bmatrix}\begin{bmatrix} \hat{U}_S^H \\ \hat{U}_N^H \end{bmatrix} \tag{3}$$

In the base station antenna, $V^H X$ is unknown and the object to be estimated. From the derivation process of Eqs. (2) and (3), the PCA analysis method shows that:

$$V^H X = 1/2\left(\sqrt{\hat{D}_S - I_L}\right)^{-1} \hat{U}_S^H Y \tag{4}$$

2.2 Multi-type Blockchain Collaborative Management

Urban traffic problems involve many aspects, and the channels to obtain traffic information involve all levels. However, all types of traffic information from collection to analysis, from release to update, the entire process is controlled by the transportation functional department, and the public and other government functional departments are rarely involved. Adopting a completely open information management model so that the public can be used as a node link information platform to read or publish traffic information at will. This approach is not desirable. Because only adopting completely open information management based on the public chain model will bring about two fatal problems. First, it is difficult to ensure that the traffic information uploaded by the public is true and accurate. The inability to tamper with the data of the blockchain technology determines that once the node is successfully linked, the published information is difficult to modify. Second, even if the information released is true and accurate, the complete transparency of the data may bring about a series of unpredictable traffic operation problems. To effectively use the co-financing traffic information provided by the public, we must not only delegate power to the public, allow them to participate in traffic management, improve management flexibility, but also strictly control the information released by the public to avoid unpredictability. Therefore, we adopt a multi-type blockchain collaborative traffic information management model to delegate power to the public while taking into account the reasonable management and control of information. The information management mode based on the private chain is adopted for the transportation functional departments, that is, the block chain is established in the functional departments with high trust, and the reading authority has a certain degree of restriction on the public.

2.3 Promote the Implementation of Blockchain Technology

The application mode of blockchain technology has three types: public chain, private chain and client chain. Blockchain technology has 7 types of open agreement, anonymity, trustlessness, immutability, decentralization, traceability and programmability. Although the development of international blockchain technology has undergone an obvious acceleration process, there is no substantial transportation application in the blockchain technology industry. The state should actively promote in-depth research on the level of blockchain technology and provide good research on the application of blockchain technology for urban transportation. Research and investigation will be conducted through a variety of methods. Blockchain technology needs a reliable network to drive. It needs a reliable identity, reliable ledger, reliable calculation and reliable storage technology to realize the application of blockchain technology in urban transportation. Therefore, urban transportation rights can be quickly and safely circulated and used on the blockchain, and quickly confirm its value in urban transportation. Through the application of blockchain technology, it not only promotes the safety of urban traffic, but also improves the mobility of urban traffic and improves the quality of urban traffic.

3 Experiment

3.1 Subject

In recent years, the urban economy of City A has developed rapidly, urban expansion, population surge, and motor vehicle ownership continue to rise, but traffic management problems such as traffic congestion, lagging public transportation facilities, insufficient parking space supply, and frequent traffic violations are also increasing. In order to study the impact and role of blockchain technology in urban transportation in the context of artificial intelligence, this article takes the actual urban traffic situation of City A as the research object, and analyzes the current status of traffic in City A and the experience with the support of blockchain technology. Compare the status quo of urban traffic after reform to understand the impact of blockchain technology on city A's urban traffic.

3.2 Experimental Method

The main research methods used in this experiment are as follows:

The first is comparative analysis. On the one hand, through horizontal comparison, that is, compared with the level of developed countries, we can clarify the gaps and shortcomings between the current urban traffic development of my country and City A and the international level. On the other hand, through longitudinal comparison, that is, time series comparison, we can clarify the development process and current situation of urban transportation.

The second is the case analysis method. When studying the development mode of urban transportation under the support of blockchain technology in foreign countries, case studies were carried out with typical developed countries such as Europe, the United States, and Japan, and provided valuable experience and useful enlightenment for the development of urban transportation in Province A.

The third is model analysis. Starting from the analysis of the consumption and urban traffic characteristics of City A, the relationship between the annual consumption, residents' transportation mode and GDP data of City A is decoupled and analyzed, and the current status of urban traffic and the passing blocks of City A are obtained. The current status and impact of city A's urban traffic after the support of chain technology.

The fourth is the questionnaire survey analysis method. By issuing a questionnaire to some residents of City A, the degree of satisfaction of the residents of City A with the urban traffic of City A was investigated, and thus the impact of City A on the urban traffic of City A after experiencing the blockchain technology on the urban transportation reform was analyzed.

4 Results

According to statistics from the Planning Bureau of City A, the city's land area is about 12,065 km^2, and the sea area is about 11,000 km^2. Beginning in 2017, the built-up area of the urban area has reached 255 km^2 (ranked 40th in the country and 3rd in the province), an increase of 6.0 km^2 compared to 2016. The city's total highway mileage is 14,700 km (5 national roads, 445 km, provincial roads 6, 322 km), and rural roads account for 68.7%. The total length of urban roads in the urban area is 1165.5 km, and the total area is 35.07 km^2. The length of the newly built road is 36.66 km and the total area is 1.21 km^2; the length of the renovated and modified road is 11.24 km, and the road area is 0.44 km^2.

According to the calculation of the urban permanent population of 3,003,500 in 2017, the per capita road area in the urban area was 12.21 m^2, an increase of 0.58 m^2 compared with 2016; the average road area of vehicles was 51.5 m^2, a decrease of 1.9 m^2 from the previous year. The indicators are shown in Table 1. Judging from the road conditions of City A, it is still in an orderly development, but the development trend is slowing down, and the density of the expressway network is far below the standard requirements.

Table 1. Urban road indicators of city a in 2017

Urban road	Length (km)	Area (km^2)	Average width (m)
Over 12 m	1153.0	34.95	30.3
Ancient city 7–12 m	12.5	0.12	9.6
Total	1165.5	35.07	30.1
Dongtou	121.73	1.60	
Total	1287.23	36.66	
Road area per capita		12.21	

According to statistics, in 2017, the average traffic congestion index (traffic index ranges from 0 to 10 during the working day of the congestion in urban area A, the higher the value, the more serious the traffic congestion) value is 5.91, which is an increase from 5.71 in 2016 0.20. In 2017, the urban congestion lasted about two hours

during the working day, compared with an increase of 32 min in 2016, the degree of urban traffic congestion increased significantly.

According to the questionnaires issued and collected, regarding travel time, the urban area of City A is not large, but 19.03% of citizens still need to spend 30–45 min to travel, and even 12.01% of citizens need to spend more time. Regarding the degree of satisfaction with traffic conditions, 34.88% of people think that the traffic conditions are not very good and even 16.78% think it is very bad.

In the end, we have conducted a survey on the current status of urban traffic in City A after the blockchain technology reform, and the results are completely different from those before the reform. Most people are satisfied with the reformed urban traffic and only occupy one (Figs. 1 and 2).

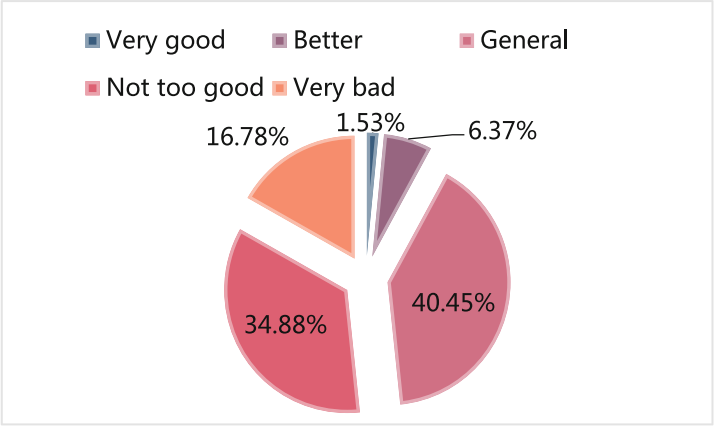

Fig. 1. Questionnaire survey on traffic satisfaction in City A

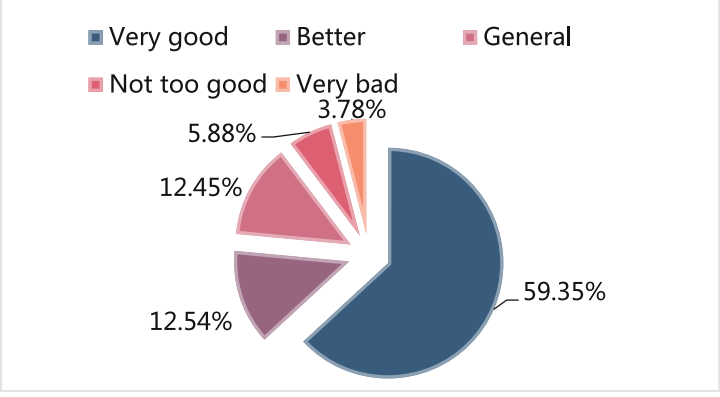

Fig. 2. Questionnaire survey on traffic satisfaction in City A

According to our Wenjuan investigation and analysis, it can be known that the urban transportation network of City A is relatively developed. Before the introduction of blockchain technology to reform the urban transportation of City A, the urban traffic of City A was crowded, and many residents were the city's traffic is dissatisfied, which affects their commuting and other life travel. However, after experiencing the reform of the blockchain technology on the urban traffic in City A, the urban traffic in City A has been greatly improved. It has basically been recognized by the residents. Most residents are satisfied with the urban traffic in City A. It can be concluded that the influence of blockchain technology in urban traffic is still great.

5 Conclusion

At present, the research of blockchain technology at home and abroad mainly focuses on the application of theoretical concepts and macrostructures, but the research on specific technologies and methods is not in-depth. With the active development of big data mining technology, artificial intelligence, intelligent identification technology, and network communication technology, integrated urban traffic management not only inherits traditional and standardized processes, but also changes creativity, innovation and development, intelligence, humanization, and flexibility and effectiveness. With the diversification of management modules, today with the rapid development of transportation informatization, blockchain technology clearly has the characteristics of decentralization, prevention of data modulation, data transparency and transparency, and will be integrated in all aspects of urban transportation And acceptance. Blockchain technology plays an important role in developing innovative solutions for developers and entrepreneurs to reduce the burden of traffic. The combination of blockchain technology, drive and driverless vehicles will significantly change the traffic situation. Our goal is to develop a series of previously incredible solutions and eliminate all traffic loads. On this basis, future research will focus more on specific technologies and methods. To promote the application of blockchain technology in big data, more blockchain technology and application cases will be proposed.

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