A Systematic Literature Review of Researches on Urban Traffic Strategy Development

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***Abstract*—With the advancement of computer science and the development of urban economy, the interest of human research on urban traffic strategy has been promoted. Number of vehicles in urban traffic network in a sharp increase, in order to solve the current status of China's traffic congestion, we hope to reduce urban vehicles greenhouse gas emissions and to reduce waiting time is a serious problem currently facing the city traffic. In order to solve this problem, it can be from two aspects. On the one hand, traffic signal control of traffic network, the other is to optimize the route of the vehicle. This paper respectively from tells the development of the traffic signal control strategy and vehicle routing process, and compares their advantages and disadvantages. The paper summarizes the urban traffic strategy and traffic optimization strategy in recent years, and systematically summarizes the present situation and existing problems of urban traffic optimization strategies at home and abroad, summarizes the development prospects of urban traffic optimization strategies, and provides the strategies for traffic optimization. In order to provide the strategy of scholars engaged in the transportation of new research perspectives and research data.**

***Key words*: Economic Development, Traffic Congestion, Urban Traffic Optimization Strategy.**

I. INTRODUCTION

City traffic conditions can reflect the civilization of human being, and urban residents living conditions are closely related. With the rapid development of social economy, urban-rural integration process to speed up the living standards of residents, urban transport demand is growing, traffic problems are increasingly significant, such as the road more and more wide, traffic conditions are increasingly crowded. This has become a city evolution and progress of a major problem. Traffic congestion not only wastes a lot of time for residents, disrupts residents' normal work and life, but also puts pressure on society, forcing more people to manage traffic, increase traffic management cost and destroy ecological environment [1].

Advances in computer science and technology have led to the use of urban transport strategies to optimize the increasingly crowded urban traffic. From the previous analysis of urban traffic optimization strategies, it can be seen that urban transport is currently facing many challenges [2]. First of all, with the improvement of people's living standards, urban traffic has become increasingly crowded state. Secondly, the urban traffic situation is becoming increasingly complex, not only in the transport network, including ordinary motor vehicles, non-motor vehicles and pedestrians, especially in the development trend of science and technology, unmanned vehicles and the invention of the robot is likely to join the future to urban transport. In addition, the inherent mode of traffic is not changed at traffic crossroads signal control, and traffic signal change is very important, unreasonable traffic signal time distribution caused by urban traffic congestion.

How to avoid and reduce the impact of traffic congestion, to maintain high-speed road traffic, safety and comfort characteristics, has become an urgent need to solve the problem of the transport sector. This paper first summarizes the current research methods of traffic congestion from both domestic and foreign aspects, summarizes the research field and puts forward the prospect of further research.

II. FOREIGN RESEARCH STRATEGY

For the study of traffic congestion, many foreign experts and scholars mainly from the cause of traffic congestion problems and countermeasures carried out in-depth study. At present, the urban traffic optimization mainly includes two aspects [3], one are traffic signal optimization, and the other one are the vehicle routing optimization.

A. Urban Transport Strategy

Urban traffic optimization strategy is to try to optimize the traffic lights. Although there are many urban traffic optimization strategies, did not completely solve the problem of traffic congestion. Urban traffic optimization strategies can be divided into three categories [4]: isolation strategy, timing control strategy and apply to approximate or exceed the state of saturation traffic strategy. Isolation strategy refers to the lane division for each traffic road, but in the case of the increase of vehicles, this approach has not fundamentally solve the problem of congestion. Timing control strategy is mainly based on historical data to control traffic conditions, but the traffic demand every day and every time there will be changes, so the timing control can not control the traffic situation in real time, it does not solve the problem of traffic congestion. Therefore,

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the proposed traffic response strategy inevitable. However, this will require installation, operation, and hardware requirements.

The previously proposed traffic response strategy was introduced in the 1880s. SCOOT [5] and SCATS [6], although SCOOT can control the entire network, its independence of each function module is too strong for traffic control is not perfect. SCATS strategy for each lane to install sensors, sensors information can collect the vehicle information, through the vehicle information to control the traffic situation. After a series of real-time traffic strategies, OPAC [7], RHODES [8], PRODYN [9], CRONOS [10] proposed by French scholars, and UTOPIA [11] proposed by Italian scholars, these traffic response optimization Strategy can only be suitable for specific occasions, can not be widely used in transportation networks. What is positive is that these strategies are proposed using the method of forecasting vehicles to estimate the number of the next stage. Which laid the foundation for the following optimization strategy.

TUC can respond to large-scale network in real time, especially in the trunk road. And it can effectively solve the problem of traffic congestion. In order to further improve the TUC strategy, adding VMSs and ramp control to form IN-TUC (Integrated-Traffic-responsive Urban Control). TUC conducted experiments on five main urban traffic arteries in four different countries [12]. TUC and IN-TUC use the forecast method (Regression Model or Neueal Network) [13] to estimate the number of vehicles, but there is a certain error in the prediction method of the number of vehicles in each road based on vehicle number prediction model of the previous stage. Therefore, the application of Gray model [14] and Markov model [14] improves the accuracy of prediction, which makes the progress of solving the traffic jam problem a big step forward.

B. Traffic Route Guidance

Urban traffic optimization strategy is to try to optimize the road vehicle routing. After optimization of the traffic lights at the intersection, the second is the choice of vehicle routing control in the road. Traditional route navigation is a static route selection, and is based on the shortest path algorithm of the GPS model, but the GPS model does not take into account the same source and the same destination number of vehicles, homologous to the purpose of the vehicle in the shortest path will cause congestion. In order to solve this problem, a dynamic routing algorithm is introduced. MCMF-R [15] can adjust to the whole network in a short time when there are a lot of vehicles. For the whole network, the partial adjustment algorithm of Traffic Splitting (TS) [15], TS algorithm can be adjusted according to the situation of other intersections, which is more suitable for vehicle adjustment in the case of fewer vehicles. In order to avoid the problem of congested vehicle routing under supersaturation condition, a method of grading vehicle is proposed, which can effectively avoid conflict between vehicles in route selection.

C. The Current Problems

Optimization of traffic is often based on historical measurement data to determine the optimization strategy, which lacks the real-time traffic considerations, which requires a real-time communication system to control, but the communication system is very complex, and an erroneous judgment will have a huge impact on traffic. There are some strategies to consider the real-time traffic conditions, but can not meet the needs of different users and vehicles.

Simulation of Urban Traffic Mobility (SUMO), Approximately Orchestrated Routing and Transportation Analyzer (AORTA), METACOR and so on. These simulation tools can be introduced from the OpenStreetMap(OSM) road information, in order to achieve the true simulation analysis of urban traffic road. In many cases, however, the true environment is extremely complex and it becomes impractical to provide an adequate simulation. AORTA and SUMO can make wise choices for individual vehicle and crossroads. These behaviors and strategies interact to control the crossroads and control the route to the destination. However, the current simulation tools have some errors in the estimation of the vehicle in the network, and need to be improved here. Moreover, SUMO is open source software, which provides researchers with a convenient use of the environment.

III. DOMESTIC RESEARCH TRENDS

The research of solving traffic congestion problem involves many fields. Domestic experts and scholars mainly study the problem of traffic congestion from two perspectives of economics and management.

A. Economics Aspects

According to the journal, "Central Canton Financial Review" reported the high German map released the "2015 annual report of major cities in China traffic analysis" shows that China ranked in the city, Beijing tops the list. Data show that the Beijing peak congestion delay index of 2.06, the average speed of 22.61 km / hour, which means that Beijing commuters traveling by car to travel to spend 2 times the time to reach the destination, the highest time cost of congestion.

Renmin University of China National Development and Strategic Research Institute, Public Governance and Harmonious Urban Research Center, Professor Yang Hongshan, deputy director of the city that: congestion is a global problem. Our country has a large population, so the congestion in our big cities is a difficult problem facing the city managers and policy makers. City development strategies should be adjusted now.

Countries present the concept of urban and rural integration, which requires not only to stay in the city, but also the development of cities around the village, the focus shifted to the city periphery. The current pressure within the larger cities, to appropriate decentralized layout, reduces the downtown congestion.

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B. Management Aspects

In the case of serious traffic congestion in urban areas [16], we can strengthen command and control. In the event of traffic accidents, vehicles broke down, etc., to speed up the failure to deal with and thus eliminate the resulting traffic jams. If the elevated road is crowded,we can control the cars up and down flexibly on the ramp. And the ground road traffic is still margin, the timely closure of the ramp to adjust the traffic flow.

The management of the tidal lane according to traffic control, due to traffic "tidal phenomenon" that every morning into the city the direction of traffic flow, reverse flow is small. And out of the city at night is the direction of traffic, but also increase the congestion. In view of this situation, traffic diversion in the transformation of the way to take a variable lane traffic organization, namely: early peak into the city vehicles for a long time, increasing the number of lanes into the city direction, reducing the number of lanes out of the city, the evening peak out of town vehicles for a long time, the number of lanes in the direction of the city to reduce the number of lanes into the city. By optimizing the traffic police service layout, and enhance traffic command efficiency, cure of "stubborn disease" governance measures to strengthen road traffic site management, fine management.

IV. SUMMARY AND PROSPECT

In summary, the development of computer technology promotes people's urban traffic optimization strategy research. How to use computer technology to control the urban traffic strategy is the problem that needs to be solved at present.

- In the urban traffic optimization strategy, the method of estimating the number of vehicles in the urban network can be improved to improve the authenticity of the simulation.
- With the increasingly complex traffic environment and advanced technology, there may be driverless vehicle on the road and in the future that will put forward a more severe road test.
- Choosing the appropriate urban traffic optimization strategy is the inevitable choice to solve the traffic problem under the condition of great change of traffic flow.
- Reasonable management policy is to solve the problem of traffic congestion, is the application of urban transport optimization strategy premise.

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