

The Relationship Between on-Street Parking Resource Utilization and Dynamic Transportation

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Abstract

The rapid development of urban motor vehicles has caused a surge in traffic volume in China, and urban land is limited to meet the static traffic demand. To alleviate the difficulty of parking and deal with the relationship between dynamic traffic and static traffic, this needs to be done without affecting dynamic traffic. To set up on-street parking to meet the parking demand, this paper studies the impact of on-street parking on dynamic traffic. The game idea of on-street parking problem, combined with the actual on-street parking in China's big cities, puts forward specific suggestions for on-street parking planning.

Keywords

On-street parking, Dynamic traffic, Parking planning advice.

1. Introduction

Through the analysis of urban parking problems, the main problems of on-street parking in large cities in China are summarized: the parking on the road is crowded, the parking resources are over-utilized, the parking management in the road is chaotic, and illegal parking is abundant. One of the important reasons for these problems is that the on-street parking policy is unreasonable and needs to be improved, and the ideal effect has not been achieved. The parking policy was formulated by the government to manage the parking system, control and adjust the parking demand, and optimize the overall social benefits. However, in the real society, there is often a conflict between the parking operators who pursue individual benefits and the governments that pursue the overall benefits of society. There will also be conflicts among the individual parking operators. When the conflict cannot be well coordinated, that is, the on-street parking strategy formulated at this stage is not enough to adjust the contradictions, the parking problem cannot be solved very well. In order to solve this problem specifically, we must first understand the game idea between parking, and proceed from the demand to achieve the consistency of the interests of the two.

2. The Game Idea of on-street Parking

2.1. Overall Game

For the government departments, the main consideration is to improve the parking market order, ensure the orderly development of the parking system, coordinate parking resources, and give full play to the social benefits of parking resources, while less consideration is given to the benefits of the parking lot itself and the individual parkers. For individual parkers, their emphasis is on parking convenience, availability, parking fees and walking distance after parking. In the choice of parking, it is easy for parkers to choose the parking lot nearest to their destination, but they are not concerned about the impact of parking on other vehicles, non-motorized vehicles and pedestrians, thus damaging the overall social benefits. In addition, there will be conflicts of interest among individual parkers. Because parkers prefer in-road parking,

when everyone chooses in-road parking, in-road parking resources are overutilized. When parking spaces are full, later parkers can only find parking spaces again, resulting in increased travel costs. Parkers choose to play the game of in-road parking and out-of-road parking as two forms of urban parking system, each of which has its own functions and functions. For users, the advantages of in-road parking are convenient parking and short driving ineffective distance. Compared with out-of-road parking, the obvious disadvantages are the impact on dynamic traffic, the reduction of road capacity and safety problems. For each parking lot user, the goal is to maximize their own utility. Utilities include relatively inexpensive parking fees, saved parking distance, walking distance, and better service. The basic assumption is that the increase of in-road parking will affect the dynamic traffic of the road, and for all parkers, the parking time will increase, the parking cost will increase, and the revenue will also decrease. The Parker is a representative economic person, and the state variable is to choose the ratio of in-road to out-of-road. No matter which type of parking lot a Parker chooses, the higher the proportion of parking in the road, the greater the impact on the road traffic.

2.2. Price Game

Then the price game of in-road parking is briefly analyzed. For parking lot users, the sum of parking fees and increased travel costs should be considered. Using Hotelling price competition model, we can see that the higher the increase of travel cost, the greater the difference between in-road parking lot and out-of-road parking lot, the higher the equilibrium profit of the two parking lots, the stronger the monopoly power of each parking lot on parkers nearby, and the optimal pricing of parking lot can approach monopoly price. It can be seen from this that when planning to set up off-road parking lots, government departments should pay attention not to set up in-road parking lots near them in order to enhance their competitiveness.

2.3. Game of Illegal Parking

For illegal parking, the game theory of "tragedy of commons" can be used to explain. The research shows that illegal parking occupies the road area. Taking the road with a width of 11-18 m as an example, illegal parking reduces the capacity of the road by 26%-34%, and the smaller the width of the road, the larger the reduction[1]. Due to the lack of strict and effective management measures for illegal parking, the risk of illegal parking is very small. These illegal and free parking lots have the characteristics of public goods and can achieve maximum benefits for parkers. More and more rational parkers choose illegal parking to gain private benefits. According to a survey, the proportion of illegal parking in peak hours in Beijing is about 35%, and that in Guangzhou is 48.24%. The result of parking illegally occupying a large amount of road space is that the road is more crowded, the traffic capacity is reduced, the travel cost is increased, the probability of traffic accidents is increased, and the overuse of resources causes the overall benefit to be reduced. So facing these problems is a difficult problem that we need to solve fundamentally.

3. Suggestions on in-road Parking Planning

Based on the game analysis of in-road parking, this paper puts forward the following suggestions from the nature of the problem to solve the difficult problems, combined with the current situation:

3.1. Determine the Strict Parking Area in the Road

The determination of the strict parking area in the road needs to take into account many factors, such as urban spatial layout, road traffic, economic development and ecological environment. Considering the actual situation of various places, and in line with the concept of "priority first, general, control and dredging combined", the road which has a greater impact on the operation of the road network or has a higher sensitivity should be chosen. For example, the contradiction

between supply and demand of parking is more prominent in the central city, comprehensive transportation hub, main business district and other areas. Once congestion occurs, it will affect the normal operation of the surrounding road network. At the same time, the implementation of strict management in these areas can make the public clearly feel the effect of parking management measures before and after implementation, and improve public opinion support.

3.2. Reasonable Setting of Parking Space in Road

The General Requirements, Setting Rate, Road Width, Road Flow Ratio, Road Safety Visual Distance and Shouldn't Set Conditions of Parking Space in Urban Road (GA/T 850-2009) are clearly stipulated[2]. In addition, in line with the principle of minimizing the impact of in-road parking on road traffic, we should analyze the characteristics of time and space distribution of road traffic, combine congestion relief, and gradually guide the healthy development of urban parking. For example, in areas with large traffic volume, such as the Central Business District, the number of parking spaces in the road is reduced step by step to promote the construction of off-road parking facilities; according to the characteristics of low night road traffic, temporary parking at night is allowed on the roads around old residential areas without affecting road traffic operation; temporary parking at night is allowed for temporary and short-term. Temporary parking demand, such as loading and unloading parking of urban logistics distribution vehicles, parking of tourists on and off scenic spots, should be reasonably set up in accordance with the actual situation.

3.3. Improve Parking Safety Management Facilities

Road traffic signs and markings are used to inform users of road traffic rights, to indicate that road traffic is prohibited and restricted. They are the infrastructure for maintaining traffic order, preventing and reducing traffic accidents and ensuring the efficiency of urban road transport[3]. Road parking signs should be clear about "whether parking is allowed, parking fee standards, parking time allowed" and other information, so as to reduce the phenomenon of excessive parking time in the road. For example, temporary parking space signs around restaurants and shopping places should be clearly allowed to parking time and penalties, so as to enhance the public's response to them. The identification degree of road parking regulations should also provide evidence for illegal parking law enforcement; the density of prohibited parking signs should be increased appropriately for the whole section of prohibited parking roads; physical isolation facilities can be set up (for example, the addition of isolation barriers in non-motorized lanes, the addition of isolation piles at the edge of crosswalks, etc.). Spatial restrictions on illegal parking on the road.

3.4. Strengthen the Punishment of Illegal Parking in the Road

Compared with other countries, China's penalties for illegal parking on roads are relatively low, and some provinces and municipalities implement them according to the lower limit of the penalty standard of the Road Traffic Safety Law of the People's Republic of China, which leads to the public's anti-parking psychology, which considers that the cost of illegal parking is low, and this psychology has a greater negative impact on the maintenance of traffic order. Influence. In contrast, in some developed countries and regions, the penalty for illegal parking is greater, and illegal parking in individual countries and regions may even affect personal credit. Therefore, in order to strengthen the deterrent power of parking law enforcement, it is suggested that the penalty for parking violations should be scored. In view of illegal parking in key sections, drivers should be warned to leave the scene according to the penalties and scoring for violation of prohibited signs, prohibited markings, and if they do not leave the scene, they should be punished by trailers; for illegal parking of unlicensed vehicles, they should be punished by violation of prohibited signs, prohibited markings and driving vehicles on the road without hanging. Two kinds of violations of license plate are punished together [4]. For the

absence of the driver, it is suggested that the trailer should be punished, and the penalty should be scored according to the violation of prohibited signs, prohibited marking.

4. Summary

The problem of in-road parking is an important link in the healthy development of urban public parking system. It is necessary to formulate reasonable in-road parking planning proposals. From the perspective of game theory, this paper demonstrates and analyses the causes of in-road parking problems, the competition between in-road parking and out-of-road parking, and the harm of illegal parking. It also clarifies the status and role of in-road parking, and puts forward corresponding urban in-road parking policies and measures.

References

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