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Research on Traffic Microcirculation System of Multi-storey Parking Garage in Commercial Complex

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Abstract

Through the elaboration of the concept of the microcirculation system, it is analyzed that it is highly similar to the circulatory system and the transportation system. Firstly, the parking space structure of the traffic space structure of the microcirculation system, the traffic microcirculation road network composition of the commercial complex parking garage, and the traffic microcirculation system of the commercial complex multi-storey parking garage are described. Organizational characteristics Analysis of traffic problems and microcirculation system characteristics of multi-storey parking garages in commercial complexes.

Keywords

Traffic Congestion; Parking Garage; Microcirculation System.

1. Introduction

With the uneven distribution of traffic in the road network and the increasingly serious problems of traffic congestion, the microcirculation system has gradually emerged as a new concept of traffic organization. After a series of researches and improvements, its status in the process of traffic organization optimization has gradually risen. However, due to the influence of the old concept of transportation construction and the lack of strong planning and guidance, the development of the microcirculation system theory is relatively lagging behind, and there are also some obstacles in practical application, so the research on the transportation microcirculation system has certain significance.

2. Definition of Urban Traffic Microcirculation

For the concept of microcirculation, it first appeared in medicine to describe the circulatory system of blood in the human body between arteriole capillaries and venule capillaries. It is the basic part of human blood circulation. In the complete circulation of the human body, blood flows layer by layer in the large arteries, middle arteries, and small arteries, and finally flows into the smallest capillaries, and in this process completes the material exchange activities with various cells, which is the most important in the human body. basic physiological activities. If the end capillary microcirculation system is abnormal during this process, the material exchange process between blood and cells will be blocked, which will further lead to abnormalities in the body. In severe cases, it will directly lead to the occurrence of various diseases. Although "minor", it is actually the most important part [1]. The system has a high similarity with the traffic road system in the city. Comparing the whole city to the human body, the roads at all levels in the corresponding city can be matched with the blood vessels at all levels in the human body to form a complete traffic-like microcirculation system. In a deeper comparison, the exchange of substances between blood and external cells is similar to that of a vehicle entering a parking lot and choosing to park [2].

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Up to now, the theoretical research of microcirculation system is still in a relatively lacking stage in China, and many summary results come from actual engineering construction. In terms of related theoretical research, this term is still a relatively unfamiliar term to the public. Not only that, but the definition of urban transportation microcirculation system is still in the stage of disputes in the academic circle, and the different terms cannot be unified. In recent years, many first-tier cities have carried out certain practices on the optimization of traffic microcirculation systems, but still mainly adopt the methods of connecting dead roads, adjusting entrances and exits, improving old roads, improving the use of signs and markings, and clearing occupied parking spaces [3]. This method is easier to deepen people's misunderstanding of the microcirculatory system.

3. Traffic Space Structure of Microcirculation System

3.1 Development of Parking Space

Usually the composition of the parking space has a certain independence, and its function should be mainly parking. Therefore, the traffic design traffic capacity around and inside the parking lot is limited, and it cannot meet the road traffic demand due to the increase in the number of private vehicles. The use of land resources around the building complex is insufficient, and there is often a phenomenon that some of the parking lots prepared by the building complex are constantly flowing, while the other part is crowded, which eventually causes the traffic pressure on the surrounding road network to increase and the traffic burden is unbalanced.

The microcirculation theory is applied between the parking garages, breaking the relative independence between the parking garages, opening the parking lot roads in each block, and forming a network structure with the surrounding roads. With the help of internal roads, the traffic pressure on the surrounding roads is relieved. Improve the efficiency of vehicle access, and improve the utilization rate of roads and parking resources to a certain extent, so that the parking garage and external roads form an overall road network structure.

3.2 Composition of Traffic Microcirculation Road Network of Commercial Complex Parking Garage

The traffic microcirculation system is the end system of the urban road network system. It not only needs to meet the saturated and overflowed traffic volume of the main road, but also ensure the convenience and comfort of urban residents. Therefore, the level of roads in the city should be clarified, and the method of distinguishing primary and secondary arterial roads and branch roads should be determined, so that the road network can be optimized systematically in a more targeted manner [4].

Compared with the urban road network structure described above, the road network space of commercial complex parking garages is generally formed depending on the development of its buildings. The research concluded that compared with the single independent parking space of ordinary parking garages, the main traffic roads of this kind of large garages that can be established with a microcirculation system are wider and faster, and are usually designed with two-lane lanes as the standard. .After connecting all parking spaces to form a micro-circulation road network structure, the advantages of large multi-storey parking garages can be more prominent. In order to ensure the connectivity between the spaces, it is recommended to keep the two-way passage as much as possible, and the internal roads are mainly two-way traffic.

The underground first floor of the multi-storey parking garage is open to traffic, connected to the road network structure, and then the internal traffic of the parking building is organized and optimized through relevant theories, so that the large parking space can strengthen the connection with the external traffic section. At the same time, the vehicles in the inner multi-storey space travel more smoothly, which not only ensures the advantages of the road network structure, but also gives full play to the parking function characteristics of large parking garages, and more completely solves the traffic congestion attracted or occurred due to commercial complexes. And other issues.

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3.3 Traffic Microcirculation System of Multi-storey Parking Garage in Commercial Complex

Through the definition of human blood microcirculation, it can be seen that the blood in the human body ensures the normal circulation of the body through the relationship of circulation at all levels. Comparing the human microcirculation with the traffic microcirculation, it can be found that the flow characteristics of the traffic flow are similar to those of the blood. Therefore, in order to achieve a blood-like circulatory system, it is necessary to enrich the "capillaries" in the traffic [5].

The integration of internal and external traffic in the commercial complex parking garage can make all or part of the parking space in the commercial urban complex act as a "capillary", thus forming an overall road network with the surrounding roads and becoming a transition space for the surrounding traffic flow. When the traffic volume around the road network is too large, you can choose to open part of the parking space, so that the surrounding traffic flow can selectively flow into the system, enter and exit from the entrance and exit of the parking space, cross the congested road section, and directly reach other smooth driving sections, so as to alleviate the problem. The effect of the traffic pressure on the surrounding road sections is a reasonable diversion for the urban road network system, so that the vehicles can travel smoothly and orderly.

4. Traffic Problems and Microcirculation System Characteristics Analysis of Multi-storey Parking Garages in Commercial Complexes

4.1 Traffic Problems of Commercial Complexes

The purpose of establishing the traffic microcirculation system of the multi-storey parking garage in the commercial complex is to solve the traffic problems in the commercial complex area. Therefore, it is necessary to analyze and summarize the causes of such traffic problems, so as to establish a more perfect traffic microcirculation system. In addition, the road network structure, traffic demand, traffic operation demand and traffic management are different from the general traffic system. The following will introduce the characteristics of this kind of traffic microcirculation system for these four aspects, which will be used for the construction of the model in the following paragraphs. And the optimization of streamlines provides a theoretical basis.

(1) Analysis of traffic flow generated by commercial complexes

Commercial complexes, as the name suggests, are buildings with commerce as the main function, so most traffic is generated for the purpose of commercial consumption. There are certain differences in the level of economic consumption in different areas of the city, which causes the amount of traffic to be attracted and generated in the affected area of the complex to be different in different directions, which makes the traffic pressure of each road section in the road network structure uneven, and there are Due to the difference in balance, it is easy to cause smooth driving in one area, while traffic congestion in another road network area.

(2) Analysis of road network structure of commercial complexes

Through the analysis of the geographical characteristics of commercial complexes, it can be seen that they are usually located in the center or sub-center area of a city, so the surrounding road sections are complex, ranging from main roads to branch roads, and the main roads need to carry commercial complexes. The commercial nature of the complex attracts a large amount of traffic pressure such as traffic volume and transit traffic volume. If the condition of the branch road section is poor, without reasonable traffic organization optimization, the surrounding traffic will be chaotic, which will not only easily cause traffic Congestion, the safety of vehicles will also become a bigger problem.

In addition, due to the differences in the functions of the various blocks of the commercial complex, the traffic distribution will also be uneven. Therefore, opening the parking garages in commercial complexes and incorporating them into the road network can avoid the occurrence of adverse effects such as uneven distribution of entrance and exit traffic. Road segments have uncontrollable effects.

After the above introduction to the situation of commercial complexes, the fundamental problems can be summarized in the following aspects:

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① The unevenness of traffic volume and direction determined by the geographical location of commercial complexes can cause differences in the distribution of road network traffic.

② The traffic pressure on the main roads around the commercial complex is high, and the utilization rate of the branch roads is low, resulting in a small traffic carrying capacity of the overall road network, and it is difficult to solve the large amount of traffic flow attracted by its commercial nature.

After summarizing, we can clearly see the traffic problems existing in the commercial complex. In the following, we will model the above two problems, and take corresponding measures to ensure the smooth implementation of the organizational optimization plan, making the road network structure more perfect, thereby increasing the number of roads. network carrying capacity.

4.2 Traffic Flow Characteristics

(1) The total amount of traffic demand is large

Traffic demand refers to the demand for traffic space when people or things with different purposes choose different travel modes to move autonomously in public space. Due to the complex and diverse traffic components in the traffic microcirculation system of the commercial complex, and affected by the commercial nature of the commercial complex, it attracts a large amount of traffic. Therefore, it can be seen that in this kind of microcirculation system, the total traffic demand is larger and the influence range is wider.

(2) The flow direction is free, and the flow meets different needs

The demand degree of traffic flow in the traffic microcirculation system of commercial complexes is affected by the functional characteristics of the plot. For example, in a residential building plot, there is less traffic per unit time on a certain section of the road section, so drivers can randomly choose different paths to enter the microcirculation system without making a reservation or asking for instructions; In areas with commercial functions, the choice of motor vehicles, non-motor vehicles and people is more arbitrary. For this reason, a considerable number of one-way lanes and pedestrian streets should be set up in the system, or through the optimized design of pedestrian passages, people should be more perfect. The goal of vehicle diversion is to improve the safety of vehicles, non-vehicles and pedestrians as comprehensively as possible, and to meet the traffic needs of people and vehicles on this basis.

(3) Trunk traffic has little impact on traffic volume

By analyzing the characteristics of the road network around the multi-storey parking garage of the commercial complex, we can see that the internal road network structure of the microcirculation system is compact and complex, and the accessibility of the road network is relatively high. Therefore, the road network structure of this kind of microcirculation system is also more perfect, so that the average traffic demand of each road section in the road network is smaller. It can be seen that the main road traffic in the road network has relatively small restrictions on the system, but it does not affect the diversion function of the traffic microcirculation system to the main road of the road network. Therefore, this kind of traffic microcirculation system can better relieve the traffic pressure caused by the large amount of traffic flow attracted by the commercial nature of the commercial complex.

(4) The temporal and spatial distribution of traffic volume is relatively uniform

When the commercial integrated microcirculation traffic system is established, the distribution of peak hour traffic volume within its area is more stable than that of arterial road traffic volume, and there will be no large temporal and spatial fluctuations. Therefore, in order to maximize the advantages of the traffic microcirculation and relieve the traffic pressure on the main line, the branch roads and parking garage roads in the road network should be fully utilized, the road utilization rate should be improved, and the traffic space resources should be allocated reasonably, so that the traffic flow in the microcirculation system is at a low level. higher level.

(5) Large demand for non-motorized traffic

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Urban residents take commercial complexes as their travel goals, and most of them take consumption as their main purpose. For the convenience of travel, many residents choose to travel by non-motorized vehicles, and the floating population accounts for a large proportion, so it can be seen that there is a great demand for non-motorized vehicles in the microcirculation road network.

4.3 Road Network Characteristics

(1) High density of road network and high requirements for network connectivity

The traffic microcirculation system is mainly composed of urban expressways, main roads and sub-arterial roads, and several subsystems, among which the subsystems mainly include branches of various grades and unnamed lanes. In the traffic microcirculation system of the commercial complex, the internal road circulation system of the parking garage is also included, which is mainly connected with the external road network through the entrance and exit of the parking garage. For the external road network of the parking garage in this system, the traffic potential of the branch roads in the road network should be fully explored for the purpose of improving the road utilization rate, so as to meet the connectivity requirements of the road network and ensure the microcirculation system. Works smoothly.

(2) High requirements for road network accessibility and flexibility

The choice of residents' travel mode varies with different travel purposes, and the traffic microcirculation system can meet the travel traffic demand to the greatest extent. Therefore, the establishment of the microcirculation transportation system is a perfect and effective solution. This has higher requirements for the traffic microcirculation system. While meeting the basic traffic needs of the road network, it also needs to have a relatively high accessibility, so that the traveler can choose the driving mode more flexibly and route, so the microcirculation system needs to have more stringent flexibility requirements.

(3) Prioritize special needs and take into account fairness

Under the background of high traffic demand in the commercial urban complex area, in order to ensure the smoother operation of the traffic microcirculation system in the area, it is necessary for the administrator to classify each traffic, and determine the sequence of traffic according to the specific needs, and determine the various traffic conditions. Right-of-way traffic. For example, an intersection determines the right of way for motor vehicles, and a school section determines the right of way for pedestrians. By analogy, the smoothness of vehicle traffic can be guaranteed. However, this method cannot be arbitrarily chosen. It needs to be based on traffic demand and balanced on the premise of ensuring fairness.

4.4 Characteristics of Traffic Organization and Management

(1) Difficulty

After the above overall analysis of the road network and traffic, it can be seen that a major feature of the traffic microcirculation system of commercial complexes is that it has a wide range of influence. The service capabilities of the surrounding road network and roads at all levels cannot be ignored, and cannot meet the regional traffic pressure brought about by the establishment of commercial complexes. In addition, affected by the actual situation, it will inevitably encounter greater resistance in the implementation process. In order to reduce the resistance as much as possible during the implementation of the urban transportation microcirculation system and ensure the balanced development of all aspects, a considerable proportion of human and material resources need to be invested. Therefore, the implementation of the commercial complex transportation microcirculation system must be a arduous and inevitable task. construction process.

(2) Complexity

Factors such as the diversity of roads in the road network and the uncertainty of traffic components determine the complexity of this type of traffic microcirculation system. For example, priority lanes need to be set up in some road sections, and their settings not only need to consider the safety of

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vehicle traffic, but also fully meet the needs of traffic services. In addition, the traffic microcirculation system of commercial complexes has a large scope of influence, and the characteristics of the areas where the buildings are located are also different, which requires decision makers to specify specific traffic management measures according to the specific conditions of the area where the system is located. It increases the difficulty of implementing the traffic microcirculation system. Therefore, the traffic management of the commercial complex traffic microcirculation system has considerable complexity.

(3) Long-term

With the continuous development of the times, the process of urbanization has become more intense, and the traffic situation has also changed. For example, the demand for traffic services is greater and the traffic components are more complex. Adjustment, timely check and fill omissions. Therefore, the determination of the management plan of the traffic microcirculation system of the commercial complex should have certain long-term goals, which cannot be done at once, so as to establish a more efficient and sustainable traffic microcirculation system with more perfect management measures.

5. Conclusion

This paper analyzes and introduces the traffic composition space of the road network in the multi-storey parking garage microcirculation system of commercial complexes, which is to open a certain layer of the multi-storey parking garage and form an integrated traffic microcirculation system with the external road network. By summarizing various aspects, the purpose of optimizing the microcirculation system is to reduce the traffic pressure on the main road through the rational planning and utilization of the traffic resources such as the secondary roads other than the main road and the branch roads at all levels in the road network, so as to form a good Transportation economy and culture system. It can be seen from this that the urban traffic microcirculation system should be an organic complex of culture, traffic, life and other aspects in the area surrounded by the main roads in the road network and in the space. has an important position that cannot be ignored.

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