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Study on Integrated Design of Parking Space in Old Town of Small City Under the Background of Urban Renewal

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Abstract: *With the development of China's economy, more and more private cars appear in small cities, but there are not enough parking spaces, which brings difficulties to residents' travel. This paper takes the old city of Dongtai as an example to investigate the parking situation. Combined with the opportunity of urban renewal, the integrated design strategy of parking spaces is proposed from the aspects of function improvement, old renovation and space expansion, which will help the renovation of the old city.*

Keywords: *Small city; Parking space; Integrated design*

1. Introduction

With the development of the economy, the purchasing power of Chinese residents has gradually increased, and in recent years, there have been more and more cars in small cities. The planning and construction of the old urban areas of small cities did not take into account the use of so many cars, which has brought a series of urban problems such as traffic jams and parking difficulties in terms of traffic and parking [1], and the continuous increase of vehicles will inevitably cause more serious "urban diseases" in the future. In response to a series of urban diseases such as parking difficulties and ecological damage, the Ministry of Housing and Urban-Rural Development issued the "Guiding Opinions of the Ministry of Housing and Urban-Rural Development on Strengthening the Work of Ecological Restoration and Urban Repair", and carried out dual urban repairs (ecological restoration and urban repair) to control urban diseases and improve quality of human settlements [2]. How to solve the problem of difficult parking in the old urban area of small cities in the process of urban double repair? Taking Dongtai City, Jiangsu Province as an example, this paper explores the solutions and approaches to the problem of parking difficulties in the old urban areas of small cities.

2. Investigation on the current situation of parking in the old urban area of small cities

Dongtai is located on the eastern coast of Jiangsu Province. The old city adopts a "repair-style" transformation and renewal model, and there is no large-scale demolition and reconstruction. At present, the old city basically retains the spatial pattern of "small blocks, dense road network" (Figure 1). In recent years, the rapid growth of private cars in Dongtai City has brought a series of problems to parking and traffic in the old city. The research group used the methods of on-site investigation and questionnaire survey to analyze the parking situation in the old city. The content of the questionnaire mainly includes the time period and location of parking difficulties, and the waiting time for parking. The questionnaires were randomly distributed by the members of the research group in the parking lot of the old city. A total of 86 questionnaires were distributed, and 78 valid questionnaires were screened out for statistics.

According to the statistical results, the parking problem is mainly concentrated in the vicinity of old residential areas, schools and large shopping malls. Parking is the most difficult in old communities during the evening off hours, and the phenomenon of 'grabbing a parking space' is prominent; it is difficult to pick up and drop off children near the gates of kindergartens, primary and secondary schools, and pick up and drop off children during school hours; large shopping malls are difficult to park on weekends and holidays. During the on-site investigation, the members of the research team found that in

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addition to the parking problem, the ecological environment of the old city was also poor, the natural environment such as rivers was destroyed, the urban facilities were aging and there were old buildings that violated regulations, and ecological restoration and urban repair were needed.

Figure 1: The pattern and current situation of the old city.

3. Solutions to parking problems in old towns in small cities

On the basis of the current situation investigation, the research group analyzed the problems existing in the old city, one is how to park more cars in a limited space, and the other is to improve the urban environment while solving the parking problem. The research group proposed to adopt the method of "excavation of stock and point-like activation", select typical plots in the old city, and carry out targeted integrated design. It is necessary to combine the opportunity of urban double repair in the old city, take the integrated design of parking space as the starting point, comprehensively consider various factors such as motor vehicles, residents, landscape, etc., to explore efficient parking modes and create a pleasant urban space.

4. Integrated design of parking space in old town

Based on the current situation investigation, the research team selected three plots for integrated design, namely the plot on the northwest side of Hailing Capital (Plot 1), the plot of the former Civil Affairs Bureau (Plot 2), and the plot of the South Campus of Experimental Middle School. (Plot 3), these three plots are all areas with outstanding parking difficulties in the old city. Based on the comprehensive analysis of the three plots, the research group proposed three different integrated design strategies, namely, functional improvement, old renovation and space expansion.

4.1 Functional improvement - integrated design strategy 1

Plot 1 is a street-side greening land, located on the south side of Haixin Road. Most of the plots are surrounded by residential quarters. Except for the Hailing Capital Residential District, the others are old communities. The east side of the plot is about 300 meters away from large-scale commercial areas. The center - Derun Plaza, there are small community commercial buildings on the west side of the plot (Figure 2). The biggest parking problem in the area is the difficulty of parking in Derun Plaza during holidays, and the surrounding old communities also have difficulty in parking at night.

For Plot 1, the research team proposed an integrated design strategy for functional improvement, and built a modern three-dimensional parking garage on the green land. The parking garage has four floors above ground and two floors underground, with a total construction area of about 7,824 square meters and a parking capacity of 335 vehicles, which can effectively solve the surrounding parking problems. In order not to occupy the urban space, the in and out flow lines of the garage are set on the basement floor, which not only solves the problem of urban land shortage, but also diverts people and vehicles. A landscape square is reserved in front of the parking garage, and the first floor is partially overhead to open up the front and rear landscapes of the garage, so that the front and rear landscapes can penetrate and merge. Adding green roof to the garage roof can not only improve the thermal insulation performance of the building, but also enrich the urban landscape of the area. Part of the roof is covered with solar photovoltaic panels to collect energy for lighting at night. The surface of the building is made of white metal perforated panels, combined with glass materials to form a contrast between virtual and real, and

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a city view that can be enjoyed (Figure 3). Through the integrated design of Plot 1, it not only solves the problem of parking difficulties in the area, but also increases the urban service function, but also retains the urban greening function of the plot, which enriches the urban landscape and enhances the urban image.

Figure 2: Status of the surrounding area of Plot 1.

Figure 3: Integrated design renderings.

4.2 Renovation of the old - integrated design strategy 2

Plot 2 is located on the south side of Yongkang Road. The current situation is an old house. It is about 160 meters away from the main urban road on the west side - Hailing Middle Road. The west side of the site is surrounded by a large-scale commercial office complex, Jindong Plaza. The south, east, and north sides are all old communities, and the old buildings on the northeast side have been demolished (Figure 4). The old community and Jindong Plaza near the plot all have the problem of difficult parking.

Figure 4: Status of the surrounding area of Lot 2.

On the basis of the comprehensive analysis of the plot, the research team proposed a design strategy for the old renovation. The old buildings in Plot 2 were demolished and renovated into an urban service complex integrating parking, business, and office. The part facing the street is set as a commercial office, and the rest of the ground and the ground floor are garages, with a construction area of about 6,205 square meters, and can park about 310 vehicles, which can effectively solve the surrounding parking problems. Plot 2 is long and narrow, with the city road on the north side but the width is narrow. In order to solve the problem of a large number of vehicles entering and leaving, the building is arranged in a long strip in the middle of the plot. Two lanes are set up on both sides of the building. There are multiple vehicle entrances and exits on both sides, and a loop is formed from under the building, which is convenient for

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vehicles to enter and exit. The commercial part of the ground floor along the street is made of transparent glass, and the office part above is made of metal grid, which enhances the image of the building; the outer surface of the garage is made of renewable metal grid and vines, which can effectively heat insulation and increase urban greening. The urban ecology and landscape functions have been improved (Figure 5).

Figure 5: Integrated design renderings.

4.3 Space expansion - integrated design strategy 3

The current state of Plot 3 is the playground of the Experimental Middle School. The plot is adjacent to Chenghe Road in the west, Xuefu West Road in the south, and a dilapidated urban river on the south side of Xuefu West Road. There are mainly schools, businesses and old communities around the plot (Figure 6). The main problems of parking and traffic in the area are the serious shortage of parking spaces in the surrounding old communities, and the serious congestion of Xuefu West Road caused by the vehicles that pick up and drop off students during school hours.

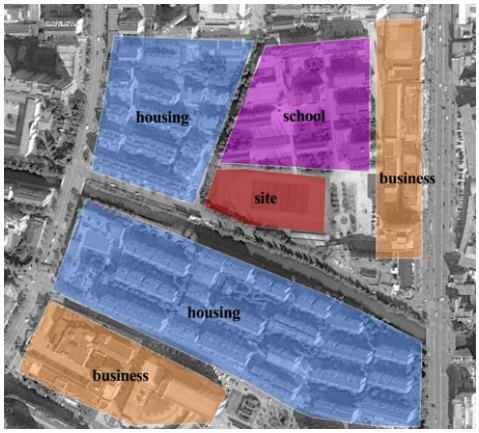

Figure 6: Status of Lot 3.

The research group proposed an integrated design strategy for space expansion based on the analysis of the plot. Because the surrounding land is very tight, the research group plans to expand to the underground of the playground, set up underground transportation and parking spaces, solve the problem of insufficient parking spaces in the surrounding residential quarters, and guide the vehicles that pick up and drop off students to the underground to relieve the traffic pressure on the surrounding urban roads. Through the analysis of the current situation, a two-story parking garage is set up under the playground, with a construction area of about 6944.8 square meters, of which the garage area is about 4819.2 square meters, the underground passage is about 2125.6 square meters, and 201 parking spaces can be arranged. In addition, an above-ground and underground cross-river transportation system is established to connect the underground garage of the playground and the old community across the river.

In the integrated design, combined with the cross-river transportation system, this paper sets up a waterfront leisure area along the river on the ground to provide a leisure place for parents who pick up and drop off children and the surrounding residents. Combined with the opportunity of urban double repair, the river ecology is restored to improve the urban environment. Ecology and activity venues (Figure 7).

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Figure 7: Integrated design renderings.

5. Conclusion

With the rapid economic development, the number of cars in small and medium-sized cities is increasing. However, the use of a large number of cars has not been considered in the old urban areas that have been built. The passage and parking of cars have brought certain problems to the transportation system of small and medium-sized cities. In the context of urban double repair, this paper takes the opportunity of repairing and ecological restoration of old urban areas, takes the integrated design of parking spaces as the starting point, and explores ways and methods to effectively solve the problem of parking difficulties in old urban areas according to the city's own characteristics and the needs of citizens; on the basis of the analysis of specific urban nodes, the planning and design strategies of "function improvement", "renovation of old" and "space expansion" are proposed, and specific designs are carried out in different urban nodes to build a parking space with dynamic and interesting, people-oriented services, optimize the traffic parking system in the old city, repair the urban space, stimulate the vitality of the old city, improve the quality of the city, and promote the sustainable development of the city.

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