PATTERN OF SPACE AND LIFE IN SUPERBLOCK
TAKING SHENZHEN AS AN EXAMPLE

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ABSTRACT

Superblock is a concept of urban form at street network level, which refers to the form of large-scale community surrounded by main arterial roads of city, containing numbers of internal community streets. The superblock is an inevitable outcome of meeting the needs of differential transportation in the process of modern urban development. The city can be regarded as a collection of multiple adjacent superblocks. In this paper, the space syntax betweenness of urban network is used to identify the main roads at urban and regional scales, the main roads and their effective linear extension sections are used as super grids to identify the superblocks in research area. A total of 163 superblocks of Shenzhen are divided and identified. Then we use urban POI data and the Step Depth parameters to analyse the configurational and functional characteristics of the superblock layouts, in combination with streetscape photos to study the relationship between the spatial-functional characteristics and the street vitality and quality. The research results show that according to the characteristics of the road network configuration and POI distribution, the superblocks can be divided into three types: inward-oriented, decentralized, and outward-oriented. The inward-oriented and outward-oriented are not well balanced in the relationship between street vitality and street quality. The decentralized superblocks not only have a better interface between different scales of urban movements, but also achieve a better balance between street vitality and street quality. The research on superblock in Shenzhen reveals the broad features and trends of the urban form of the mega-city in modern China from the aspect of structure and function. It has important reference meaning in creating interactive interface, supporting diversified patterns and enhancing the vitality of superblocks in different city scales.

KEYWORDS

Superblock; Urban Form; POI; Interfacing Space; Spatial Hierarchy

1. RESEARCH BACKGROUND

2. THE ACCESSIBILITY HIERARCHY OF URBAN ROAD NETWORK

Due to the inconsistent accuracy of the road data in different area of Shenzhen, the lack of urban branch road and group road will have a certain impact on the road identification. Therefore, the next analysis will select the road network with the same high precision and completeness in Shenzhen. The study is finally conducted in a consistent area, which including: West to Moon Bay Avenue, North to North Ring Avenue - Nigang West Road, West to North River Road, South to Shenzhen River and Shenzhen Bay. The area covers the most intensive development urban part in Shenzhen, shown below in the Figure 3.
In this section, we collate the POI data of our research area in Shenzhen. POI is an abbreviation of "Point of Interest", and each POI with a specific coordinate represents the location of a functional facility. The distribution of functional facilities can be seen from the urban POI. The POI data in Shenzhen is divided into five types: commercial facilities of small scale, commercial facilities of large scale (such as large commercial complexes), office facilities, public service facilities, and bus station. After data sorting and cleaning, we have obtained more than 70,000 effective POI data. The “step depth of each segment from the regional road” and “the total length and distribution of the POI density/total number of each line segment” are respectively formed as a histogram of the x-axis and the y-axis, reflecting the layout characteristics of the urban function based on the urban form, As shown in Figure 6.

The total number of POIs reflects the distribution of functions in cities. 1 step depth segments obtain the maximum amount of POI at a non-highest total length; conversely, although the maximum POI density is obtained on a 0 step depth segments, the total amount of POI at the 0 step depth is less than 1 step depth segments (not even more than 2 step depth segments), this shows that the urban function facilities tend to be not laid out on the roads of the most city traffic, but to located in the segments 1 step depth from them to gain a somehow balance.

The POI density distribution can reflect the support efficiency of different levels of roads to different facilities. On the whole, the density of each type of POI decreases with the increase of the step depth, indicating that the support efficiency of the road to POI decreases with the increase of spatial depth, the depth level of the road has a profound impact on the POI. The 0 step depth road and the 1 step depth road most effectively support the urban functional facilities.

For different types of POIs, it can be seen from the trend that bus stations and commercial facilities of large scale greatly impacted by the road's depth, the average density of them decreases to near 0 in 2 step depth's segments; office facilities and small commercial facilities bear relatively large impacts. The impact of step depth to the public service facilities is minimal, even at depths of 7-12, the density of POIs has a rebound (representing the internal business set in the modern community planning). Therefore, the 2 step depth is the critical point of the change of POI density distribution in the superblock. We have come to a conclusion in the previous part about the critical point of the urban form itself is 3 step depth, considering the 2 step depth as POI's critical point, we may conclude that the layout of the functional facilities is more sensitive than the urban morphological change itself.
Three colour levels are used to represent different step depth levels, red segments represent the segments of 0 steps depth from the regional road, and orange segments represent the segments of 1 steps depth from the regional road, and blue segments represent the segments of 2 or more steps depth from the regional road. The different thickness of segment is used to represent the total POI density of the line segment (the total POI density is calculated in the sum of that five types’ POIs, in order to highlight the magnitude of the commercial facility of large scale, we multiply the number of commercial facilities of large scale by 10 before sum the 5 types up). Finally, we got a comprehensive figure that can simultaneously reflect the urban morphological characteristics and the functional distribution characteristics, as shown in Figure 7 below. According to the functions and morphological characteristics of each superblock in the figure, the superblock is mainly divided into three types: inward-oriented, decentralized and outward-oriented.

The outward-oriented superblock (Figure 8): It means that the POI is basically distributed on the 0 step depth or 1 step depth road, less distributed on the 2 or more step depth road. Such superblocks are dominated by green parks within the study area, with a small total number (No.52/16/115). The insert street is relatively inactive, but the quality of the environment is very good.
The inward-oriented superblock (Figure 9): It refers to POIs that are basically distributed on two or more step depth roads, and are less distributed in the 0 or 1 step depth road. In this type of superblock, the main function of the super grid is for the use of transit traffic, whose life function and atmosphere are weak (No.97), the centre of daily life is often located deep inside the superblock. This kind of superblocks more often appears in the urban village area (No.49/36/161), advanced residential area, RBD for large cities (No.145/78/154). The inner area of the urban village is widely recognized by the image of "strong street vitality but poor quality", and the super grid is relatively good in quality; the RBD land and the advanced residential community are opposite, tending to be isolated to the external transit traffic to has a quiet inner centre. At the centre, the interior streets are both vibrant and of good quality, in stark contrast to the super grid's low street vibrancy and low quality. Both types fail to balance street vibrancy and street quality.

The decentralized superblock (Figure10&11): It means that POI has a proper amount of distribution at all levels, both the super grid and the inner insert streets have a certain scale centre. The decentralized superblocks are widely distributed within the scope of research, and can be divided into the following three types according to the different contact methods of their internal and external centres:

(1) The internal and external central structure are clear, and a clear one-step or zero-step depth linear street, which we call it" main street", interconnects the inner and outer centres (No.83/9/42/145) (Figure 10). The super grid concentrates the centralization function of the regional and city scale, and the interior concentrates the local feature of the neighbourhood scale centre. It is important that the main street system can serve as an important interfacing space between the urban scale and the neighbourhood scale. That is, when a person walks around the superblock, he will simultaneously perceive the central activity that linearly extends on the urban scale and the activities that are spread throughout the local neighbourhood, the rhythm between the scales is thus generated (Peponis and Feng et al., 2015).
(2) The various hierarchies of road with high POI distribution are intertwined to form a dense network (Figure 11). In such a network, the local centre cannot be defined according to the shape and function of the street system, that is, each part reflects the homogenization characteristics, and the distinction between any place and other places must be completely dependent on the building. Morphologically, the obvious feature of such a block is that seems there are more main street running through the block. The POI is homogeneously distributed on three levels of roads. Secondly, such blocks are usually strictly orthogonal (No.113/114) or a slightly deformed (No.98/138) orthogonal network form, it shares greater similarities with the network format of Manhattan and Chicago, known as typical grid cities. Conversely, although some blocks are similar in shape to the orthogonal network, they lack the main street system in nature and the function tends to be internalized (No.159/153). Each part of those superblock reflects a diverse street vibrancy. Taking the block 114 as an example, it is an important modern science and technology business district in Shenzhen, with various levels of vitality.

(3) The internal and external centre structure features are clear, but there is no main street system running through as the interfacing space. This kind of block also has urban regional scale and neighbourhood scale, but the relationship between the two is relatively discrete (No.81/40/92/42).
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degree of vitality is similar to (1), but there is a more obvious "hollow zone" when the internal and external interfaces transition.

4. CONCLUSIONS AND DISCUSSION

Superblock can be regarded as a number of adjacent cell units making up the city, which is the main form of street network in many parts of the cities today, and is the inevitable product of the urban differential transportation system.

Based on the definition of the superblock, this paper identifies the urban regional roads in the city based on the space syntax betweenness parameter, then relying on the regional road and its 0 step depth roads as the main elements to identify the urban superblock. This has quantitatively improved the traditional way of identifying superblock, and can, to some extent, improve the qualitative differences caused by the subjective factors in dividing the superblocks. Judging from the results of the division, the super grid, the boarder of superblock, are not always highways/ expressways/arterial roads, also contain a small number of secondary roads and branch roads, indicating that although its low road graded but bears important traffic function in city scale, and should also be the boarder of the superblock. In addition, considering the existence of the “mismatch” phenomenon between the grade and the actual function of the road, making use of the betweenness parameter can judge the actual function of the road from the overall road network fabric relationship of the city, which makes the judgment and division more scientific.

Based on the Step Depth and POI data of the road segment, we divided the superblocks into three types: The inward-oriented, the outward-oriented and the decentralized with the characteristic of different density of "main street". When combining streetscape pictures and field research data to judge the street quality and street vibrancy of those 3 types, it is found that the Inward-oriented superblock (residential communities, a large number of urban villages) and outward-oriented superblock (office facilities, large urban RBD facilities) fail to balance the street's vitality and street quality. For example, in the Shangxiasha Urban Village, the Super Grid was lack of the function of life and vitality, while the insert streets have high vitality but low environment quality (greening and sanitation). On the contrary, the inward-oriented superblock has higher quality of insert street but lack vibrancy. The inward-oriented block itself is isolated from other parts of the city and it will be difficult to be integrated into the urban network system. The public resources would also tend not to be arranged in such areas. Finally, in the decentralized superblock, with the morphological characteristics of high permeability, it can better balance street quality and street vitality, and to some extent improve the shortcomings of inward-facing blocks and outbound blocks. This also illustrates the interaction between urban form and urban functional facilities. The configuration of the superblock also has a certain correlation with the street vitality and street quality.

However, this article is still somewhat inadequate and will be improved in subsequent research. Firstly, and most importantly, in the process of categorizing the morphology and function of the superblocks at the last part of the study, it mainly relies on the experience of space syntax research to judge its type, and there may be differences caused by certain subjective factors; some superblocks also lack POI data so we can't identify its type. In the future research, we will try to quantify the data according to the individual superblock and use land use data to make the research more scientific and reliable. Secondly, in the future research, the connection relationship between the superblock and the surrounding neighbouring superblock should also be considered. According to the functional density and the actual road width of the super grid, it can also be inspected that the super grid is actually an isolation factor (the superblocks on both sides of the edge road presents a certain isolation trend), or to integrate the two neighbours organically and effectively. This will be further deepened in the follow-up study through road width, pedestrian crossing facilities (zebra crossing, overpass, etc.) to better understand the relationship between the superblock itself and its surrounding environment.

REFERENCES


