

Comprehensive Evaluation of Public Space in Urban Villages from the Perspective of Social Network: A Case Study of Tangxia Village in Guangzhou

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Abstract: The existing evaluation studies on urban villages generally lack the evaluation of the current situation of public space from a sociological perspective. In this paper, we use AHP and SNA to construct a comprehensive evaluation system of public space in urban villages from the perspective of social networks, combining the main evaluation of "public space" and the synergistic evaluation of "social status". Taking Tangxia Village of Guangzhou as example, conducts a comprehensive evaluation of the ability of its public space to promote the healthy development of social networks, provides a theoretical basis for renovation strategy and guides the future renovation of public space in urban villages.

1. Introduction

With the process of urbanization, the surrounding traditional rural settlements are constantly surrounded by urban construction land, forming a typical urban phenomenon of "villages in cities" with urban-rural dual economic and social structure ^[1]. At present, there are 139 villages in the downtown of Guangzhou; By 2019, the migrant population of urban villages in Guangzhou will be about 4.95 million, accounting for about 50% of the total population coming to Guangzhou ^[2]. The influx of foreign groups into the villages in the city has made a huge change in the rural social relations, which were originally based on kinship and blood ties. In the research on the transformation and renewal of the material space of urban villages, more and more attention has been paid to the research on the relationship between social relationship structure and material space. The research object of social network related theories and methods is the network set formed by social actors and their relationships ^[3].

In recent years, social network theory has begun to be applied to the study of public space in urban villages. For example, Guo Jiasheng ^[4], Tao Binbin ^[5], Li Ling ^[6] and others have used social network analysis to conduct quantitative research on the status quo of residents' social network, public space network and individual behavior network, and put forward transformation and updating strategies. However, the social network analysis method focuses on the analysis of spatial structure, neglects the scale and morphological characteristics of space, and cannot provide a theoretical basis for specific public space design strategies. At the same time, in the existing evaluation system of urban villages, most of them are the evaluation of the feasibility of urban village transformation ^[7], the evaluation of transformation mode ^[8], and the evaluation after transformation or use ^[9], lacking the evaluation research of public space from the sociological perspective. Therefore, this paper aims to promote the healthy development of the social network of urban villages. Taking Tangxia Village, Guangzhou, as an example, by using the social network analysis method, this paper evaluates and analyzes the public space of urban villages by building a comprehensive evaluation system of public space, combining

space structure and space design, so as to enrich the application of social network theory in the field of public space of urban villages, It provides a new perspective and idea for the study of urban villages and the evaluation of public space.

2. Research Design

2.1 Research object

(1) The theoretical research object is the comprehensive evaluation system of public space. "Comprehensive evaluation" mainly refers to comprehensive evaluation methods ("qualitative quantitative" comprehensive evaluation), comprehensive evaluation contents (combination of main evaluation and collaborative evaluation), and comprehensive evaluation perspectives (combination of macro and micro).

(2) The practical research object is Tangxia Village, Guangzhou. The village is located in Tangxia Sub-district, Tianhe District, north to Tangde South Road, east to Tangdong Village, south to the west of Zhongshan Avenue, west to Tangxia river and Chongdong Road, with an area of about 33hm², excluding residential and commercial areas in the village. According to the morphological characteristics of the public space of urban villages, it is divided into node space and street space. See Figure 1 and Figure 2 for the number and location distribution of specific node space and street space.



Figure 1. Spatial distribution of nodes in Tangxia Village.

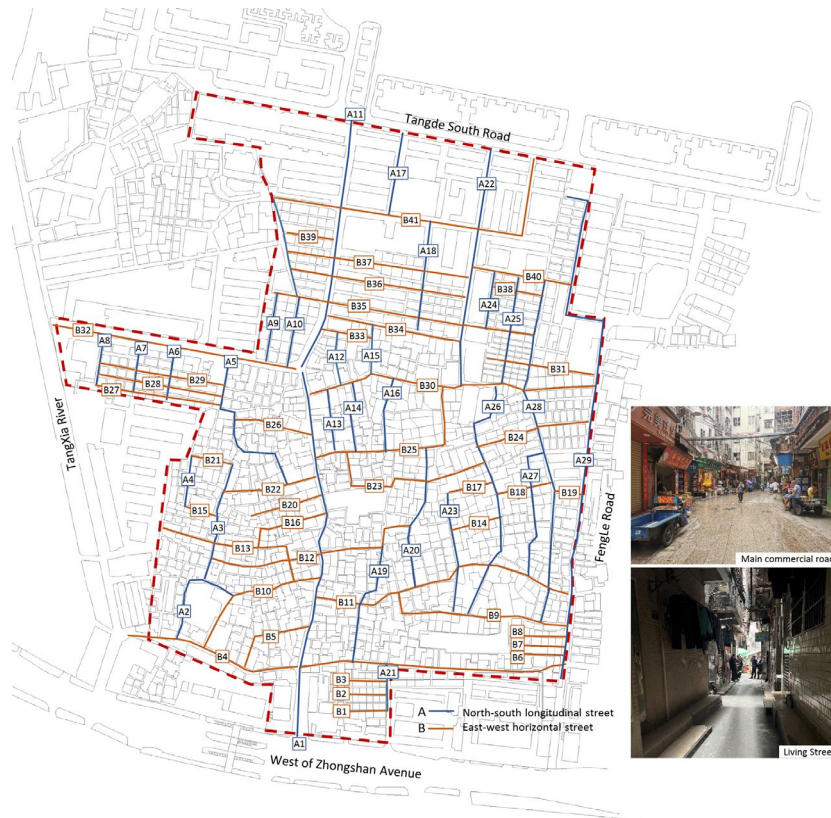


Figure 2. Tangxia Village streets and alleys are distributed spatially.

2.2 Research Method

First of all, according to the relationship and characteristics between the social network of urban villages and public space, the analytic hierarchy process is used to decompose the comprehensive evaluation of public space into multiple objectives and criteria, establish the evaluation system framework, and select the evaluation factors based on the existing evaluation studies. Secondly, the Delphi method is used to invite many experts to optimize the evaluation factors and investigate the importance, so as to obtain the final evaluation factor system and calculate the weight of indicators at all levels. Then, the social network analysis method is used to evaluate the spatial structure of Tangxia Village node and street space from the Degree centrality, Betweenness Centrality, Node Clustering Coefficient and Closeness Centrality. The spatial quality and diversity evaluation and collaborative evaluation are evaluated by using questionnaire survey, field research and other methods to obtain data. Finally, the comprehensive evaluation value is obtained by weighting each evaluation index value with the comprehensive evaluation method, and the overall comprehensive evaluation is finally formed.

3. Construction of Comprehensive Evaluation System for Public Space of Urban Villages

3.1 Evaluation system framework

From the perspective of social networks, there is a mutual influence between urban village social networks and public spaces, that is, "social networks build public spaces to influence public activities, and public spaces produce social networks to stimulate public activities" [5,10]. In the evaluation of public space, the structure, quality and pluralism of space are the influencing factors of public space, while the current situation of social networks and public activities is the result. Therefore, the framework construction of the evaluation system is divided into the main evaluation system of "public space" and the collaborative evaluation system of "social status" (Figure3). Among them, the main evaluation system is the public space evaluation, which is divided into two sub-evaluation systems: node space and street space. The collaborative evaluation system is the evaluation of the current social situation, including three parts: spatial satisfaction, the current situation of public activities and the

current situation of social networks. The evaluation results of the collaborative evaluation system will verify and optimize and supplement the evaluation results of the main evaluation system, so as to obtain a comprehensive and objective evaluation result of the public space in urban villages.

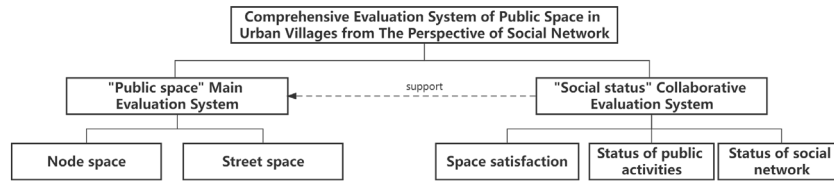


Figure 3. Evaluation system framework.

3.2 Evaluation factor selection and meaning

Target layer	Criteria layer	Weight	Metric layer	Weight	Metric meaning	
Comprehensive Evaluation System of Public Space in Urban Villages from The Perspective of Social Network (U)	"Public space" main evaluation system (U ₁)	Spatial structure (S _{1a})	Degree centrality (I _{1a})	0.27	In the urban village public space network, the nodal degree of the public space represents the number of public spaces directly connected to the space, reflecting the degree of connectivity of the space	
			Betweenness Centrality (I _{1b})	0.249	In the urban village public space network, the intermediate centrality of the public space reflects the importance of a public space in the entire spatial network	
			Node Clustering Coefficient (I _{1c})	0.222	In the urban village public space network, the tightness between the public space and its adjacent space is reflected	
			Closeness Centrality (I _{1d})	0.259	In the urban village public space network, the accessibility of a public space in the network can be measured	
		Node space (U _{1a})	Space quality (S _{2a})	Space security (I _{1a})	0.16	In the PSPL spatial evaluation indicators, space safety is divided into three aspects: traffic accident prevention, crime prevention and violence, and prevention of unpleasant sensory experiences brought about by the external environment
				Spatial scale (I _{1b})	0.131	The appropriate spatial scale can create a more comfortable space environment, which is conducive to more residents to move in public space
				Space façade (I _{1c})	0.117	A good space façade façade fades to attract crowds to stay and is assessed by the integrity of the façade, the detail design and materials, and the attractiveness of the space façade
				Floor paving (I _{1d})	0.071	For a large number of people in urban villages, the flatness, consistency and guidance of ground paving are very important
				Landscape setting (I _{1e})	0.179	A good and comfortable landscape environment can increase the attraction of the activity crowd, enhance the sense of identity of the activity crowd for the space, and help the crowd to extend the activity time.
				The quality of the facilities (I _{1f})	0.138	Good space facilities help to stimulate public activities. Due to the limited spatial scale of urban village node space, many public activities are based on facilities.
				Cultural connotations (I _{1g})	0.079	The cultural connotation of the public space in the urban village includes not only the deep local culture, but also the embodiment and integration of foreign culture.
				Manage maintenance (I _{1h})	0.126	Management and maintenance not only includes the daily maintenance and operation of the space, but also the formulation of usage rights.
		Spatial diversity (S ₁)	Spatial type diversity (I ₁₁)	0.261	The types of people who are active in the urban village node space are complex, and the types of activities that occur are also diverse, so many types of small spaces are needed in the same space.	
			Spatial scale diversity (I ₁₂)	0.243	The types of public activities are diverse, and the types of spaces with diverse needs also have different needs for the scale of space.	
			Spatial landscape diversity (I ₁₃)	0.224	The diversified landscape can provide residents with a more ornamental and multi-level spatial environment to meet the aesthetic and spiritual needs of residents.	
			Spatial interface diversity (I ₁₄)	0.136	Multiple spatial interfaces can inspire different types of public events	
	Diversity of space facilities (I ₁₅)		0.136	Space facilities include event facilities, infrastructure, service facilities, etc. Different types of facilities can meet the different needs of residents.		
	Street space (U _{1b})	Spatial structure (S _{1b})	Degree centrality (I _{1b})	0.35	Same as I _{1a}	
			Betweenness Centrality (I _{1b})	0.146	Same as I _{1b}	
			Node Clustering Coefficient (I _{1c})	0.126	Same as I _{1c}	
			Closeness Centrality (I _{1d})	0.378	Same as I _{1d}	
			Space security (I _{1e})	0.216	Same as I _{1e}	
		Space quality (S _{2b})	DH (I _{1a})	0.164	The spatial scale of the streets and alleys in the urban villages is relatively single, lacking rich changes, and the characteristics are very obvious. Select the street aspect ratio DH value as the evaluation factor	
			Along the street façade (I _{1b})	0.129	For the same street space, the façade along the street does not change much, and it is mostly of a certain type. The main function of the façade along the street is to promote indoor and outdoor communication, sales and other activities.	
			Floor paving (I _{1c})	0.083	Same as I _{1c}	
			Identify the system (I _{1d})	0.103	The urban village street space system is very complex, and the roads are crisscrossed. A good signage system can increase the guidance and circulation efficiency of the street space.	
			The quality of the facilities (I _{1e})	0.117	Same as I _{1e}	
			Cultural connotations (I _{1f})	0.077	Same as I _{1f}	
			Manage maintenance (I _{1g})	0.111	Same as I _{1g}	
			Space satisfaction (S ₃)	Satisfaction with spatial accessibility (I ₃₁)		Refers to the satisfaction of villagers with the ease of reaching each space
		Space quality satisfaction (I ₃₂)			It refers to the satisfaction level of urban village residents with the quality of the spatial environment of each public space, focusing on the satisfaction of residents with the comfort of public space and the willingness to move.	
		Satisfaction with spatial diversity (I ₃₃)			Satisfaction with spatial diversity refers to the satisfaction of urban village residents with whether each urban village public space can meet their own various activity needs.	
Status of public activities (S ₄)		The type of public activity (I ₄₁)			It refers to the current situation characteristics of the type, crowd and time of public activities in urban villages	
	Public event crowd density (I ₄₂)					
	Public event crowd type (I ₄₃)					
	Distribution of public activity time (I ₄₄)					
Status of social networks (S ₅)	Instrumental social support (I ₅₁)		Using the Wehrmann "Social Network Intimacy vs. Regional Survey", respondents will choose the type of person they will turn to when faced with these problems and the scope of their location, so as to qualitatively analyze the intimacy and regional characteristics of urban village social networks			
	Emotional social support (I ₅₂)					
	Intensity of neighborhood interaction (I ₅₃)		The intensity of neighborhood interaction includes the number of neighborhood interactions of the respondents, the degree of familiarity, and the frequency of interactions. Neighborhood interactions include preferences for the way they interact and the ways in which social relationships are established.			
	Neighborhood interactions (I ₅₄)					

Figure 4. Comprehensive evaluation system of public space in urban villages from the perspective of social network.

Referring to the relevant design codes and evaluation standards of urban communities^[11,12], the community-scale public space evaluation system^[13-17], and the parameter indicators of the social network analysis method^[10, 18, 19], combined with the analysis of the characteristics of urban village public space from the perspective of social network, the evaluation factors are preliminarily selected. The results of the preliminary selection were surveyed by experts, and the opinions of 26 experts in related fields were summarized and summarized, and the evaluation factors were optimized to form a final evaluation system, as shown in Figure 4.

3.3 Factor weight calculation

In this paper, the importance judgment matrix of the evaluation factors is established by the Delphi method, and the score scale is 1-9 for two-by-two comparison. Through the questionnaire survey, 10 experts were invited to judge the importance of the evaluation factors. Yaahp 12.7 is used to calculate the weights of each judgment matrix and perform a consistency test. The consistency test adopts the common C.R.<0.1 as the test standard, and the calculation formula is as follows:

$$C.R. = (\lambda_{max} - n) / RI (n - 1)$$

Among them, λ_{max} is the largest eigenroot (calculated automatically by the software), n is the number of evaluation factors of the matrix, and RI is the consistency parameter of the matrix. The weight results of the consistency test are aggregated to obtain the final evaluation factor weight, as shown in Figure 4.

3.4 Comprehensive evaluation model

In order to make a comprehensive evaluation of the public space in the urban village, the multi-objective linear weighting function method is used for comprehensive evaluation, and the formula is as follows:

$$A = \sum_{i=1}^n W_i \cdot X_i = \sum_{i=1}^n W_i \left(\sum_{j=1}^m W_{Ij} \cdot I_j \right)$$

Among them, A represents the final score of a public space, i is the evaluation criterion of the criterion layer, n represents the number of criteria, W_i the weight of this criterion, X_i is the score of this evaluation criterion, and $\sum_{i=1}^n W_i = 1$; j is the evaluation factor, m represents the number of evaluation factors, W_{Ij} the weight of this evaluation factor, I_j score the evaluation factor, and the $\sum_{j=1}^m W_{Ij} = 1$.

Based on the A value, a comprehensive evaluation rating of each public space can be obtained, as detailed in Table 1.

Table 1. Evaluation levels of public spaces.

Score	Rank	Rank Meaning
4.5~5	I(Excellent)	This level of public space is excellent in its ability to promote the development of social networks in urban villages, and there may be minimal problems in some aspects
3.5~4.4	II(Good)	This level of public space is good at promoting the development of social networks in urban villages, and there are minor problems in some aspects
2.5~3.4	III(General)	This level of public space is generally capable of promoting the development of social networks in urban villages, and there are certain problems in some aspects
1.5~2.4	IV(Poor)	The ability of public space at this level to promote the development of social networks in urban villages is poor, and there are many problems in various evaluation aspects
1~1.4	V(Extremely Poor)	The ability of public space at this level to promote the development of social networks in urban villages is extremely poor, and there are great problems in all aspects of evaluation

4. Comprehensive Evaluation of public space in Tangxia Village, Guangzhou

4.1 "Public space" main evaluation analysis

1) Node space

① Evaluation and analysis of spatial structure

The social network analysis semantic model of the node space in the urban village is constructed, and the relationship matrix of the node space network is established through practical research. The corresponding indicator calculation is carried out using the Ucinet 6.0 software. The evaluation results are obtained (Figure 5): The spatial structure evaluation factors are weighted and the node space-spatial structure comprehensive evaluation results are obtained. Among them, the comprehensive rating of the spatial structure of nodes 1, 2, 3, 6, 7 and 8 is II (Good), and the various factor scores in the entire node spatial network may have individual problems, but overall it is basically good. The comprehensive rating of the spatial structure of nodes 4, 5, 9, 10, 11, 12 and 13 is III (General), which means that there are certain problems in the indicators in the entire node space network, and there may be obvious shortcomings. The comprehensive rating of the spatial structure of node 14 is the lowest, it is IV (Poor), and the evaluation factors basically have major problems, the specific reason should be that the location is relatively remote in space and far away from other nodes.

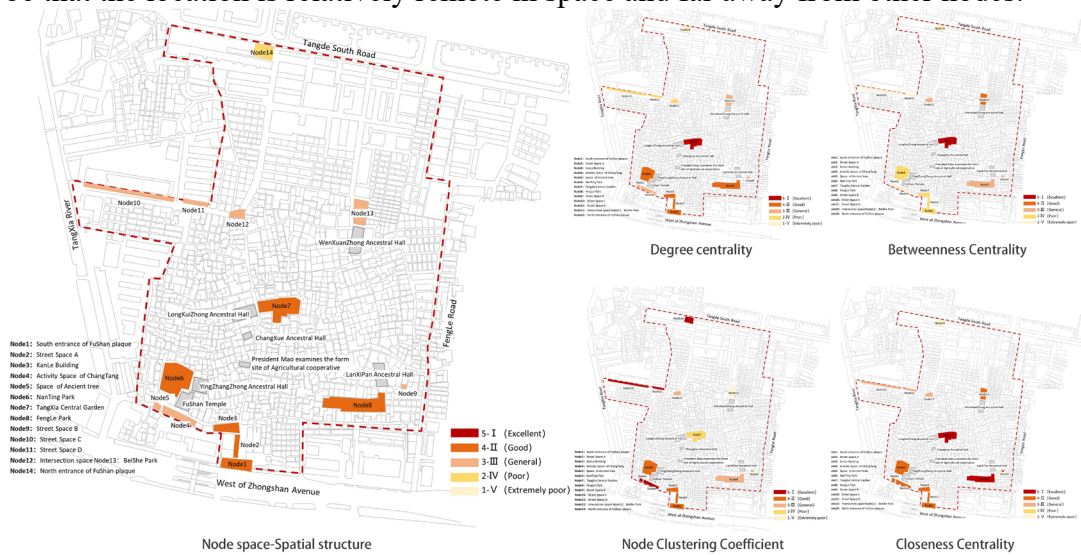


Figure 5. Evaluation of nodal space-spatial structure.

② Space quality evaluation and analysis

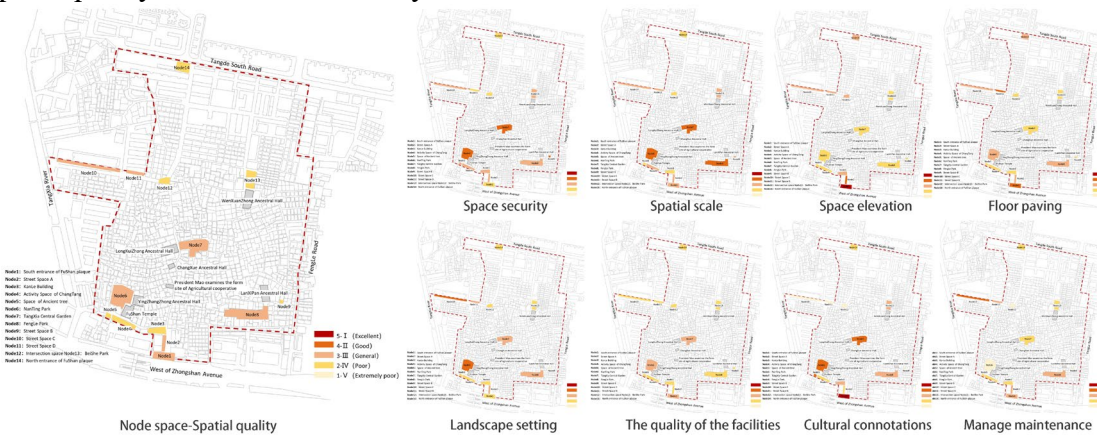


Figure 6. Node space-spatial quality evaluation.

The evaluation factors of spatial quality are weighted and the comprehensive evaluation results of nodal space-spatial quality are obtained (Figure 6). From the overall point of view, the comprehensive evaluation level of the node-space quality of Tangxia Village is generally low, and belongs to the evaluation level of III (General) and below. The evaluation grades of nodes 1, 2, 6, 7, 8, 10 and 11

are III (General), the spatial quality is general, and some of the various evaluation factors have certain problems. The evaluation grades of nodes 3, 4, 5, 12, 13 and 14 are IV (Poor), the spatial quality is poor, and most of the various evaluation factors have relatively large problems. The lowest evaluation level of node 9 is V (Extremely Poor), the spatial quality is extremely poor, and basically all evaluation factors have serious problems.

③ Evaluation and analysis of spatial diversity

The evaluation factors of spatial diversity are weighted to obtain the comprehensive evaluation results of nodal space-spatial diversity (Figure 7). The highest evaluation level of spatial diversity in node 8 is I (Excellent), and there is basically no problem in its spatial diversity; Secondly, the evaluation level of node 6 and node 7 is II. (Good), and some of the spatial diversity evaluation factors of these two nodes have some small problems; The evaluation level of node 13 is III (General), and there are certain problems in the evaluation factor of spatial diversity; The spatial evaluation level of the remaining nodes is below medium, that is, the spatial diversity evaluation factors of these nodes have large or great problems. It can be seen that the node spaces with an evaluation level of III (General) and above are all planned and designed village parks, with a larger area and more public activities that can be carried, which is more conducive to the healthy development of the social network of Tangxia Village.

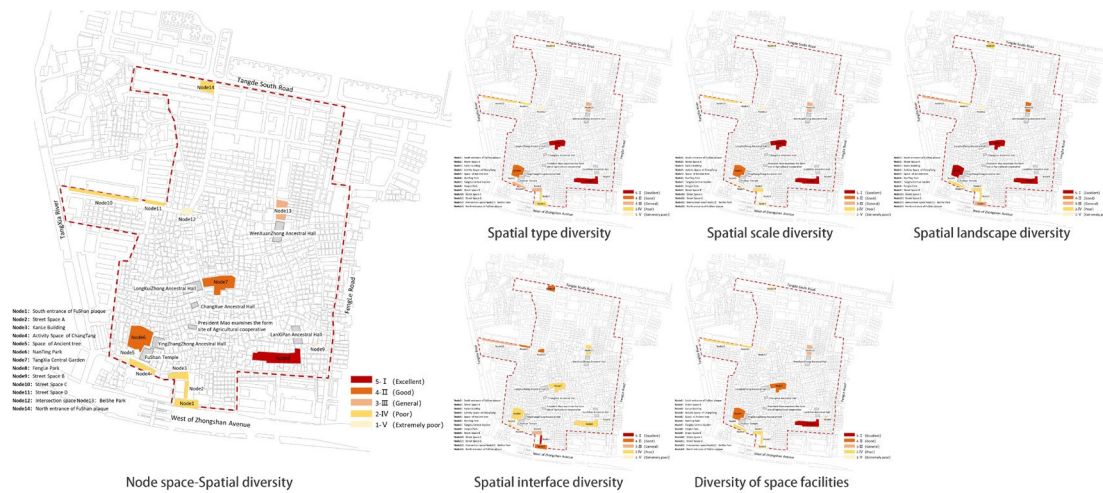


Figure 7. Evaluation of nodal space-spatial diversity.

2) Street space

① Evaluation and analysis of spatial structure

The semantic model of the street space in the urban village is constructed, and the relationship matrix of the node space network is established through practical research. The corresponding indicator calculation is carried out using the Ucinet 6.0 software. The evaluation results are obtained (Figure 8): The evaluation factors of the spatial structure are weighted and the results of the comprehensive evaluation of the space-spatial structure of streets and alleys are obtained. Overall analysis, the spatial structure of the main street is generally scored higher, and some of the smaller streets and alleys in the living streets have lower scores. Street space A1 and B30 have the highest evaluation level of I (Excellent), and these two roads basically have no problems in the spatial structure of the entire Tangxia Village street and lane space network. The evaluation level of street space A11, A28, A29, B4, B11, B32 and B35 is II. (Good), and there are some flaws in the spatial structure of the street space network. Other streets and alleys are rated at III. (General) and below, and there are basically large or very serious problems.



Figure 8. Street space - spatial structure evaluation.

②Space quality evaluation and analysis

The evaluation factors of spatial quality are weighted and the comprehensive evaluation results of street space-space quality are obtained (Figure 9). The overall evaluation of street and alley space is low, and the comprehensive evaluation of the quality of street space on the north side is generally higher than that of the streets and alleys on the south side. The highest evaluation level of street space is that street and alley A1 is II. (Good), the comprehensive evaluation of space quality is better, and there are some small problems in various evaluation factors. Among them, the evaluation level of A2, A11, A17, A18, A22, A29, B4, B32, B40 and B41 is III (General), the comprehensive evaluation of spatial quality is general, and there are certain problems in various evaluation factors. The evaluation level of other street spaces is IV(Poor) and below, and these street spaces have very serious problems in terms of space quality.

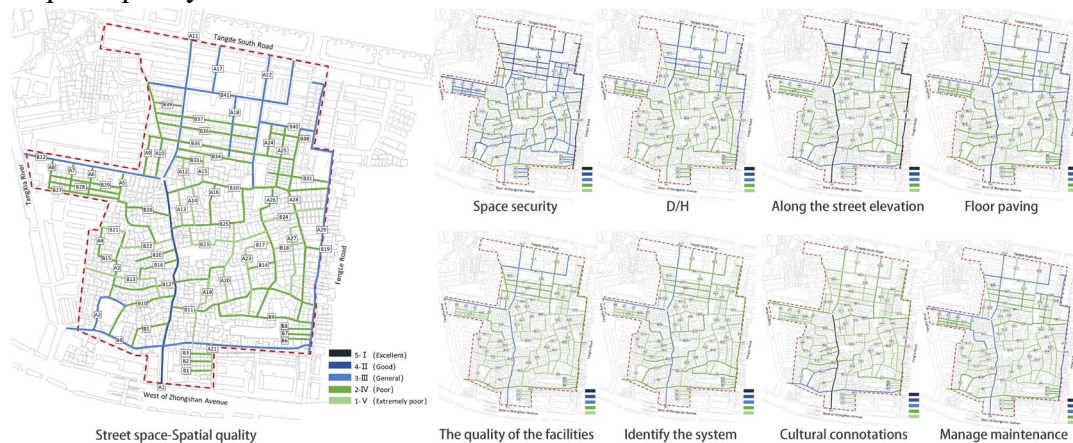


Figure 9. Street space - space quality evaluation.

4.2 Collaborative evaluation and analysis of "social status"

The data analyzed by the collaborative evaluation are derived from field survey statistics and questionnaire survey methods. Among them, the spatial satisfaction and social network status quo were surveyed by questionnaire survey, and a total of 150 copies were distributed, 150 were recovered, and 146 valid questionnaires were issued, with an effective rate of 97.3%. The current situation of public activities is to select weekend time for research, from 8:00 am to 20:00 pm, every two hours interval for a time point, a total of seven time points for research. The node space mainly investigates the types of public activities, the number of people who are active, the density of the crowd, and the types of people.

1) Space satisfaction

① Node space satisfaction

From Figure 10, the overall evaluation of spatial accessibility satisfaction can be obtained at the "general satisfaction" level, and nodes 1, 2, 3, and 12 have the highest satisfaction and are "relatively satisfied". The overall evaluation of space quality satisfaction is more polarized, and the spatial quality satisfaction of node 1, 2, 3 and 7 transformed node spaces is generally higher than that of untransformed node spaces. The overall satisfaction of spatial diversity satisfaction is higher, of which the spatial satisfaction of nodes 1, 2, 3, 6, 7 and 8 has reached the level of "relatively satisfactory". Nodes 4, 5, 9, 12, and 13 are all satisfied with accessibility, quality, and diversity. The three satisfaction results are basically consistent with the analysis results of the main evaluation of "public space", indicating the rationality and accuracy of the comprehensive evaluation system.

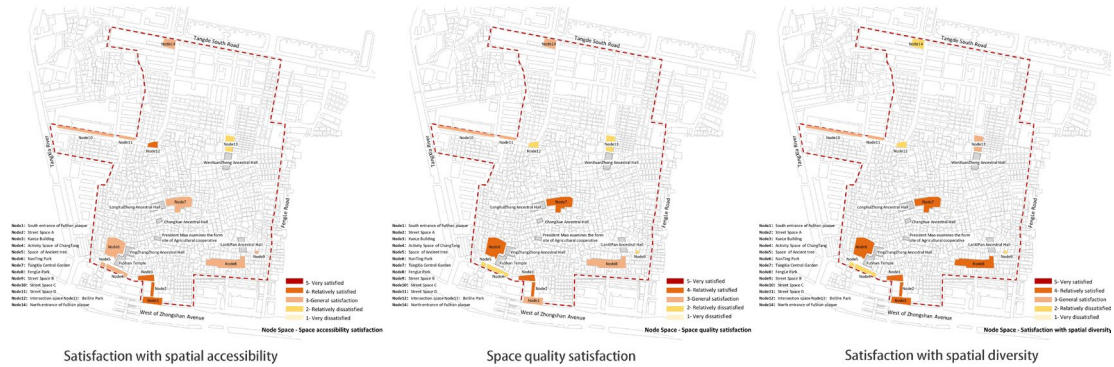


Figure 10. Node space - spatial satisfaction.

② Street space satisfaction

Due to the large number of streets and alleys, only a few major streets and alleys were surveyed on the satisfaction of residents, including A1, A11, A29, B4, B30, B32, B41, and other smaller streets and alleys to do a unified satisfaction survey. From Figure 11, we can see that the satisfaction of several streets surveyed is generally higher, and they are above the "general satisfaction" level. In terms of spatial accessibility satisfaction, the satisfaction of the streets and alleys A1, A11, A29 and B32 has reached "very satisfaction", and they are also the main streets with the largest flow of people in Tangxia Village, carrying most of the shops. In the satisfaction of space quality, the satisfaction of A1, A11, A29 and B32 has reached "relatively satisfactory", and the rest of the streets and alleys are "generally satisfied". The satisfaction results of these streets and alleys are consistent with the results of the comprehensive evaluation of the space-space quality of the streets and alleys, which confirms the rationality and accuracy of the results.



Figure 11. Street space - space satisfaction.

2) Status of public activities

From the overall analysis (Figure 12), the data performance of nodes 6, 7 and 8 are better than other node spaces, which is consistent with the evaluation results of the three criterion layers of node space structure, quality and diversity in the previous article. Tangxia Village public activities have the following characteristics: Tangxia Village public activities have a single type, mainly daily activities such as rest, small talk, chess and cards, etc., and the scale and scope of activities are small, which is not conducive to the expansion of the social network breadth of the activity population; The small number of public activities and the low density of crowds reflect the difficulty of node spaces to attract and promote public activities for people; The distribution of different types of people participating in public activities is not independent, and the phenomenon of mixed activity space occurs; Public activities usually occur between fixed acquaintances and acquaintances, and the characteristics of "small groups" are more obvious, which is easy to homogenize social interaction groups and enhance the cohesion of social networks, which is not conducive to the development of their breadth and depth.

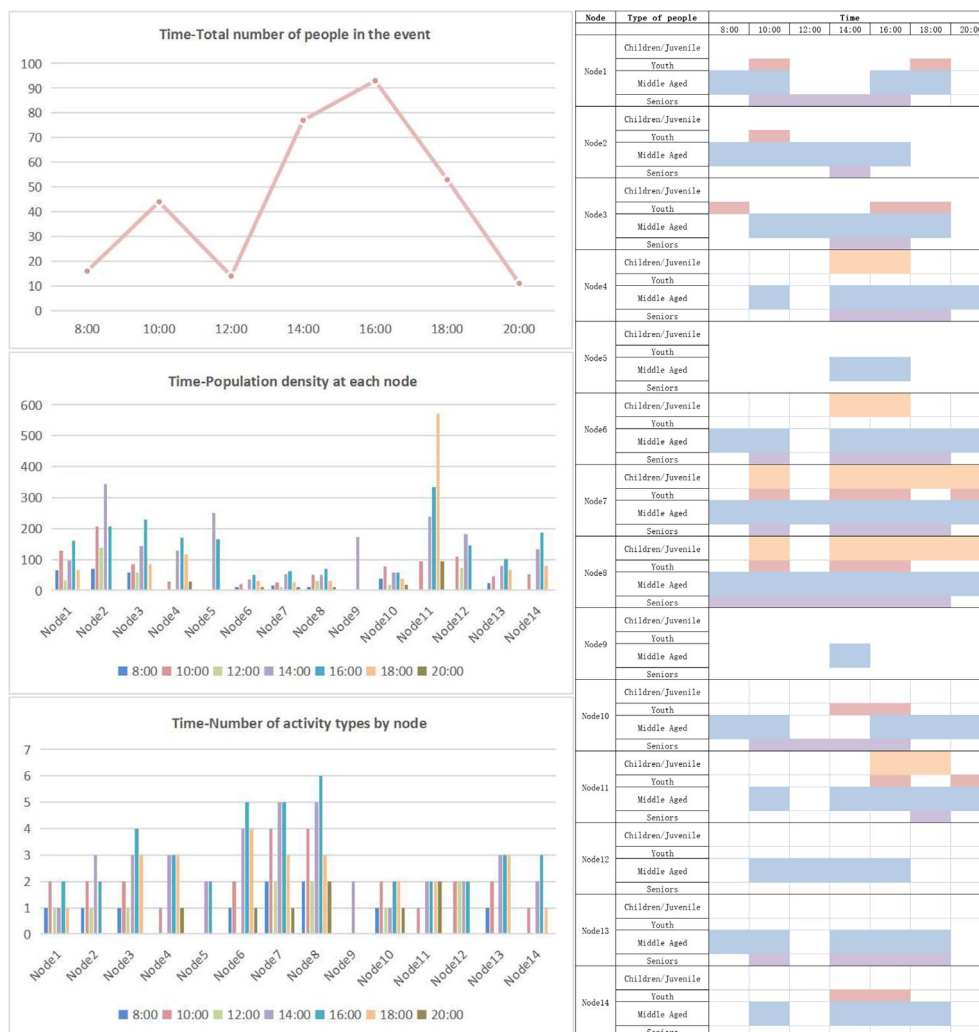


Figure 12. Status quo of public activities in Tangxia Village.

3) The current state of social networks

According to the questionnaire survey (Figure 13), the social relations of the residents of Tangxia Village showed multiple differences. Among them, diversity is reflected in the social relations between indigenous peoples and foreign groups, including friends, relatives, colleagues, neighbors and classmates. The differences are reflected in the large differences between indigenous peoples and foreign groups in terms of the intimacy and regionality of social networks, as well as the intensity and mode of social interaction.

The overall social network of Tangxia Village shows de-regionality and instability. De-

territoriality means that whether it is an indigenous person or an alien group, when seeking social support, there is a greater probability of seeking support from outside the village, and it is difficult to comprehensively and effectively cover the social support network of the residents by relying on the geographical relationship in the village, which is more obvious in the foreign group. Instability is reflected in the fragility of connections between residents and neighborhoods, the weak network of social interaction, the low degree of integration and connection between the social networks of indigenous peoples and foreign groups, and the less circulation of information and resources. In the actual investigation and visits, it was found that some foreign groups mainly in Henan, Hubei and Hunan provinces will show a high density of settlements with fellow villagers and relatives and friends in Tangxia Village.

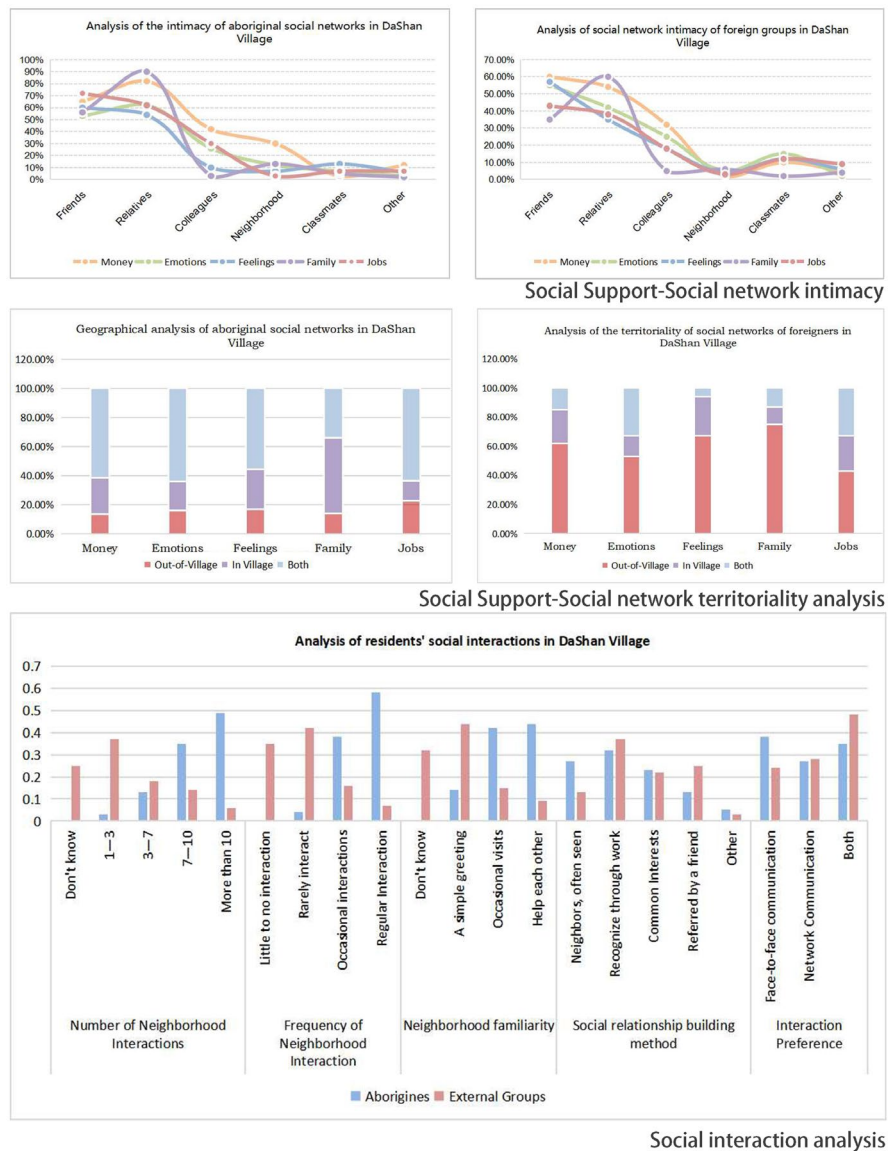


Figure 13. Status quo of social network in Tangxia Village.

4.3 Comprehensive evaluation results

According to the analysis of the main evaluation of the "public space" in Tangxia Village and the collaborative evaluation analysis of the "social status" in Tangxia Village, a comprehensive evaluation analysis is carried out.

1) Comprehensive evaluation of node space

The comprehensive evaluation results of the ability of each node space in Tangxia Village to promote the healthy development of social networks are shown in Figure 14. In general, the ability of node space to promote the healthy development of social networks is relatively general, the

evaluation level of individual capabilities is high, and the evaluation level of most node spatial capabilities is generally or even poor. This is consistent with the current pluralistic heterogeneity, fragility and instability of the social network in Tangxia Village.

Nodes 6, 7 and 8 have evaluation grades of II (Good), accounting for 21.4%, carrying most of the types of public activities and activity crowds in the village. In the process of renovation and renewal, on the basis of retaining the original space structure, the individual problems existing in the quality of the space are optimized and improved.

Nodes 1, 2, 3, 10 and 13 have evaluation ratings of III. (General), accounting for 35.7%, carrying the types of public activities and activity crowds in the village. In the process of renovation and renewal, we pay attention to improving the larger problems in the quality of space, and focus on the improvement of its spatial diversity to enhance its functional complexity.

Nodes 4, 5, 9, 11, 12 and 14 were rated IV (Poor), accounting for 42.9%, carrying a small number of public space types and activity groups in Tangxia Village. In the process of transformation and renewal, nodes with large problems in spatial structure are focused on clarifying their status in the node space network, and comprehensively improving and optimizing the major problems in spatial quality and spatial diversity.

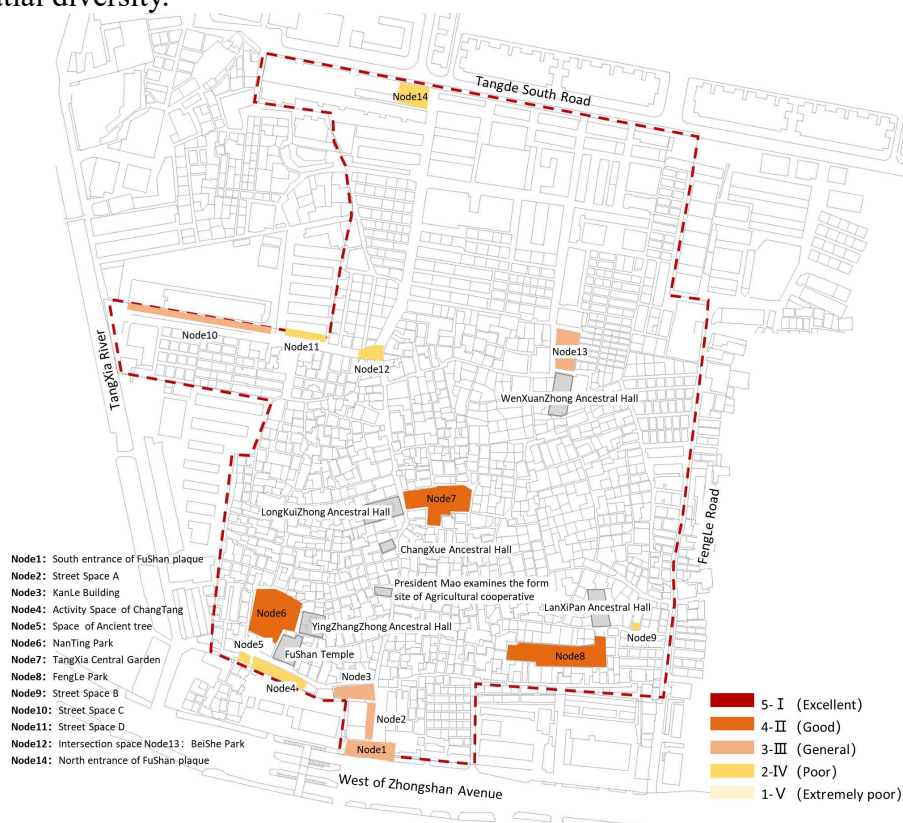


Figure 14. Comprehensive evaluation of node space.

2) Comprehensive evaluation of street space

The comprehensive evaluation results of the ability of each street space in Tangxia Village to promote the healthy development of social networks are shown in Figure 15. In general, the evaluation level of the spatial ability of individual streets and alleys is high, and the evaluation level of spatial ability of most streets and alleys is generally or even poor. Among them, the street space A1, A11 and A29, rated II (Good), accounting for 4.3%, carry the most important commercial functions and flow of people in Tangxia Village. In the process of renovation and upgrading, only the individual problems in the quality of its space need to be optimized and improved.

The evaluation grades of A22, A25, A26, A28, B4, B9, B10, B11, B25, B30, B32, B35, B36, B37, B40 and B41 are III (General), accounting for 22.9%, carrying part of the commercial functions in Tangxia Village, and has a large flow of people. In the process of renovation and renewal, pay attention to improving the larger problems in the quality of the space, and improve the carrying

capacity of its residents, commercial and other functions.

The evaluation of other streets and alleys is IV (Poor) and V (Extremely Poor), accounting for 72.8%, which carries the function of residents in Tangxia Village. In the process of renovation and renewal, the living streets and alleys with major problems in the spatial structure are focused on clarifying their status in the street and alley space network, and comprehensively improving and optimizing the problems in the spatial quality evaluation factors.



Figure 15. Comprehensive evaluation of street and alley space.

5. Conclusion

In this study, using the analytic hierarchy method and the social network analysis method, a comprehensive evaluation system of public space in urban villages with the main evaluation of "public space" and the collaborative evaluation of "social status" is constructed, and the public space of Tangxia Village in Guangzhou is comprehensively evaluated as an example, and the characteristics and problems of its public space are obtained, so as to provide guidance for the micro-transformation of its public space.

This research has the following innovative points: First, it further enriches the research on the evaluation system of public space in urban villages, provides new theoretical research perspectives and ideas for the research of public spaces in urban villages, and promotes the development of the research field of cross-integration of social network theory and public space. Secondly, in recent years, social networks have had extensive research in the fields of urban and rural planning and landscape architecture, but they are often limited to the overall research of the network and cannot directly solve the problems at the micro design level. This study directly evaluates and analyzes the macro planning level and the micro design level in a combination of qualitative and quantitative methods, which can more comprehensively evaluate and study the public space in urban villages, put forward more reasonable transformation strategies, and improve the application and practice methods of social networks.

There are still some deficiencies in this study, and I hope to expand it from the following aspects in the future: (1) This evaluation system evaluates a single public space, and fails to quantitatively

evaluate the public space as a whole. (2) It is difficult to prove the universality and rationality of the evaluation system for a single case study, and it is expected that the comprehensive evaluation of public spaces in multiple urban villages will be comprehensively evaluated and analyzed horizontally in order to verify and optimize the comprehensive evaluation system.

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