The Influence of the Interface Characteristics of Street in Historical and Cultural Blocks on the Vitality of the Block

Taking Kuanzhai Alley as an Example

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Abstract. The historical and cultural blocks have rich spatial interface characteristics and rich research value. However, after literature review, most of the previous studies have not separated the influence of individual material attributes on neighborhood vitality, so it is impossible to determine which factors are more important and they are suitable for space. Whether there will be differences in the impact of vitality. Based on the previous literature research, this study attempts to deeply analyze the influence of the interface characteristics of the street space in historical and cultural blocks on the vitality of the neighborhood, namely, the three main influencing variables of interfacial transparency, store density and street width, through mathematical derivation and theoretical analysis. The combination of analysis and analysis reveals the influence of these variables on the vitality of the neighborhood, aiming to provide reference for the design of high-quality street space.

Keywords: Spatial interface features, Historical and cultural district, Street vitality, Features and features.

1. Introduction

Historical and cultural blocks refer to living areas that preserve a certain number and scale of historical structures and are relatively complete in style. Buildings in the block may not all contain the value of cultural relics. However, the overall environment and spatial form of the building constitute the characteristics of the particular historical stage of the region. The street space has always been a place for people to participate in life, communication and interaction, and is an external space in which we live. The functions of the streets and lanes start from the walking and driving requirements to exchange goods along the road, and gradually integrate political, economic, cultural and artistic factors. Since then, the street space has become a living space for multi-functional activities, thus enabling its spatial interface is also diverse and complex. The interface is generated along with the formation of streets and lanes. Together they evolve and evolve with the occurrence and development of the city. Compared with space, the interface refers to the planar elements that define a certain space or field. As the interface between the entity and the space,the interface is a special morphological component, which is an indispensable component of the physical element and inseparable from the space. It is usually the interface that people are most likely to perceive on the road, and is the vertical component of the street space. Because its form, scale, and composition form directly shape the shape of the street, it will have a crucial impact on the creation of space. Street vitality refers to the good interaction between people and neighborhoods. According to the characteristics of social life, the combination of human activities and street vitality forms an open revival thinking and builds a macro vision.

For the characteristics of the street space interface, most of its research methods have gradually shifted from the empirically based induction analysis to the empirical research in different street environments. For example, Jan Gehl discovered through the investigation of commercial streets in Copenhagen in 2012. The street space in the surface features is seven times more vibrant than the negative one; Thomas Hill Lopez based on the case study in Madrid, draws similar conclusions and proposes the interface variable parameters of the vibrant street; Space Syntax Company The analysis

of 17 walking environment factors in the city of London also found that the activity level of the bottom floor interface is a key factor affecting the vitality of street space, and its importance is second only to spatial integration. In 2010, Kamada and Hiroshi selected 10 different streets in Japan, listed eight spatial variables such as road width, street width, building layer and building density, and analyzed the correlation between street space constituent elements and spatial perception, and found the building. The bumps of the object will affect the spatial feeling of "broadness." Recently, Chen Yong and Zhao Xinghua used a combination of mathematical derivation and theoretical analysis to study the bottom interface of 17 sections of Huaihai Road in Shanghai based on the pedestrian perspective, and analyzed the width of the frontage area. The effects of transparency, store density and functional density on street activities; Xu Leiqing and Kang Qi also used the same method to study the bottom interface of 11 sections of Nanjing West Road in Shanghai, and analyzed street length, street width, street height, store density, functional density, transparency, openness, and the impact of the total length of the seat on street activities. Both groups of researchers have achieved important results. However, most of the above studies summarize the various attributes describing the interface characteristics of the bottom layer of the building into a variable factor, that is, describe the influence of the activity level of the interface on the activity, and gradually get rid of the individual material properties to study its influence on the vitality of the block. Consciousness, but still can't determine which factors are more important in the street space interface and whether they will have different effects on space vibrancy.

Based on the previous literature research, this paper attempts to deeply explore the influence of individual material attributes on the vitality of the neighborhood, that is, empirically study the relationship between the spatial characteristics of the street and the various variables of the interface, and to reveal the influence of these variables on the vitality of the neighborhood through mathematical derivation. On the one hand, it helps to better understand the relationship between historical and cultural blocks and its street space, to provide suggestions for the humanized design of street space, and to provide clues and experience for objective and comprehensive evaluation of historical and cultural blocks.

2.　Empirical Research

Through data review, this paper selects Chengdu Kuanzhai Alley Historical and Cultural Street as a research case. Chengdu, as one of the 24 historical and cultural cities announced by the State Council, has a long history. Kuanzhai Alley, in 1984, in the "Chengdu Historic City Protection Plan", together with Daci Temple and Wenshu monastery, three historical and cultural reserves were identified, which are typical examples of Researching historical and cultural blocks.

The Kuanzhai Alley retains the layout of the northern alley "fish-bone" in the spatial layout. The street is a barrack-style, Consisting of three parallel east-west alley, with three or four courtyards on either side. The spatial hierarchy is distinct and rich, the texture is dense, and the street scale is pleasant. It is a typical case to study the influence of individual material properties on the vitality of the neighborhood.

In this study, three parallel east-west alleys (Wide Alley, Narrow Alley and Jing Alley) in the Kuanzhai Alley Historical and Cultural District of Chengdu are the focus of this study.

Fig. 1 Basic overview of wide alley narrow alley and jing alley (source: self-recording)

3.   Research Methods

First of all, the author divides the three alleys of Kuanzhai Alley into 12 sections according to the unit modulus of 100m. Considering the radiation impact of the surrounding environment on the street vitality, 11 sections are selected for research.

The density of the storefront refers to the number of commercial units per 100m on the street building interface of each street. The author's design calculation formula is: store density = total business unit / street length $\times 100$m

Interface transparency, as we all know, there are various forms of building interface along the street. In this study, the author divides it into three main categories: 1. Free and open storefront length: a facade that allows visitors to enter and exit freely; 2. Transparent Facade: Place glass on the wall so that people's eyes can pass through it into the room; 3. Transparent window: Visitors can only see windows of a certain depth, and when the height of the bottom edge is too high (above 1.5m) , multiply its width by 0.5; 4, impervious to the wall: the person's line of sight is blocked and can only see through the wall of the building surface. Transparency = (free open storefront length * 1.25 + transparent facade length * 1 + 3 transparent window length * 0.75 + 4 impervious wall * 0) / total length of the building's bottom interface * 100%.

Street width, because the three old streets are almost the same way of walking, so the overall width of the street as the research object, take the overall situation to calculate the street width, the calculation method is as follows: street width = total street / street length.

For the vitality of the neighborhood, the author will select several suitable blocks of different time periods to average the vitality. The specific calculation method is: select the population thermodynamic maps of three different time periods. In order to avoid the contingency of the experimental results, the author selects the selected Four holidays with good temperature and fine weather (March 17-18, 24-25, March 2018) and four working days (March 19-22) were investigated and selected including morning (9:30) and afternoon (2: 30) and evening (6:00) data were analyzed. The author divides the heat map into four different stages, namely: 1, most crowded, the number is more than 400; 2, more crowded, the number is 200-300; 3, slightly less crowded, the number is 100-200; 4, is sparse, the number is less than 100 people. The final vitality calculation method is: neighborhood vitality = (1 most crowded length * 4 + 2 more crowded length * 2 + 3 slightly less crowded length + 4 sparse length * 0) / total length of the building bottom interface.

Finally, this study will use linear regression analysis for analysis. First, linear regression analysis shows that street vibrancy is affected by various spatial interface elements, and the simple scatter plots are further analyzed by the distribution of the distribution points of the two variables and the shape and direction of the quasi-parallel lines. Finally draw conclusions about the correlation between the three variables of the bottom-level interface of the historical and cultural blocks and the neighborhood vitality.

Fig. 2 Street distribution map (source: self-drawing)

Table 1 Street width, store density, interface transparency and street vitality

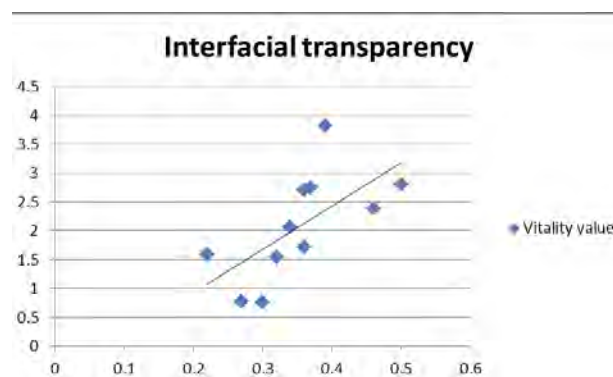|	Interfacial transparency	Store density	Street width	Vitality value
1	0.46	0.12	8.28	2.38
2	0.27	0.07	7.54	0.77
3	0.50	0.14	9.74	2.81
4	0.34	0.15	7.85	2.07
5	0.37	0.16	9.44	2.75
6	0.39	0.18	5.52	3.82
7	0.36	0.16	5.98	2.7
8	0.32	0.15	6.34	1.54
9	0.30	0.06	14.99	0.76
10	0.22	0.03	20.02	1.59
11	0.36	0.04	15.32	1.72

Fig. 3 Street width, store density, interface transparency and street vitality (source: self-drawing)
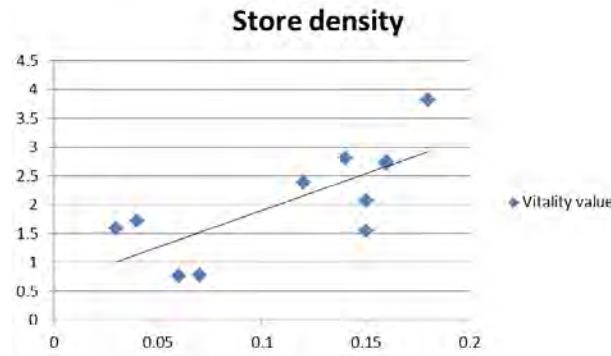
Store density

Fig. 4 Street width, store density, interface transparency and street vitality (source: self-drawing)
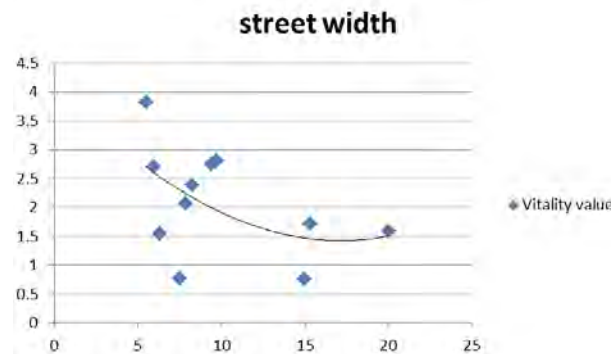
street width

Fig. 5 Street width, store density, interface transparency and street vitality (source: self-drawing)

3.1 Interfacial Transparency

Transparency of the bottom layer along the street has a great impact on the vitality of the block. The fitting line shows a clear upward trend. The 11 street segments have large differences. The interface transparency ranges from 0.22 to 0.50. The highest vitality value is located in the 6th street segment. The transparency is 0.39. Judging from the on-site investigation, the two sections are mainly composed of food stores and jewelry stores with small area but high openness. When the transparency is greater than 0.3, the street vitality level is significantly higher. It can be seen that the transparency of the bottom layer interface of the historical and cultural blocks has a positive influence on the street vitality and the impact is more significant, and the transparency of the interface can be promoted when the transparency of the interface is not less than 0.3.

It can be seen that the transparent bottom-floor interface is an open interface, which enables visibility between internal architectural activities and external street activities to communicate and interact. This is an important design of attraction for pedestrians in such historical and cultural blocks.

3.2 Store Density

The fitting curve of store density and street vitality distribution chart showed an upward trend, and when the store density was 0.18, the vitality value was the largest. According to the field investigation, in addition to the large-scale food and beverage storefronts, more street-side stores face small units, high-density and multi-format forms. The store density is 3~18 commercial units per 100 meters and the store density is higher. High, the higher the vibrancy of the street. It is not difficult to see from the figure that the density of the store has a positive impact on the vitality of the block, and the layout of the high-density and multi-format of the small unit can promote the vitality of the block.

There is a positive relationship between the density of the storefront and the street vibrancy. The high-density and multi-format layout mode of the small unit makes the underlying storefront and the street related to each other, and has more commercial display areas, and can provide more options for pedestrian activities. In this study, it is not difficult to see that the store density of the Kuanzhai Alley Historical and Cultural District in Chengdu is more serious. According to its planning background, the Wide Alley and Narrow Alley adopt the layout of small units, high density and multi-format, while the Jing Alley are opposite. The street vibrancy of the two streets is also very different. The

street vigor of Jing Alley is obviously lower than that of Kuanzhai Alley. It can be seen that the storefront density of the building has a positive impact on the vitality of the historical and cultural blocks. In the design of the historical and cultural blocks, it is possible to enrich the vitality of the neighborhood by setting up a small-unit high-density and multi-storey storefront, which is more popular.

3.3 Street Width

The street width and street vitality scatter plot fitting curve showed a significant downward trend and decreased with increasing width. Most of the activity values greater than 1.5 are distributed in the range of the street width of 5-10m, the highest point is distributed at 5.52m, followed by 5.98m. Judging from the results of the survey data and the line, the width of the street has a negative impact on the vitality of the street. The control of the street can optimize the street vitality to a certain extent within a certain width.

Street width is one of the primary factors affecting walking activities. Narrow streets are good for promoting vitality. When the width of the street exceeds a certain limit, it has a very negative impact on street vitality. By consulting the literature of the predecessors, 0-7m is the strongest communication distance. Combined with the analysis of this study, in the design of historical and cultural blocks, it is recommended that the total width of the street is 5-8m, which will contribute to the improvement of the vitality value when the lower limit is taken. In short, the street width of historical and cultural blocks should not be too wide.

4. Conclusion

Studies have shown that the interface characteristics of the street space in historical and cultural blocks do have a significant correlation with the vitality of the block. Through on-the-spot investigation and analysis of the above data results, the author puts forward the following suggestions for the planning and design of street space in historical and cultural blocks: (1) The transparency of the bottom floor interface of historical and cultural blocks has a positive impact on street vitality, and appropriately increasing the transparency of the bottom interface can promote the vitality of the block. (2) The storefront density of the building has a positive impact on the vitality of the block. In the design, the storefront can be enriched by setting small units, high-density and multi-format storefronts. (3) Street width is one of the primary factors affecting pedestrian walking activity. Narrow streets are conducive to promoting vitality, but the street width exceeds a certain limit and has a very negative impact on street vitality.

At the same time, it is necessary to explain that the key variables of the interface are interactive. It is these that are the superposition and complementarity of these key elements that together contribute to the street's vitality. This study only selects some spatial variables that mainly affect the bottom-level interface of pedestrian activities, and the selected spatial variables are not all variables. There are similar macro-level and micro-level factors in the street, which affect their vitality to varying degrees, but variables are difficult to quantify, so they are not analyzed in this article, but this does not deny the importance of these factors, which needs further research to refine and correct.

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