Short Paper

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Analysis of Space Attribute and Tourist Behavior Pattern on Chinese Private Gardens restructuring the spatial argument

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Chinese private garden; spatial attributes; tourists behavior pattern

Abstract
Chinese private gardens are the representative of the tiptop accomplishment of Chinese classical garden art. To better understand the configuration of these gardens, the Guozhuang Garden in Hangzhou city and the Shizilin Garden in Suzhou city are taken as the typical case studies. This thesis explores and elucidates the space attribute of both gardens, and integrates the theoretical analysis with the investigations of the tourist behavior pattern. Syntactical analysis together with classical comparative methods analyzes both gardens on the eye-height level and the knee-height level space in terms of the connectivity, the step depth, and the integration values with the purpose of proving one of the most distinctive space attribute of Chinese classical garden that the knee-height level space is separated while the eye-height level space is still continuous. By comparing the space attribute of the gardens with the tourist behavior, this analysis explains why tourist response that the Shizilin Garden is larger than the Guozhuang Garden while the former is actually smaller than the latter. This result also suggests that the quantitative analysis can help the designers to understand more explicitly about the space design of gardens. Moreover, the eye-height level and the knee-height level spaces of the gardens influence the tourist behavior respectively.

Introduction

Two space attributes are regularly discussed in the history of Chinese landscape architecture. One is that the knee-height level space is separated while the eye-height level space is still continuous (referred to as the Principle of Continuity in below) and the other one is that the scene changes along with moving steps (Peng 2003, 38-39). Hundreds of scholars have done a great deal of qualitative analysis in centuries. Recently, there comes forth a growing demand of putting quantitative analysis of space attributes on the agenda. The paper aims to analyze the space attributes of Chinese Classical Gardens in a quantitative perspective and at the same time study on how tourist behavior will be influenced by space distribution.

Selection of Research Object

The paper chooses the Guozhuang Garden and Shizilin Garden (Figure 1) as case studies for comparative analysis. Three major factors are taking into account. Firstly, the two gardens are comparable because they are similar in size and function (She 2006, 39-41). Secondly, tourist behavior analysis is essential because the difference in layout will inevitably cause diversity in how tourists travel in the gardens. Finally, the Principle of Continuity is one of the greatest roles in spatial design of Chinese Classical Gardens (Zhou 2005, 447-448), especially for private gardens in Yangtze River regions (Cheng 1999, 159-160). The sizes of the two gardens are relatively small which provides good conditions for both knee-height level and eye-height level studies.

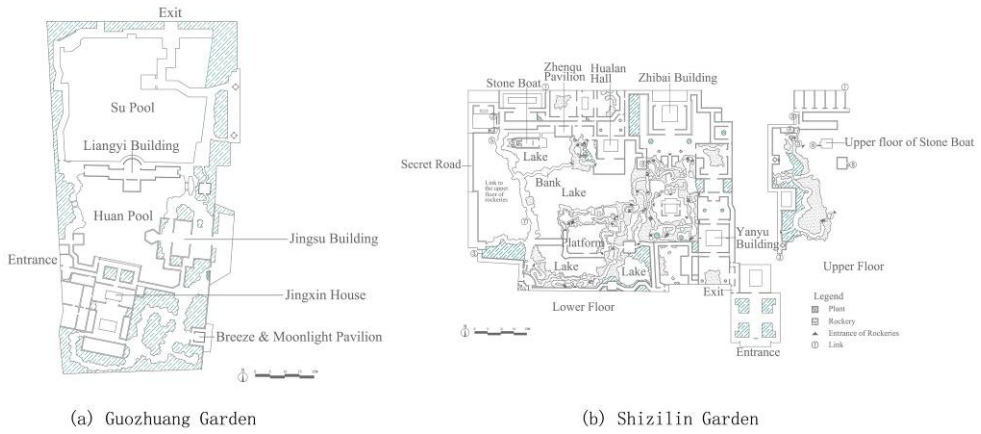

Figure 1
General Layout of both Guozhuang Garden and Shizilin Garden.

Methodology

In the paper, comparative analysis are carried out on space attributes and tourist behavior of Guozhuang Garden and Shizilin Garden. In order to describe the space attributes (Hillier 1996) of the gardens, the author employs Visibility Graph Analysis provided by Depthmap software. When describing the visitorsi¯ behavior pattern, a field survey is carried out to record how people travel in the gardens and their feelings about the garden spaces. Connectivity, step depth and integration are analyzed and the figures are plotted according to the obtained data. The warmer color in the graph represents the area of higher connectivity and integration while it illustrates lower step depth (Duan and Hillier 2007, 17-19).

Tourist behavior pattern is discussed from two aspects, route record (Tsuyoshi and Furuyama 2000, 69-71) and stop record. In order to investigate the route how tourists travel, different groups of people are selected randomly in the entrance regardless of people who are guided by tourist guiders. Spots where people stop are also recorded in the survey, including places people may pause for photography, rest or sight-seeing.

Another important work in the study is field interview. No matter what the scale and complexity of a space is, there exist some important attributes that are easy to memorize for the tourists, referred to as readability (Lynch 1960, 3-4). So as to study how people memorize the readable parts of the gardens, a field interview is designed. The interview includes issues such as whether people have got lost in the garden and whether they can locate their position on the map.

Comparative Analysis on Space Attributes of Guozhuang Garden and Shizilin Garden

Figure 2(a) shows both the knee-height level and eye-height level connectivity of Guozhuang Garden. Generally speaking, the connectivity of knee-height level is quite low (cold color) while it is relatively high on the east of Jingsu Building and on the northeast of Su Pool. However, the eye-height level connectivity is commonly higher and the warmest color appears all around the Su Pool. The main reason to explain this is that the Su Pool is an open area and spaces which are separated by the pool on knee-height level is still continuous on eye-height level.

Figure 2(b) shows the connectivity of Shizilin Garden. The knee-height level connectivity values of each areas are all relatively low, especially that of the rockeries. This is because that the roads on the rockeries are not only zigzag but also very narrow, with an average breadth of less than 1 meter. In some area of the rockeries only one passenger can walk through at a time. The narrowness and the sinuosity of the roads lead to space discontinuity.

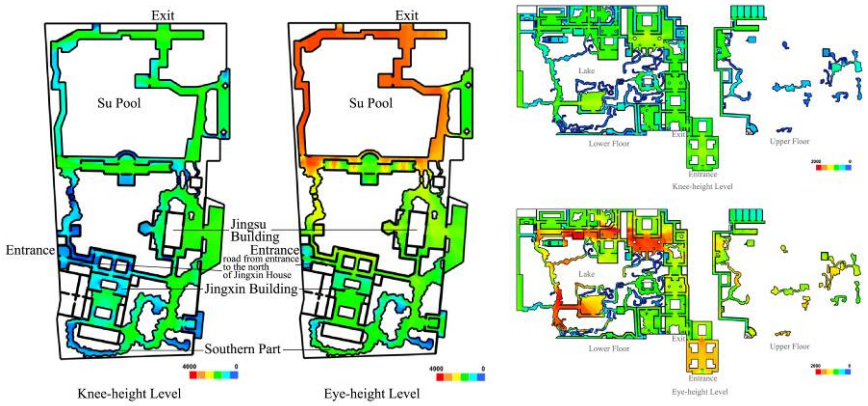

Figure 2
Connectivity Graph

Figure 3(a) shows the integration of Guozhuang Garden on both levels. On the knee-height level, the center of integration is on the east of Liangyi Building while on the eye-height level the center transfers to the west of Liangyi Building. This demonstrates that in the knee-height level analysis, the east of Liangyi Building is the most accessible place while the eye-height level analysis shows that the west of Liangyi Building is the most observable. That is why Liangyi Building is the best choice for visitors to stop for a rest.

Figure 3(b) shows the integration of Shizilin Garden. The center of integration is located in front of Zhibai Building in knee-height level analysis while it transfers to Zhenqu Pavilion on eye-height level. In practical survey, the data show that a lot of people are dwelling near Zhibai Building and Zhenqu Pavilion which can be explained from the result of integration analysis. Zhibai Building is the most accessible area and Zhenqu Pavilion is the most observable place and that is why many tourists are attracted.

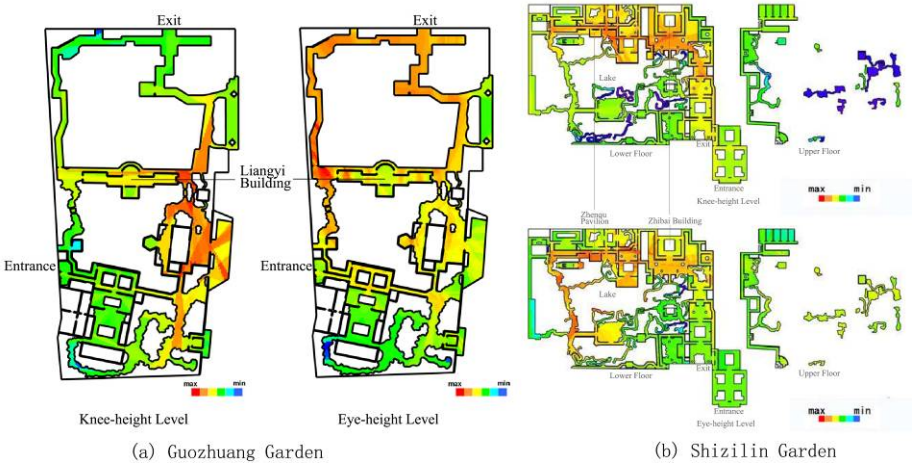

Figure 3
Integration Graph

Independent analysis of Guozhang Garden and Shizilin Garden reveals the important role the leaking window, -a widely used architectural component in Chinese Classical Gardens -plays in determining the integration of the spaces. This application is very common in the design of Chinese Gardens such as pavilions, joint galleries. In the long-narrow pathway of Guozhuang Garden and Shizilin Garden, the leaking windows connect separated spaces as a whole, though their sizes are quite small, shown in Figure 4 .

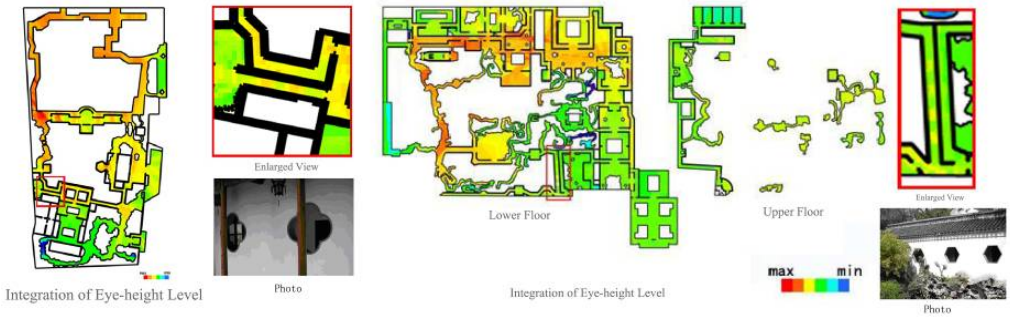

Figure 4
Effect of Leaking Window on Integration

Figure 5 shows the step depth of the entrance in Guozhuang Garden and Shizilin Garden. It is easy to observe the influence of leaking window which connects separated areas together.

Figure 5
Step Depth Graph of the Entrance

The average step depth of knee-height level is 5.84 and eye-height level is 2.42 in Guozhuang Garden, however, the former one is 10.65 and the latter one is 4.06 in Shizilin Garden. The data show that the average step depth on eye-height level is much less than that on knee-height level. This not only gives a quantitative description of the Principle of Continuity in Chinese Classical Gardens but also points out the distinction between the garden space and urban space. Moreover, the average step depth in Shizilin Garden is larger than that of Guozhuang Garden in both levels. In term of the two gardens are of the same size, an obvious fact is proved in a quantitative way: the Shizilin Garden is more complex than the Guozhuang Garden.

Comparative Analysis on Tourist Behavior Pattern of Guozhuang Garden and Shizilin Garden

Figure 6(a) shows the result of random survey of tourist traveling routes in Guozhuang Garden. Traveling routes mainly converge on the east of Jingsu Building which is in accordance with former integration analysis on knee-height level. The knee-height level integration value of this area is quite high which means that this place has the greatest arrival rate of tourists.

Random survey of tourist routes is also carried out for Shizilin Garden, shown in Figure 6(b). The figure shows that when arriving at the red area, 6% of tourists pick the narrow road on the right, while

others choose the road on the left. The road on the right is originally designed for servant use, so it is quite dark and narrow. Meanwhile, the analysis of integration illustrates that the road on the left is of higher integration value and that is a good explanation for having more passengers.

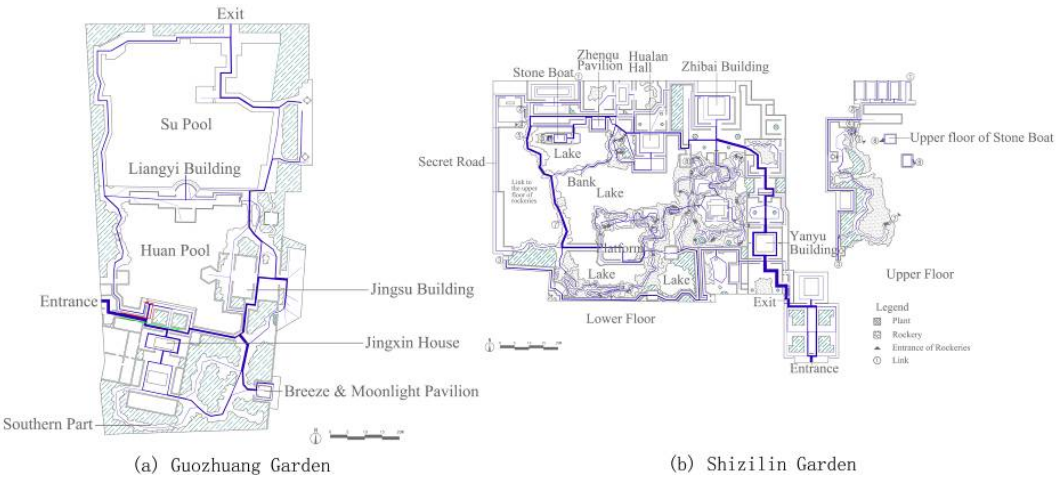

Figure 6
Statistical Graph of Routes

Figure 7(a) shows the record of tourist stops during traveling. The stop density is much higher on the west of Jingsu Building, the east of Liangyi Building and the north of Jingxin Building. This can be explained by eye-height level integration shown in Figure 3. These places are of high integration values which means they are quite accessible. The roads in the southern part of Guozhuang Garden have few visitors and people rarely pause for sightseeing. These roads were built for servants in old times so they are very narrow and dark. The inaccessibility of these roads is also proved in connectivity and integration analysis.

Figure 7(b) shows the stop records of tourists who mainly dwelling at places such as the entrance area, Yanyu Building, Zhibai Building, Hualan Building and the surroundings of the lake. These places have high values of connectivity and integration while the step depth is quite low which means that they are not only easily accessible but also have a good vision for nearby spaces. In comparison, the secret road has no stop record which conforms to its low values of integration and connectivity. The road is quite darksome and is located in spots that have few visitors.

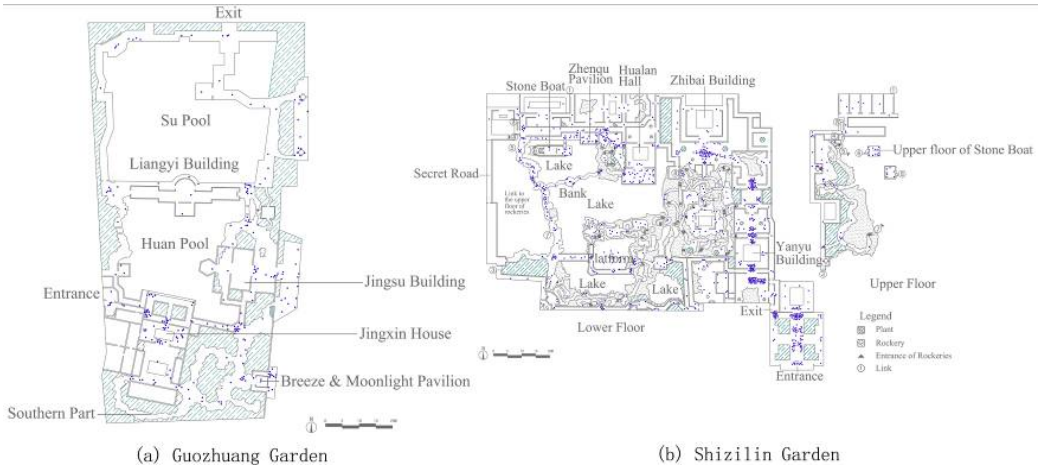

Figure 7
Statistical Graph of Stops

Field interview is carried out on issues such as self-positioning in the garden and personal feeling of spaces, shown in Table 1. It is easy to discover that the percentage of people who can identify the correct direction in Guozhuang Garden is much higher than that of Shizilin Garden which reflects that the latter garden space is much more complex than the former one.

	Guozhuang Garden (%)	Shizilin Garden (%)
Have feeling of lost	4	86
Point out the north direction	72	32
Point out the entrance	86	22
Point out the self-position on the map	84	20

Table 1
Comparison of Tourist Self-posotioning in Percentage

An interesting phenomenon occurs in the interview when almost most of the people think that the Shizilin Garden is larger than the Guozhuang garden while in fact they are of the same size. Further survey of route length, traveling time and traveling speed are recorded in both Guozhuang Garden and Shizilin Garden. The average route length of people in Shizilin Garden (494.0 meters) is 1.7 time as much as that of Guozhuang Garden (290.6 meters). The average traveling time in Shizilin Garden (42.6 minutes) is 4.3 times as much as that of Guozhuang Garden (36.3 minutes). The average traveling speed in Shizilin Garden (11.7 m/min) is about 1/3 time as much as that of Guozhuang Garden (36.3 m/min). It is a good explanation for why the Shizilin Garden appears to be larger than the Guozhuang Garden.

Conclusion

The study tries to develop a comparative analysis of space attributes and tourist behavior pattern and finally lead to following conclusion.

Firstly, space syntax can be used to verify whether the design of a garden is in accordance with its original purpose. Computer aided methods can simplify a tough issue on space configuration by modeling, analysis and cartography. Thus the designer will be able adjust their work to meet the demands. Meanwhile, unique designs such as the arrangement of secret road and optimal sight spots agree well with the analysis of space syntax.

Secondly, leaking window has great effect on the space attributes in both two gardens. The leaking window is a kind of decorative carved window and its existence not only increases the brightness of the wall surface but also connect together the spaces which are formerly separated.
Thirdly, the Principle of Continuity is one important design technique of Chinese Classical Garden. The spaces which are separated on knee-height level by waters, plants or walls may still be continuous on eye-height level. Besides, the average step depth value on eye-height level is much less than that of knee-height level which illustrates that the gardens are continuous on eye-height level. This is also a major difference between the garden space and urban space.

Finally, by comparing the connectivity, step depth and people's reflection to space configuration, it proves that Shizilin Garden's space is much more complex than the Guozhuang Garden which even influences people's judgment of the size of the two gardens. This case study also verifies one truth that through unique space configuration the designers can make up the limitation of space and achieve the desired effect.

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