

Garden space. Morphotypes of private gardens of Jiangnan region

D S Tceluiko

Pacific National University, 136, Tihookeanskaya st., Khabarovsk, 680035, Russia

E-mail: dima123117@gmail.com

Abstract. The paper discusses the types of space representation of private gardens in the Jiangnan region. The definition of space is given, its main elements and features are revealed. Private gardens of China are described as one of the examples of complex space organization, the work of researchers studying the garden space is analyzed. The method of uniform distribution of space between elements has been studied in detail. The logic and the possibility of using the method are shown. The example of three private gardens in the Jiangnan region is the breaking of space. The article presents an analysis of space with the identification of the main elements and the use of the Voronoi diagram. Morphotypes of landscape gardening complexes are described. The text sets out the methods for applying this type of representation of space and outlines the directions for further work.

1. Introduction

Space is a wide topic, it can be attributed to the city, building, forest, etc. The term “space” can also be used metaphorically, philosophically, psychologically or perceived from a geometric point of view. It is also a sociocultural phenomenon affecting the theme of the location. The architectural volume is determined not only by mathematical values, it is the result of sociocultural processes. Consequently, people who arranging their space, express differences in social and cultural life, which differ not only depending on the territory, but also on the time period.

The elements of the space configuration are the cells, axes and nodes of the planning structure, which are characterized by different building intensities, different functional content, landscaping, relief, etc. The combination of various factors forms a specific element of the system - the morphotype. “Morphotype is a form of space organization of a territory, characterized by a balance of open and built-up spaces, expressed in quantitative and connections of development, landscaping, etc.” [1]. And if in urban planning practices the types of life activities of the population are formed due to the spatial organization of the territory, in Chinese private gardens designers were more focused on creating a unique object with their own idea, under which the surrounding landscape changed.

2. Garden space

The space configurations of traditional private gardens in the Jiangnan region are a popular research object. As a result of more than a thousand-year history of development, landscape complexes have a unique space structure that differs from others in both Asian and European estates. One of the features is the location of architectural structures in the volume of the garden, as a result there are different points of view on the space composition of landscape gardening complexes [2].

Each of the researchers revealed not just spatial values, there were patterns and correlation that are



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part of creating a habitat and human life, the layout of elements created under the influence of a large number of both external (culture, religion, legislation, etc.), and internal (relief, existing buildings, site orientation, etc.) factors.

S. Lu explored the Yuyuan Garden (Garden of Joy) in Shanghai [3]. He identified the main seven spaces inside the garden and 58 space units in the form of separate structures, their blocks and courtyards. A different view of space was presented in the work of R. Yu, as a result of the study of three private gardens of the Jiangnan region, space was presented in the form of the main elements and the relationships between them: large room, small room, pavilion, courtyard / square, covered galleries and footpaths [4]. The mathematical analysis of the garden space was also carried out by Z. Li [5], M. Keswick [6], W. Zhou [7], H. Chang [8], M. Mead [9], R. Yu. [10], M. J. Ostwald [11].

As a result, at the moment, the space of private gardens in the Jiangnan region may appear differently with respect to the main architectural elements:

1. Considering space as components of one volume [4].
2. Exploring all the elements of space [3].

But there is also a third method, previously used by the author of the article, but not disclosed with respect to the two above.

3. Evenly distributing the space between the main elements [12].

The garden space is considered as a set of basic functions than formed the environment around itself. Each function represented by a building, structure, architectural or landscape object in garden space. Due to this, it is possible to divide the entire territory into parts using the Voronoi diagram. This allows generating new space configurations, relying on the original planning structure, using the elements and structure of the object under study.

In the third case, the area is distributed using non-natural – mathematical tools, but how objective is this separation for a private garden? A place filled with harmony with nature and art.

In this case, a larger number of tools and techniques were used, but the most important was Feng Shui – Taoist practice of symbolic development (organization) of space. This teaching helps to correctly distribute the positive energy of Qi and prevent the accumulation of negative energy Sha in the area. The name Feng Shui refers to two of the most important forces of nature – wind and water [13].

Within the framework of the theory, there are several schools and directions that use different tools for breaking down the territory (Bagua trigrams, Loshu square, etc.), and also interpret each element of space differently, depending on the local characteristics of the place. Nevertheless, each of the tools clearly separates the boundaries of functional zones and architectural structures, which is a kind of mathematical selection with reference to the area.

The study examined three private garden: the Humble Administrator's Garden (Fig. 1), the Lion Grove Garden (Fig. 2) and the Canglang Pavilion (Fig. 3), all of which are located in the historic district of Suzhou and are included in the World UNESCO heritage. Each of the examples was built in different eras, respectively, expressing different views on the formation of space in the framework of private garden complexes of the Jiangnan region, but the area and content of the estates are also different.

The Humble Administrator's Garden has the largest area - 4.8 hectares, construction was completed at the beginning of the XVI century. The Lion Grove Garden is laid out on a plot of 1 ha, which was laid in 1342. The Canglang Pavilion Garden covers an area of 1.6 hectares, and is also the oldest of the studied plots - it was built in 1044. Different centuries of construction and area make it possible to better identify changes in both the morphotypes themselves and their connections (Fig. 4).



Figure 1. Morphotypes of Humble Administrator's Garden



Figure 2. Morphotypes of Lion Grove Garden



Figure 3. Morphotypes of Canglang Pavilion

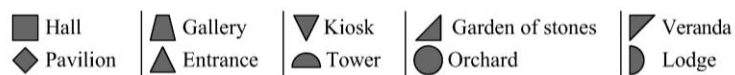


Figure 4. Morphotypes of investigated private gardens

3. Identification of morphotypes of private gardens

In order to analyze the space, each garden was divided into zones, the center of each was an architectural element. In this regard, the traditional Chinese private garden is a unique landscape artifact, having a large number of structures evenly located throughout the territory. The analysis is possible only with the existence of different volumes and relationships between them. In this case, zones attached to architectural elements with various functions act as volumes. Regardless of the exact

shape of the space, if it has one function, it is considered as one node. Garden spaces do not have strict functional boundaries, each part effectively serves as a passage, contemplation, or is involved in social activities.

Each morphotype may include other structures, which in a different situation are themselves morphotypes, it all depends on the significance of the element in space. For example, in each of the gardens there are galleries, but only in the Lion Grove Garden it stands out as a separate element, due to its size, location and initial significance in space relative to the environment.

For this study, nine different spacel types were identified: a hall, a pavilion, an entrance group, a kiosk, a tower, a Veranda, a loggia, a stone garden and a gallery. Each plot inside the garden is focused around an architectural structure or landscape object. Using the Voronoi diagram, the territory is divided into functional zones. All the examples have an individual set of elements, the complexity and depth of space depends on the number of architectural volumes [6].

The hall is the largest architectural building in the garden. It can consist of one or several rooms. The building used for family parties or ceremonies, usually with a courtyard, near the entrance gate [14].

The pavilion is one of the main elements of landscape gardening. In the Chinese garden, it is possible to find many isolated, scattered throughout the estate buildings, each of which has a special function, creates a certain mood. Like everything in the garden, these buildings were subject to the general concept of the garden, and each architectural detail had its own meaning. Each building has a harmonious name that displays its function. In addition to the function of the viewpoint, the pavilions can serve for meditation, tea drinking, academic studies, playing music, bathing, preparing potions, admiring the snow, even afternoon nap and etc. [2, 15, 16, 17].

The entrance group is a portal group that separates the space of the garden and the environment. With eye-catching architectural volume and rich detail. May consist of a separate space or a group of buildings. The color and details on this element may indicate the status of the owner and the territory located outside the gate [17, 18].

The kiosk is an open structure of small size, crowned with columns around the circumference, with a complex and lavishly decorated roof. In many respects, the pavilion repeats in its functions and internal content [19].

The tower is a two-story building with a viewing platform on the top floor. Mostly located on the edge of the garden. Due to its height, a beautiful view of the garden and remote landscapes opened from the top of the building [17, 18].

The veranda is an open or semi-open area with a canopy. It can be located both separately and be part of the hall or pavilion. Designed for receiving guests and entertainment [15].

A loggia is a premise closed on three sides, it is a viewpoint and a place for meditation, reading, painting, versification, etc. These elements, as well as scenic views are carefully planned during the design of the garden, due to this they are located in places of the best perception of the environment [20].

Stone garden. Stone compositions in a traditional Chinese private garden located everywhere. They can be stand-alone, decorating the interior, being the center of composition or a single monument. This study examines precisely a large composition of many stones, surrounded by walls, or located in a special room. This type of space was created from special stones brought from Taihu Lake.

The gallery is narrowly spanning corridors that connect buildings, protect visitors from rain and sun, and also help divide the garden into different sections. Galleries rarely have a straight shape, they are zigzag or serpentine, following the garden wall, the edge of the pond or climbing a hill in a rocky garden. In the galleries there are small windows in the form of a circle or regular geometric shapes, they are a frame to the landscape that opens to the visitor [1, 20, 21].

4. Conclusion

In each of the presented garden park complexes there is a different number and set of morphotypes, but the pavilion is the most common in all examples. In the Humble Administrator's Garden there are 30 morphotypes, in the Lion Grove Garden there are 24, in the Canglang Pavilion – 13.

The number of morphotypes allows identifying the overall density of the site. The densest is the Lion Grove Garden, where 24 elements are located on an area of 1 ha, which indicates the unevenness of the development relative to the area, and shows the local tendency to form the garden space, speaking not only about the functions and types, but about their quantity and density in the volume of the estate (table 1).

Table 1. Distribution of morphotypes in private gardens

Garden morphotypes	Humble Administrator's Garden	Lion Grove Garden	Canglang Pavilion
Hall	4	6	1
Pavilion	13	8	4
Entry group	1	2	1
Kiosk	1	-	2
Tower	5	3	1
Veranda	3	1	1
Loggia	3	1	2
Stone garden	-	2	2
Gallery	-	1	-
Total	30	24	13
Square Ha.	4.8	1	1.6

From these elements and their connections, the space of the garden is formed. It varies depending on social knowledge, but it is often characteristic for him to have certain features in accordance with very complicated codes. which determine which spaces exist, how they are marked, how limited they are, how they are connected, how consistent these connections are, what types of activities are combined and divided, which individuals or categories of people have rights in them, how they are decorated, what types of objects must be displayed in them, etc. These patterns vary from one cultural group to another, but only a person perceives internal space models without thinking about them and without even knowing about them until they are challenged.

In comparison with the first two types of representation of space, the identification of the main functional elements, as parts of the structure, has great potential for both researchers and designers. As a result, this type of garden layout allows representing the volume as a space configuration, consisting of the basic elements of space and the relationships between them, which subsequently make it possible to analyze the functions of the complexes, their location relative to each other, topography, green spaces and species frames.

Due to the use of the Voronoi diagram, the cell structure of the garden space was obtained, where each of the sections has its own semantic load and clear boundaries. The obtained result can be used for syntax analysis as a convex map in the framework of the “Theory of space syntax”. This allows identifying the following space quantities: depth, connectivity, integration, entropy and etc. It is necessary to describe the space of the garden from a mathematical point of view.

Representing the garden as a cell structure, it is possible to study and further use the results obtained, which were formed under the influence of a large number of cultural, religious, political and other factors. Despite the fact that many scholars explore the private garden of the Jiangnan region as a planning structure, this object also represents spiritual value, which manifests itself not only in the

drawing, but in the surrounding area of the complex, creating a special atmosphere for the visitor who has set forth a “fairy-tale world” created centuries ago for the detachment from everyday vanities. Many features of the relief, architecture, vegetation and other garden elements that create the atmosphere are clearly reflected in the plan, that’s the reason why planning structure is one of the sustainable forms of landscape complexes that can be analyzed.

This work is primarily devoted to the methodology for analyzing the space of the garden, but also due to the creation of a cell structure and the identification of connections between its elements, it is possible to generate a new layout while preserving the number of elements and connections between them, but with an excellent layout in space. Work in this direction was demonstrated in the article “The space of syntax in a traditional Chinese private garden” [12].

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