Research on Personalized Expression in Urban Waterfront Landscape Design Based on Pattern Language Theory

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Abstract: In urban waterfront space design, the expression of design language has different expressions at different times and in different regions. However, due to the globalization of the economy and the continuous emergence of new materials and new technologies, design is gradually converging, so localization, Regional and other typical landscape features are gradually being ignored. Once again, which is more important, formal beauty or functional beauty, is a topic of intense discussion among design practitioners today. This article focuses mainly on the inquiry of the relationship between the three major fields "waterfront landscape", "graphic language" and "spatial morphology", through the inductive refining of the graphical language and the integration of aesthetic elements into the design process, and the relatively systematic elaboration and analysis of the characteristics of the waterfront landscape space This leads to a model library of waterfront landscape spatial morphology at a small scale that is exclusive to the environmental design landscape discipline, and provides guiding suggestions for the subsequent design and application of waterfront landscape spatial morphology.

Keywords: Waterfront Landscape; Schematic Language; Expression of Personality; Aesthetic Studies

1. Introduction

Through investigation and research on relevant research progress at home and abroad, it was found that the research of schema language is mostly concentrated in other fields such as architecture and even computer majors. There is less research and application of schema language in landscape planning and design, while waterfront landscape morphology The inductive refinement of landscape schema language in research is more subtle Construct a system of modeling the "waterfront landscape morphological schema language" from two-dimensional to three-dimensional, complete a set of waterfront landscape spatial morphological model libraries dedicated to the environmental design landscape discipline at a small scale, and provide guidance for the subsequent design and application of waterfront landscape spatial morphology. Suggestions, the above are all research blind spots in the current subject topics. There are few existing research results on the connection between these three. Most of its research results are stagnant in the morphological research of two-dimensional planes. There is a lack of morphological research on three-dimensional schema language and a lack of small-scale schema language research on the spatial morphology of waterfront landscapes.

2. Conceptual and Aesthetic Elements of Schematical Language

By conducting research on a large number of relevant literature and design practice cases on waterfront landscape design at home and abroad, we finally discussed a series of elements in waterfront landscape design with elements of morphological composition aesthetics and design composition aesthetics as the main line of thinking, as shown in Figure1. Among the elements of morphological composition aesthetics, according to the characteristics of the waterfront landscape, it can be divided into natural morphological analysis containing organic and inorganic forms and artificial morphological analysis containing geometric and bionic forms. On this basis, the expression of personality about the waterfront landscape composition is analyzed. And in the design

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composition aesthetic elements, it is mainly analyzed from two aspects: the formal beauty law and the specific design elements.

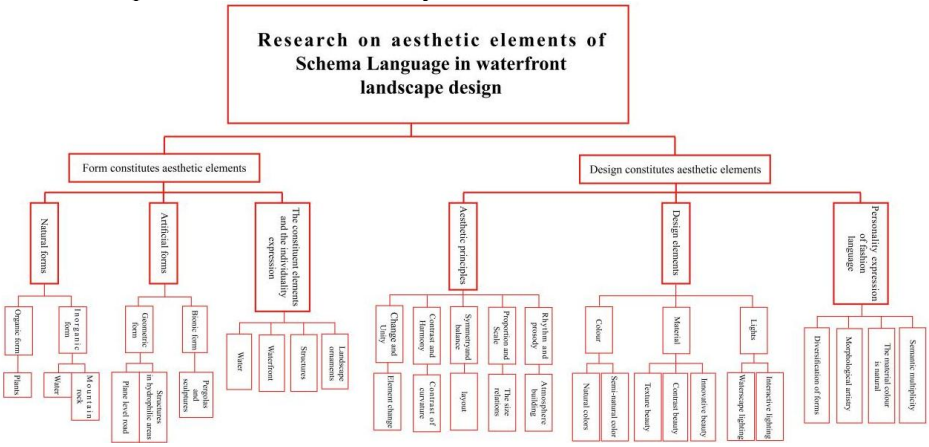

Figure 1. Graphical Illustration of the Study of Elements of Graphic Language Aesthetics

2.1 The Conceptual of Schema Language

Landscape schema language is both a theory and a method. It is grounded in the theory of cultural adaptation and employs a spatial schema that merges the virtual with the real as its mode of expression. Through the use of linguistic logic, it constructs the organizational process of landscape space, drawing on the organizational logic and structure of "language." The whole is spatially unified with the "spatial unit" as the fundamental component; the landscape spatial unit is lexicalized with "schema" to express the spatial unit; and the spatial texture is grammaticalized with "splicing and nesting" as the logical relationship.

“Landscape schema language” is the product of the integration of the three major ideas of “language of landscape” (Anne Spirn), “pattern language” (Christopher Alexander), and “schema method” (Simon Bell) [1]. Unlike the "three major ideas", “schematic language” reveals the diversity of solutions to landscape spatial problems, emphasizes the splicing, transformation and nesting of schemas in two dimensions: horizontal and vertical, and focuses on the universality of “schematic language” and locality.

2.2 Aesthetic Elements of Schema Language

2.2.1 Natural morphological aesthetic elements

The basis of landscape design planning is the natural ecosystem, and any renovation should be carried out in the natural environment, and waterfront landscapes are no exception, so all forms of beauty in waterfront landscapes must involve natural objects [1]. And natural forms are divided into organic forms and inorganic forms. All natural objects, whether organic or inorganic, can reflect different aesthetics under different morphological compositions.

2.2.1.1 Organic natural forms in waterfront landscapes

Organic forms in waterfront landscapes include forms with renewable biomass such as flowers, plants and trees, and these organic natural form elements refer mainly to plant forms, which are crucial for their impact on the overall beauty of the landscape. In terms of morphological composition, the design of plants in waterfront areas is based on the overall landscape design layout, with the design principle of setting up plant combinations adapted to different functional areas and strengthening the intimacy and nature of man-made landscapes and rivers. In addition to this, waterfront landscape plant cultivation also takes into account the flood control function as well as the diversity, ecology, aesthetics, growth patterns and other factors of the plants. All the plant elements can play the role of greening, cooling, beautifying and shading in landscape viewing. At the same time, the artistic principles of plant landscaping can be used to form a waterfront plant landscape with reasonable evacuation and dense layout, harmonious relationship between skyline and forest source line, and beautiful plant community configuration.

The methods of planting landscape plants in waterfront areas generally include pair planting, cluster planting, row planting, solitary planting and other methods. Based on these basic methods, combined with the coordination of the relationship between plants and buildings, water bodies, and roads, it can be extended. Plant morphological design methods for waterfront

landscapes. For example, low shrubs are planted on slightly higher river banks combined with lawns to avoid blocking tourists' sight while forming a stepped plant planting layer, which has a better visual effect; when setting up landscape sketches in water-friendly areas, you can combine them with scattered vegetation combinations to make the overall shape of the sketch more agile and free, thus unifying with the natural environment And it increases the viewing and fun of the water-friendly area.

Therefore, according to the various types of waterfront landscapes, the following types of plant morphological composition can be summarized as shown in (Figure 2), coastal parallel planting type, opposite bank scattered planting type, local point scene planting type, and functionally dispersed planting type. Using these morphological composition techniques, it is possible to design and construct a waterfront landscape with rich layers, a combination of virtual and real, and shared ecological functions and aesthetic needs.

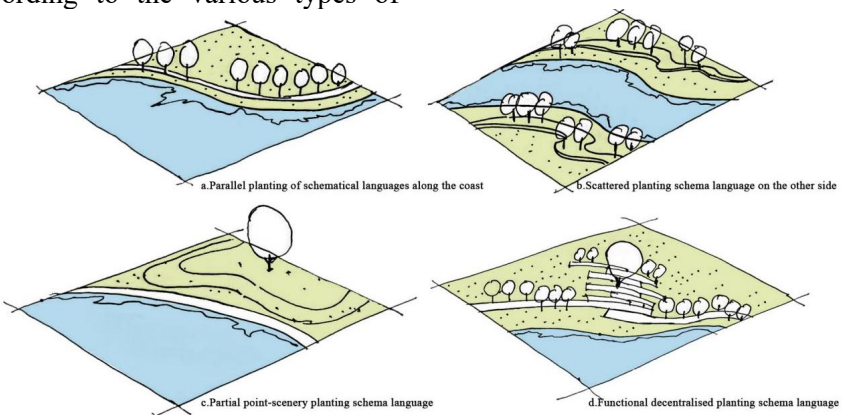

Figure 2. Schematic of the Morphological Composition of Plants

2.2.1.2 Inorganic natural forms in waterfront landscapes

Inorganic forms in waterfront landscapes contain forms of inanimate substances such as water bodies and stones in landscape design. The most important body of water in terms of elements in a waterfront landscape, followed by mountain rocks. The following higher aesthetic morphotypes can be summarized by studying the morphology of water bodies in different waterfront landscapes. From the vertical morphological level of the water body, it can be divided into two types: water spray and falling water: water spray refers to the water body forming various forms of springs upward due to pressure, etc., and falling water refers to the water body falling due to gravity to form waterfalls and water curtains of different forms. From the level of the planar morphology of the water body, it can be divided into the dispersed mottled type, the smooth curve type, the undulating straight line type, and the undulating curve type as shown in Figure 3 Regarding the morphological design of the water body, we should consider three points: whether the curvature of the edge line of the water body is graceful and gentle, whether there are obvious artificial signs of changes in the shoreline, and whether the vertical upward changes of the water body are abundant and appropriate.

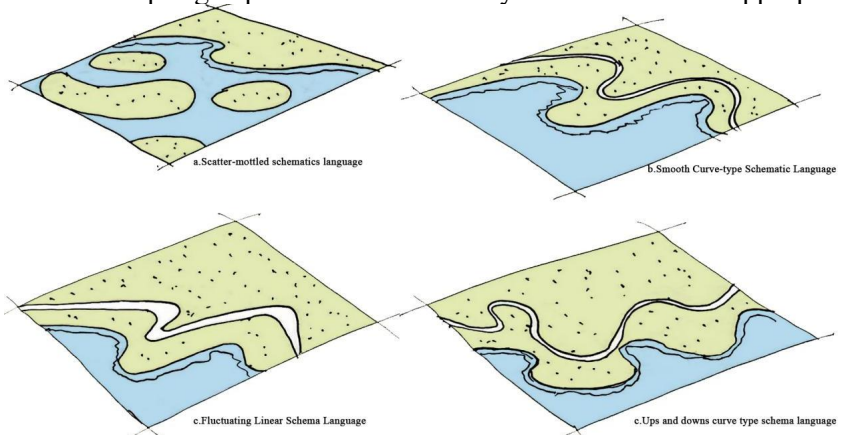

Figure 3. Type of Water Planar Morphological Composition

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And "mountain and stone elements can be seen everywhere in various landscapes, playing a core framework role in creating beautiful natural spaces". The mountain and hill forms or towering steep or continuous in nature can be summarized as steep slopes, gentle slopes, single-sided mountains, square mountains, ring mountains, cliffs, cliffs and other schema languages according to their different forms. Using these schema forms for design can achieve unexpected landscape effects. Taking the Swiss Arzo quarrying scene viewing space scheme as an example, as shown (in Figure 4), the design completely retains the original stone walls of the mountain, and uses it as the background space of the landscape without any treatment. The curved shape of the stone walls sets off the atmosphere of the entire site and is the core point of the space. Surrounded by bouldering stone walls, it forms a natural amphitheatre that is gradually raised from the stage ground level to form a converging field together with the stone walls. The irregular morphology further strengthens the landscape of the site.

Figure 4. View Morphology of the Arzo Quarrying Scene

And unlike a large mountain, the stone has a more refined and compact form and is more widely used, and it has profound significance for landscape beautification, functional setting, interface division, etc. In the "waterfront landscape", in addition to using natural mountains to create a beautiful natural landscape surrounded by mountains and rivers, it is more about combining the shapes of stones. There are three main methods for combining stones in waterfront landscapes: the scattered stone group morphology can be perfectly integrated at the junction of the water surface and the shoreline, which can make the whole present a natural and beautiful transition; the polyhedral stone group morphology is often used as a certain middle partition It can create an enclosed or semi-enclosed space; the shape of the agglomerated stone group is generally used as a point view sketch to enhance the viewing. For example, stone sketches can be designed to embellish the space, spreading stones and shrubs on gently undulating terrain, and using larger stone peaks and corresponding sub-peaks as foil, the primary and secondary echoing forms achieve the function of organizing and beautifying the space.

2.2.2 Artificial morphological aesthetic elements

Looking at the waterfront landscape as a whole, the aesthetic objects should not only include natural objects, but also buildings and man-made objects. Artificial forms can add richness to waterfront landscape forms without damaging the natural environment, making the entire landscape belt more exciting [2]. At the same time, in addition to the function of providing service to people, a high aesthetic value corresponding to the natural environment can be achieved by using various morphological design means.

2.2.2.1 Geometry in waterfront landscapes

Geometric forms in waterfront landscapes are mainly revealed from their graphic design, and using different geometric forms, planar forms such as grid-like, circular-ring-like, diced-block-like, square-like, and irregular-curved shapes can be combined. In terms of plane layout, roads mostly function as “lines”, connecting various landscapes “points” along the way, thus forming different “surfaces”, that is, functional activity areas. For waterfront landscapes, the morphology of roads and waterfront structures is equally important and a top priority in the morphological design of waterfront landscapes.

The waterfront landscape belts are mostly long strips, which require the development and design of different functional areas along the coast as extension spaces for river banks. The shape of the road will affect the comfort and aesthetics of each area and the rationality of the traffic flow [3].

By analyzing various waterfront landscape

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design cases and consulting relevant information, six methods of road morphology composition can be summarized, as shown (in Figure 5), the first type is a parallel shoreline type(a): the road is directly connected to the water body, and this form is more used in urban waterfront landscapes. The second type is the bifurcated confluence type(b): the road bifurcates first and then meets, which can form a space in the middle to set up a highly ornamental landscape or functional area. The third is the interrupted dispersion type(d): a series of secondary spaces can be cut through changes in the road, which is more effective at higher waterfront banks. The fourth is the cross-repeat type(c): it is suitable for use in waterfront areas with complex ecological environments and rich landscapes, where roads interspersed can make visitors feel more experienced. The fifth is the three-dimensional superimposed type(e): the three-dimensional path is an essential road form design method to enhance the layering of the waterfront space and make the visual effect cool. The sixth is of the graphic superposition type(f): this road morphology emphasizes the node space, which can be used singly or in combination in waterfront landscapes.

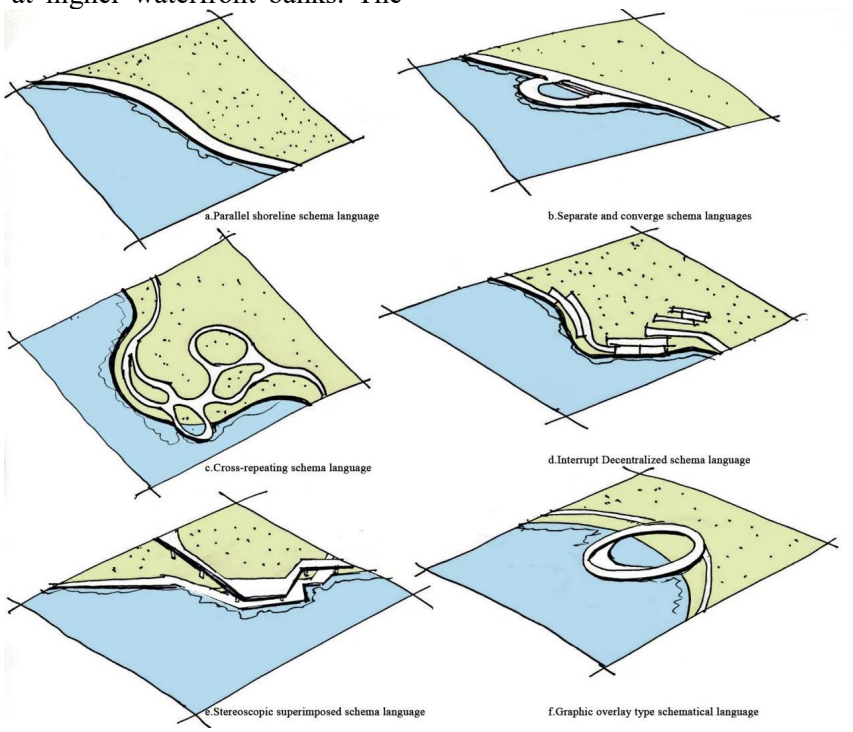

Figure 5. Geometric Morphological Composition Type of Plan Road

In addition to the planar road form in the design, the geometric form is specifically reflected in the design aspect of the constructed building. The types and forms involved in the planning of landscape sketches and construction facilities in waterfront scenic spots need to be both practical and ornamental. Among them, the design of construction buildings in waterfront areas that best reflects the difference between waterfront landscapes and other landscapes. Combined with the analysis of such landscapes in other waterfront landscape cases, six geometric morphological composition types of waterfront structures can be summarized. As shown in（in Figure 6）, the first type is a single-sided type(a): the most common type in waterfront landscapes, a waterfront shelter space set up separately on the river bank for people to stay and rest, which may be a promenade or a long observation deck. The second type is the combined type(b): Compared with the unilateral type, the combined type has a larger amount of constructed objects, more variable shapes, and contains more functions. It is an open space that allows tourists to stay for entertainment. The third is the single-out type(c): providing a dock or a functional space for fishing strengthens the dialogue between land and water bodies. The fourth type is the sinking type(d): facing the water body directly in the sinking space can bring an unexpected viewing experience, but the construction technology and water body characteristics are demanding, and there is a risk of flooding. The fifth is the reticular height

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difference type(e): the grid is used to divide the spatial morphology, while the height difference between the river bank and the water surface is treated, and the layers of falls of the trail or small platform make the hydrophilic space more interesting. The sixth is of the platform type(f): the setting of resting steps in combination with the slope of the river bank is the form with the highest intimacy between man and water, and is suitable for setting up in shallow water areas.

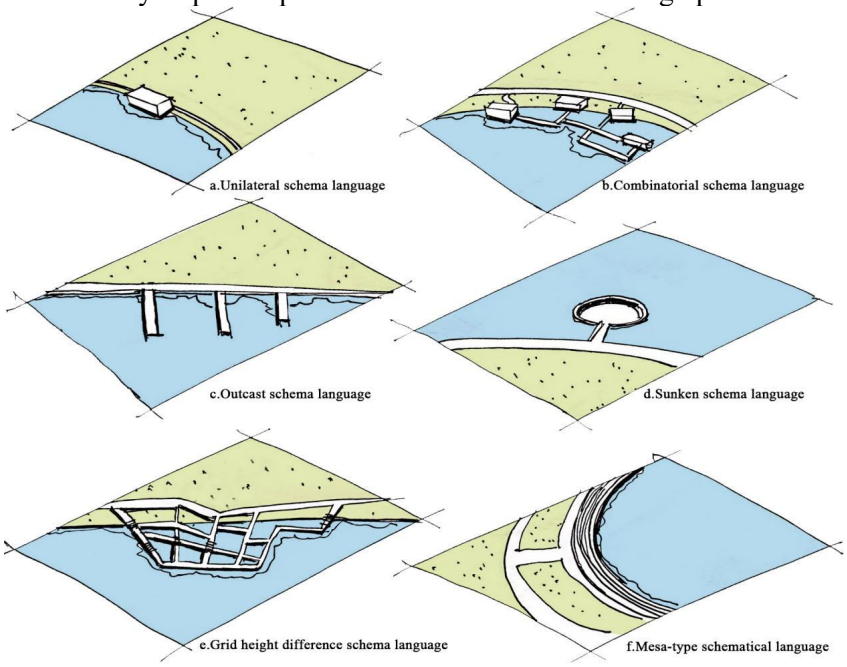

Figure 6. Hydrophilic Zone Structures Geometric Morphological Composition Type

2.2.2.2 Biomimetic forms in waterfront landscapes

The biomimetic forms in the waterfront landscape are mainly displayed from structures that have a crucial impact on the aesthetics, culture, and functionality of the entire landscape. Compared to geometric forms, bionic form constructions are more skillfully integrated with the natural environment and more artistic [4].

Bionic form refers to abstractly extracting typical external forms of animals, plants, microorganisms, humans, etc., imagining them to seek breakthroughs and innovations, and emphasizing the expression of the aesthetic characteristics of biological external forms and human aesthetic needs[5].When designing some structures such as gallery frames and seats for waterfront landscapes, natural forms such as flowing water and aquatic animals and plants that are in harmony with the environment can be combined to create artificial forms with more visual impact and better performance. Taking the "London Swing Bridge Design Plan" as an example. As shown in (Figure7), the project is located on Dinosaur Island in Crystal Palace Park, London. The designer designed the plan based on the appearance of the “prehistoric bony fish” as a bionic object. The entire bridge body is only supported by a center in the center of the water. The infrastructure supports this setting, which avoids the project's need for large protective barrier devices While keeping the bridge at a distance from the dinosaur sculpture. When not in use, the bridge in turn subtly transforms into a sculptural artwork floating in the park's water features, making it a wonderful landscape of its own.

Figure 7. Bionic Morphological Bridge

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3. Application of Formal Beauty Rules in Schematical Language in Urban Waterfront Landscape Design

The law of formal beauty in design schema language is the empirical summary and abstract summary of the formal laws of beauty in the process of creating beautiful forms and beauty. It is also a traditional aesthetic methodology [6]. The laws of formal beauty include change and unity, contrast and harmony, symmetry and balance, proportion and scale, rhythm and rhythm. The comprehensive application of these laws in the graphic design and planning of waterfront landscapes can bring different aesthetic experiences to tourists.

3.1 Change and Unity

Figure 8. Variation and Unified Design Schema Language

The supreme law in the law of formal beauty embodies the principle of change and unity in the composition of aesthetic relationships, as shown in（Figure 8）. Change and unity are both mutually antagonistic and interdependent. In the horizontal and vertical graphic design of waterfront landscapes, changes are mainly reflected in the different shapes, colors, plant combinations, etc. of different functional areas. Unification is mainly reflected in the fact that the landscape in any one place does not exist independently. Different design elements There is a thematic connection between them. Designers need to grasp the degree of change and cannot use too many design elements, otherwise the plane will be too scattered and unwhole. However, at the same time, we must control the degree of unity and avoid situations where the designs of various areas are too similar and the landscape becomes monotonous and boring. For example, when designing a coastal hydrophilic zone, the same planar elements such as ground paving and material color can be applied, but corresponding adjustments will be made to the edge treatment of the hydrophilic platform according to the shoreline shape of different zones, or functional changes will be added according to different natural environments, humanistic backgrounds, etc. The coastal water-friendly area created in this way will be richer and more interesting but not detached from the whole.

3.2 Contrast and Harmony

The principle of contrast and harmony is mainly used to deal with the difference between opposing things, as shown in （Figure 9）. Contrasting and emphasizing different aspects can make the design object personality more distinct; harmony emphasizes the same aspect, and the design object can be reconciled to achieve coordination. Contrast and harmony are essentially about seeking common ground while reserving differences, and the two are mutually reinforcing, but they are also a kind of contradictory and opposing existence. Only by looking for balance from the opposition can the whole have a harmonious beauty [7]. In the graphic design of waterfront landscapes, the use of contrast and harmony techniques is mainly reflected in the coordination of warm and cold plant colors, the harmony of straight processing of functional block shapes, and the reasonable distribution of dense structures. For example, when a geometrically shaped structure is set up on a curved revetment, it is necessary to adjust the relationship between the natural curve and the artificial straight line so that the structure stands out but is not abrupt in the surrounding environment, and has a modern aesthetic without destroying the natural beauty.

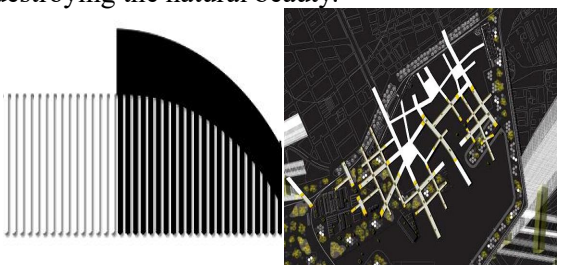

Figure 9. Contrast and Harmonious Design Schema Language

3.3 Symmetry and Equilibrium

The most common formal beauty law applied in all designs is symmetry and equilibrium, as shown in（Figure 10）. Symmetry is a design technique that deals with equal shapes and equal quantities of layout up, down, left, and right. Equilibrium refers to the combination of the same quantity but different shapes to form a stable and balanced state. Symmetry

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encompasses many forms of symmetry such as axial symmetry, bilateral symmetry, rotational symmetry, spherical-radial symmetry, and two-radial symmetry. Symmetry will give people a stable sense of order and can reflect the beauty of rationality, nobility and tranquility, but excessive symmetry in landscape design will bring boredom and boredom. Equilibrium compared to symmetry, it increases the influence of gravity and direction on the design, reconfiguring and adjusting its components according to the center of gravity of the force, thus achieving the effect of equilibrium. Equilibrium is a free form, but if it is too equal, it will appear dull, change too much and be easily unbalanced. In the graphic design of waterfront landscapes, symmetry and balance should be combined. By analyzing factors such as site nature and functional equipment, and using controllable substances such as plants, roads, and structures, a symmetrical design should be designed in an environment suitable for a sense of order. But the landscape with its axis hidden in it makes the overall layout appear flexible and natural Make "artificial landscapes more friendly to tourists".

Figure 10. Design Schema Language for Symmetry and Equilibrium

3.4 Proportion and Scale

Proportion and scale is an application of mathematics in art, the cornerstone of all creative activity, as shown in (Figure 11). Proportionality is the quantitative relationship between part and part or part and the whole, while scale refers to the proportional relationship between structure, function and person [8]. Good proportions are not intuition-dependent, but are to be measured and delimited in terms of related theories such as ergonomics. The scale places more emphasis on the plausibility of the dimensions of a specific object within a certain space and on the sensory impact on the human being. In landscape design, proportion and scale are principles that must be followed, and they must exist in them. The composition and landscaping of landscape space can bring people a feeling of beauty through a moderate proportion and scale, and the same is true in the graphic design of waterfront landscapes. Controlling the scale of a site and the proportional relationship between things and people and things is the most basic requirement. It is necessary to fully understand the dimensional control standards and comfort of various sites, facilities, sketches, etc., which not only requires a beautiful and impressive plane form, but also It must be scientific and practical. For example, when dealing with the irregular terrain of waterfront areas, there should be contrasting changes in size, length, width, and straightness between different blocks, pursuing a beautiful and harmonious proportional relationship, but at the same time, the size of each area should be based on the flow of people, plant density, etc. Specify appropriate data to ensure that tourists have good sensory enjoyment and physiological feelings.

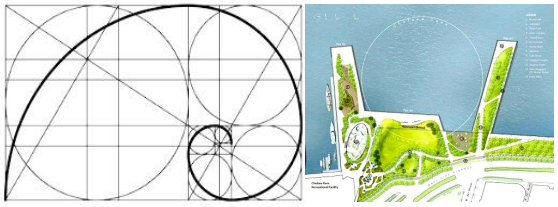

Figure 11. Design Schema Language of Proportion and Scale

3.5 Rhythm and Prosody

Rhythm refers to the sense of movement produced when repeated continuously with the same visual element in the composition design, and rhythm refers to an image with regular changes, as shown in (Figure 12). The rhythmic change can cause different psychological feelings among tourists, it has an arrangement composition of size, length, height, etc., as well as equal distance continuity. Prosody is reflected in the arrangement of design objects treated in numerical and equal ratios, so that it produces a sense of melody in music and poetry [9]. In landscape design, rhythm can be used to enhance the overall appeal as well as the expressiveness of art, adding changes with uniqueness, and prosody can be used to constitute positive vitality to strengthen the charm and beauty of the landscape. Rhythm and prosody echo, is a kind of undulating rhythm, when the shape, line, color, block in order and order to repeat, or rich variety of repeated arrangement, the sense of rhythm can be obtained [10].

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In landscape design, it is mainly reflected in the coordination of contrasting relationships such as density, height, straightness, squareness, size, and stagger. For example, when dealing with a large area of lawn on the shore of a waterfront landscape, you can use the minaret-shaped green plant sketch to change the original overly rounded lawn undulations and increase subtle contrasting relationships such as strength, height, and stagger, while being able to create a positive natural atmosphere full of life rhythm and create a beautiful visual impact.

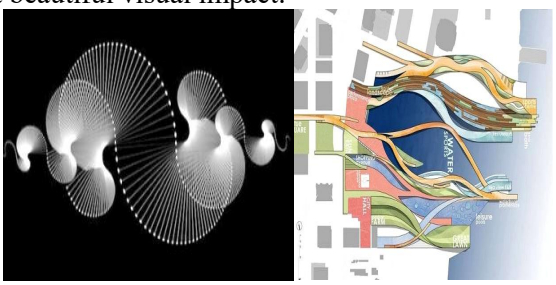

Figure 12. Rhythm and Prosody Design Schematic Language

4. Conclusion

Nowadays, there are a series of problems in the design of landscape spaces in urban waterfront areas in my country, such as the blind imitation of the whole and the increasingly serious phenomenon of homogeneity. This article focuses on poor design aesthetic literacy, backward aesthetic concepts, and weak landscape recognizability and difference. and other issues. While using schematical language theory and methods, we will also look for landscape morphology research that has universal and aesthetic value for urban waterfront landscapes, and explore the spatial morphology of waterfront landscapes through the use of schematical expressions to adapt to urban waterfront landscapes and new forms of design development.

Conflict of Interest

The authors declare that there is no conflict of interest.

Acknowledgments

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