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Spatial layout and aesthetic analysis of landscape design supported by computer vision

Junjie Liao[1,*]

[1] College of Life Science and Resources and Environment, Yichun University, Yichun, Jiangxi, 336000, China

SUMMARY: *As an important part of urban environment construction, garden landscape design, its spatial layout and aesthetic effect directly affect people's quality of life. This study explores the application of computer vision technology in garden landscape design, and quantitatively evaluates the spatial layout and aesthetic features of gardens through the methods of image semantic segmentation, spatial syntactic analysis and SD semantic difference method. Typical gardens in A and B were selected for the study, and parameters such as spatial integration degree and connection value were calculated using Depthmap software, and aesthetic evaluation was carried out through 160 valid questionnaires. The results show that the global integration degree of garden B is 0.8266, which is 0.1781 higher than that of garden A. The t-test p-value of the road integration degree of the two gardens is 0.0244, which indicates that there is a significant difference in accessibility; the spatial undulation and change factor scores the highest in the aesthetics evaluation (0.7496), and transcendence feeling scores the lowest (0.1525). The study shows that computer vision technology can effectively identify the spatial characteristics of the garden, spatial syntax parameters can objectively reflect the rationality of the layout, while the aesthetic evaluation needs to be comprehensively optimized at the three levels of physical, emotional, and intentional contexts.*

KEYWORDS: *Computer vision; garden landscape design; spatial syntax; aesthetic evaluation; semantic segmentation; integration degree*

1 Introduction

In the context of rapid urban development, landscape garden design provides brand new elements for the urban ecological environment as well as the life of urban residents [1]. It is an inevitable choice for the modernization of cities at the present stage to guarantee the rationality of urban spatial planning and enhance the beautification degree of the environment in urban areas through high-quality landscape gardening [2, 3]. However, landscape garden design has a certain degree of complexity, in addition to ensuring the rationality of its basic planning, it is also necessary to take measures from the year of spatial art layout to improve its design quality and aesthetic value [4-6]. Most landscape gardens are composed of different types of plants, green space, to comply with the relevant standards of urban greening in the design layout, to ensure that the structure of the urban green space has been optimized on the basis of configuration, to ensure the harmony of urban ecology and nature [7-10].

On the one hand, the actual function is integrated into the spatial layout and planning of

*207236@jxycu.edu.cn
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the landscape, so as to ensure that the construction and implementation of the landscape garden can reflect the balance between human beings and the ecology, and to give the spatial layout a stronger artistry and rhythm [11-13]. On the other hand, it is also necessary to subdivide and adjust the functional structure and site dimensions in order to pursue a harmonious visual art effect and meet people's needs for environmental protection, art and aesthetics [14, 15]. For this reason, it can be combined with computer visual image information processing technology, the visual image of ecological greenery landscape in the garden, can play a more direct and effective role in improving the garden landscape environment [16-18].

The basic idea of this study is to construct a framework for analyzing landscape design supported by computer vision technology. Firstly, image semantic segmentation technology is used to process the landscape images, identify different landscape elements and analyze their spatial distribution characteristics. Second, based on topology theory and spatial syntax method, a mathematical model of the garden space is established, and quantitative indexes such as integration degree, connection value, and depth value are calculated to evaluate the rationality of the spatial layout. Again, combined with the parametric design method, the generation law and optimization strategy of spatial morphology are explored. Finally, the SD semantic difference method is used for aesthetic evaluation to analyze the aesthetic characteristics of the garden space from the three levels of physical, emotional, and intentional contexts, which provides the basis for the comprehensive optimization of the garden landscape.

2 Landscape design supported by computer vision

2.1 Computer vision technology

2.1.1 Concepts

Computer vision is an interdisciplinary field aimed at developing algorithms to enable computers to understand digital images or videos, replicating the functionality of the human visual system [19]. Typical computer vision systems take as input a 2D image or video, convert it to mathematical form through pixel values, analyze this data to identify information such as specific patterns, features, and spatial sequences, and provide a detailed description of the image.

Computer vision enables automated analysis of visual systems, and deep learning enhances the ability to automate visual tasks, where convolutional neural networks in deep learning networks are currently one of the important research directions in computer vision.

2.1.2 Image classification and recognition

Image classification refers to the classification of images into appropriate categories based on their content by computer vision algorithms, emphasizing the overall semantic information expressed by the image. Image recognition, on the other hand, involves the need to discriminate between multiple objects that may be contained in an image, and focuses more on specific categories of local features of an image as compared to image classification.

2.1.3 Image Semantic Segmentation

Image Semantic Segmentation (ISS) is to classify each pixel in an image into a corresponding class based on the semantic information contained in the image in order to achieve image pixel-level recognition. Some scholars proposed the full convolutional neural network (FCN), which improves the image-level recognition to pixel-level recognition and enhances the accuracy and computational efficiency of semantic segmentation, so deep neural networks have been widely used in the field of image semantic segmentation.The FCN network architecture subsequently continues to incorporate techniques such as CRF, ASSP, and Xception, which further improves the accuracy of semantic segmentation.

2.2 Spatial layout and aesthetic optimization of garden landscape composition features

2.2.1 Determination of landscape imagery based on spatial characteristics

Spatial morphology characteristics often become an important grip for morphogenesis in landscape garden space design research, and this study determines the design imagery of the landscape to be generated at the site through the analysis of the current spatial morphology characteristics of the site where the landscape is located, the interpretation of the site characteristics, and the designer's conceptualization of the design imagery of the landscape to be generated at the site [20]. It is worth noting that the spatial characterization presented in this section is not only applicable to the interpretation of the current state of the site where the scene is located, but also to the optimization of the spatial form of the scene when it is generated.

2.2.2 Landscape spatial layout morphogenesis based on generative imagery

After the imagery of landscape generation is determined, the generation of landscape spatial form can be carried out through the analysis of excellent cases similar to the generation of imagery, combined with Rhino manual modeling software and Grasshopper visualization and analysis platform. This step can be divided into two parts, one is to determine the composition of the factors influencing the generation of the target landscape spatial form and its ideal features, and the other is how to map these ideal features into the process of form generation. Based on this, it is necessary to select some excellent cases with high recognition in the industry and analyze them in terms of spatial morphology features and landscape creation methods, in order to form the ideal presentation of each influencing factor. Then, with the help of Grasshopper visualization and analysis platform, the ideal presentation of each factor will guide the generation of spatial structure and element volume of the landscape, and then combine with the generation of imagery to obtain a landscape model that can be generated and regulated.

3 Spatial layout and aesthetic optimization evaluation methods for landscape design

3.1 Garden space construction under topological perspective

3.1.1 Representation of landscape morphology from a topological perspective

Landscape is a psychological perception of objective things, is a specific aesthetic object, so the landscape is not the object itself, but based on a certain scale “scene” and “view” of the combination. The topological morphology of the landscape is expressed differently at different bottom interfaces and spatial boundaries. There are two categories of topological forms: purely geometric and natural. The two can be transformed into each other, and the latter is more plastic and can be flexibly changed according to local conditions. The construction of terrace landscape in the Yellow River Delta, that is, under the premise of ensuring that the elevation structure remains unchanged, the principle of topological evolution is applied to transform the terrace plane form to create a more vital terrace landscape to meet the needs of different sites. At the spatial level, the topological transformation, as an abstract expression of the landscape form, increases the connection between the "inner" and "outer" parts of the landscape space, assists in weakening the hardness of the enclosed space, and creates new changes in the spatial experience.

3.1.2 Garden space construction under topological perspective

In the analysis of garden space, architects use topological methods to carry out direct or indirect feasibility attempts are endless, the research object including corridor space, path space, and even introduced topological deformation thinking and methods to analyze the irregular shape of the water body space form, complex rockery space, confirming the classical garden theory of step by step, step by step, change the scenery of the statement. Taijitu became the centralized manifestation of some Chinese classical garden layout features this discovery, in the study of garden architecture plane and interface, the composition and creation of garden space form, garden space centripetal and connectivity, etc., as the relevant theoretical basis has been generally adopted, the spatial scope is also expanded to a broader sense of the garden architectural space, and even from the physical space through the topological language to the mood of the space to reach.

3.1.3 Topological Perspectives on Landscape Dynamic Connectivity

The role of topological indices is crucial in the representation, inscription, classification and modeling process of complex networks. In landscape ecological planning, several scholars have applied the relevant theories of landscape geography, utilized topology-based graph theory combined with complex network theory, and conducted research on ecological networks through tools such as ArcGIS network analysis and social network analysis. The research focuses mainly on constructing ecological spatial networks of landscape patches, or taking green space patches as nodes, studying the spatial structure of land use, the dynamic evolution of urban green space connectivity and the static reliability of the network and other issues. Topological grid is a strategy for generating landscapes that better grasps the effective connection between landscape components from the perspective of functional connectivity, thus constructing landscape ecological networks as a whole. Since the landscape system and topological relationships also exist in the dynamic relational space that maintains the internal structure, the natural ecological process and landscape perception process in the landscape process can also be explained by the topological system.

3.2 Spatial Syntax Theory

Spatial syntax theory is a theory that studies the ontology of space based on the theoretical study of topological relations of geometric shapes, which mainly explores the logical relations between space itself and each other, as well as quantitatively describes the conformation of space, and then discovers the relationship between spatial forms and human society. In the theory of space syntax, there are three major properties of space. First, space has its own property, i.e., self-organizing property. Since space is created in the continuous production activities of human beings, secondly, space has social properties. Third, space has a social effect, that is, not only human activities act on space, space also has a reaction to human activities. The research object of space syntax theory is the space on which human beings live.

Space is closely related to the production and life of human beings. If the space is divided according to the scale, from small building space to large urban space, all of them belong to the research scope of space syntax theory. The significance of using spatial syntax theory for research is that the relationship between spaces can be studied to further discover the regularity of the space itself, so that the space can better serve the human society. The word “syntax” in the theory of spatial syntax originally means the principle and law of the structural composition of a sentence in a language passage, but in this theory, the word “syntax” is used to refer to the structural composition of space. Therefore, the theory of spatial syntax is a logical theory that studies the compositional relationship between different spaces.

3.3 Parametric design

Parameters, also known as parametric variables. Parameter is a variable, in mathematics, statistics and other disciplines, the term parameter has different definitions in expression, but it is the same in essence, in the field of computers, the term "variable" is interpreted as the amount of change in each value in the process of computer operation, from this aspect, "parameter" is "variable", parametric design is very different from traditional manual modeling, which is assigned parameter value to the object of design in the computer program, This enables the design object to produce different results as the parameter values change. That is, associative design, the definition of associative design is that in the process of parametric design, the object of the design is controlled by changing the parameter variables, and the results of the design change with the change of the value of the parameter variables.

3.4 Topological network quantization parameters

The relative relationships of spatial nodes can be relatively simply visualized through the topological network structure, while more specific quantitative relationships can be explored through the integration degree and depth values.

There are two important variables in the calculation related to depth values: the total depth value TD and the average depth value MD. The total depth value TD is the sum of the depth distances from a node in the topological network to every other node in the network starting from a certain node, while the average depth value VD is the average depth distance of the total depth value relative to other nodes. Assuming that there are a total of n nodes in the topological network with a depth distance of d, both formulas are expressed as:

$$TD = \sum_{1}^{n} d \tag{1}$$

$$MD = \frac{TD}{n-1} = \frac{\sum_{1}^{n} d}{n-1} \tag{2}$$

The depth values are obtained through the formula, which can be found to be more accurate quantitative values on the original vague expression of the degree of high and low, which in turn better represents the differences between systems.

Depth values are comparisons between different systems, and the asymmetry of the topology makes them not universal. In order to eliminate such effects and allow an attribute of a single node in a system to demonstrate connectivity to the surrounding space, it is necessary to introduce the degree of integration $I(Integration)$ to realize the expression of spatial accessibility potential. Integration I can also be used as an important indicator of spatial accessibility, the larger the value, the more accessible the node space it represents, and the higher the aggregation. The integration degree I is calculated by the formula:

$$\mathrm{I} = \frac{n\left[\log_2\left(\frac{n}{3}\right)-1\right]+1}{(n-1)(MD-1)} \tag{3}$$

The integration degree calculation process in topological network analysis is relatively cumbersome, so in order to improve the efficiency and accuracy of the operation and analysis, Depthmap software will be introduced in this process. Depthmap is an open source spatial analysis software, by modeling, connecting, calculating and displaying the planar prototype map, it can show the spatial integration degree through color change, and can display the specific value of integration degree of each point. At the same time, Depthmap's display of the entire spatial plane can be better felt cognitively, and will be specifically applied in the analysis of the practice later.

3.5 Creation of spatial aesthetics

3.5.1 Landscape Metaphors and Suggestions

The reason why traditional Chinese gardens can make people linger, never tire of seeing, in addition to the wonderful scenery, but more importantly, it contains the historical and cultural enrichment of the landscape content, so that people in the process of touring to produce more interest and associations. In the process of creating the space of Jiangnan garden, the metaphor and implication of the door and window openings for the space is crucial. The directionality and guidance of the door triggers a series of spatial sequences, making the overall spatial rhythm become more complete, while the implied role of the window is more obvious. The walls of corridors in gardens are often decorated with windows of different shapes. Looking in through the window opening, one can see the scenery on the other side, suggesting that there is a cave in front of the visitors, and guiding them to enter the space behind the window with anticipation in their hearts. This euphemistic and implicit beauty of space makes the garden space become richer, thematic variety, twists and turns.

3.5.2 Creation of a garden mood

Figure 1 shows the generation mechanism of garden mood, and the “seeing” of landscape viewing requires a certain degree of mobility. In the process of touring, the images captured by the eyes are like a movie screen, with successive images appearing on the retina and linking into a complete image in the mind. In fact, the human brain does not remember all the images seen during the tour, and only a few of them are really impressive, but for the observer, just capturing some extremely weak visual impressions is enough to make people think that they have already recognized what they are observing. By carefully grasping the details of the landscape, the gardener can visually reconstruct a completely new garden space, which is also a reflection of human subjective initiative. However, people's views and perceptions of things are often affected by a variety of subjective factors, so when different people observe the same thing when they see and reconstruct the results may be very different. Watching the garden door and window openings is similar to enjoying an art painting, whether it can produce an impression on the viewer, what kind of impression depends not only on the door and window openings and the scenery behind itself, but also depends on the viewer's growth environment, spiritual state, cultural background, comprehension ability and the current state of mind, the same garden in different times will produce different effects on people. Therefore, after hundreds of years, modern visitors re-enter the ancient gardens, whether the space created will still be the same as in the past to make people touched, is a thing to be expected. Doors and windows as an important component of garden architecture, not only has a practical function, more importantly, has an aesthetic function. People use their senses to perceive the world from a first-person perspective, and reflect external reality through conscious processing. Therefore, windows and doors are the material tools that make the garden perceived, communicated with and resonated with people, and the cultural context brought by the windows and doors will affect the perception experience of the garden space to a certain extent.

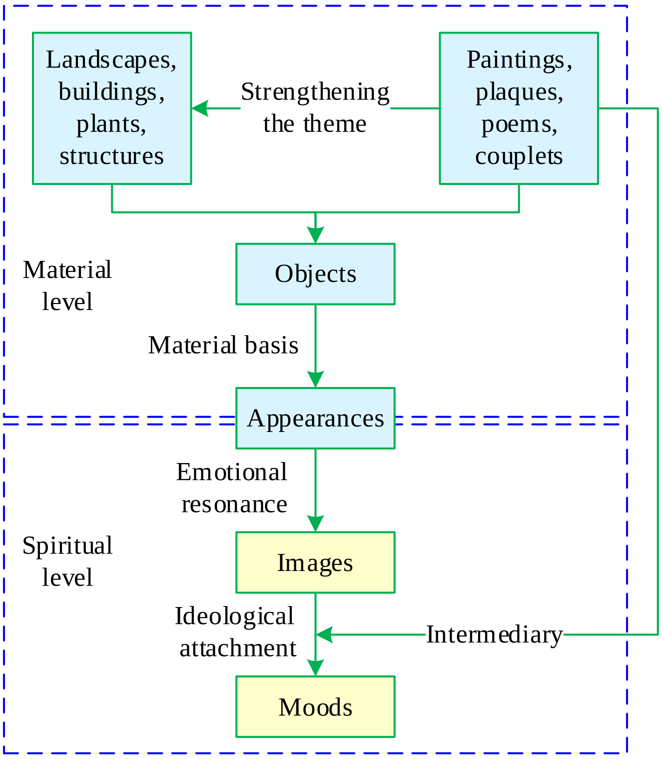


Figure 1: The production mechanism of garden artistic conception

4 Spatial layout and aesthetic analysis of landscape design

4.1 Space layout effects

4.1.1 Analysis of spatial syntactic parameters

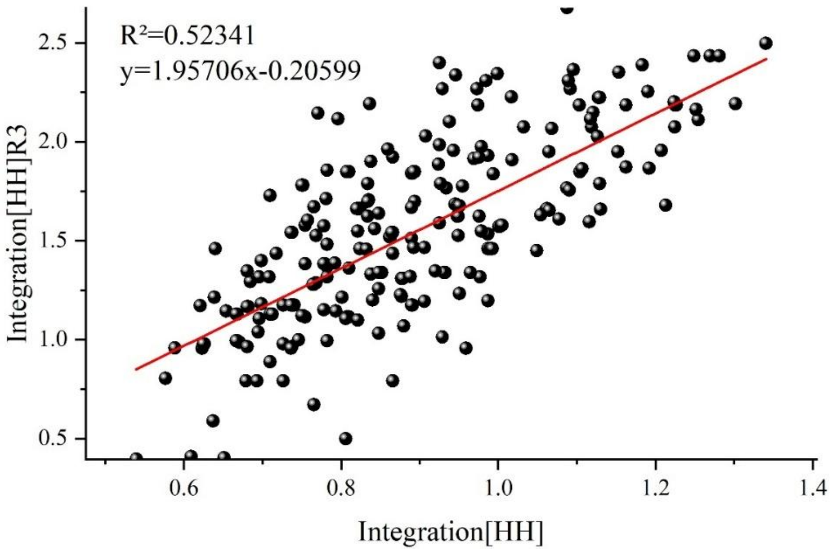
In this paper, the space of village A and village B is analyzed by using the axial method of spatial syntax, which is a study of the overall space of the landscape. A straight line is used to represent the trail to get the axial model of the landscape space, and then the integration degree, connection value, depth value and comprehensibility degree in the axial method are selected to analyze the spatial form of village A and village B, and the data are obtained for organizing. Table 1 shows the results of syntactic parameter analysis. Integration degree indicates the degree of spatial aggregation, reflecting the degree of connection and accessibility between a unit space and other spaces in the system. Usually the warm color indicates a high value, which means that it has centrality, strong connection with other spaces, and strong accessibility, and vice versa. Integration degree can be divided into global integration degree and local integration degree, global integration degree indicates how closely a node is connected to all nodes in the whole system, showing the centrality of a space in the colony. The local integration degree indicates the closeness of a node to its neighboring nodes within a few steps, which is usually calculated in 3 topological units, called "radius-3 integration degree". Connection value indicates the degree of influence between spaces in the landscape, reflecting the ability of spatial penetration. In the axial method, it can be judged by analyzing the number of intersections between a certain space and other spaces. A high connection value indicates that the space is closely connected to the surrounding spaces and has a strong influence on them. On the contrary, if the connection value is low, the space is weakly connected to the surrounding and does not have a strong influence on the surrounding space. Depth value expresses the accessibility of the space node, the topological distance between two neighboring axes is defined as one step, the minimum number of steps (i.e., the number of spatial transitions) from one axis to another is expressed as the depth value between these two axes, the smaller the depth value, the better the accessibility of the space, the higher the degree of portability. The degree of comprehensibility is the degree of consistency between the overall space of the village and its local space, and the value of comprehensibility reflects the degree of perception of the local space of the village to the overall space.The data of garden B are higher than that of garden A, and the degree of global integration is higher than that of garden A by 0.1781, and the values of connection and depth are 2.7995 and 8.4984, respectively.

Table 1: Analysis of syntax parameters

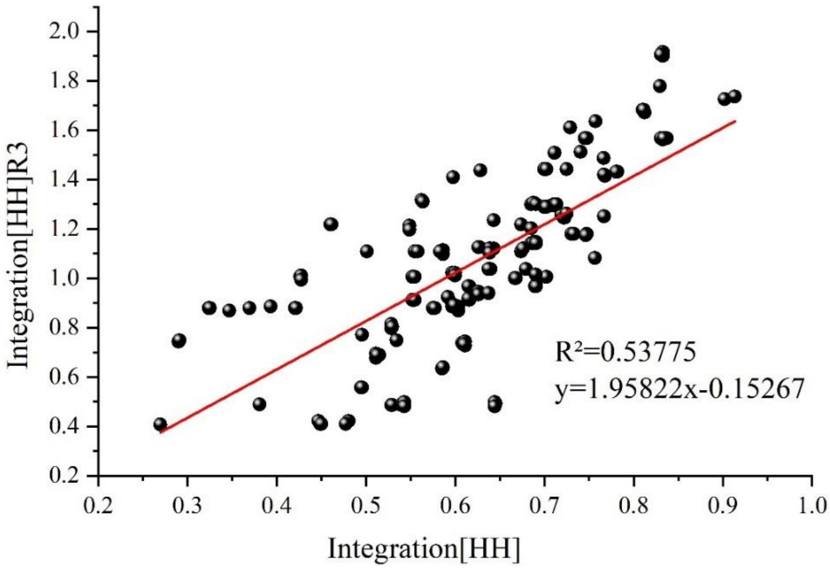
Garden	Global integration	Local conformity R=3	Local integration R=7
A	0.6485	1.1655	0.8466
B	0.8266	1.4688	1.0548
Garden	Connection value	Depth value	Comprehensibility
A	2.5486	8.0795	0.5485
B	2.7995	8.4984	0.4966

4.1.2 Comprehensibility

Figure 2 shows the comprehensibility of garden A and garden B. Figure (a) shows garden A and figure (b) shows garden B. The X-axis of the figure indicates the global integration degree, the Y-axis indicates the local integration degree within three topological depths, and R^2 indicates the comprehensibility degree, and the comprehensibility degree is considered to be better when R^2 is between 0.5 and 0.7, and is considered to be very good when the value is greater than 0.7. The comprehensibility degrees of both garden A and garden B are average, and the comprehensibility degrees of garden A are 0.52341 and 0.53775 for Garden A and Garden B, indicating that the localized spaces of the two gardens have some degree of correlation to the perception of the overall space.



(a)A Garden



(b)B Garden

Figure 2: A garden and B garden understanding

4.1.3 Integration t-test

The previous section described the differences between the typical gardens in A and B based on the results of spatial syntax analysis, but whether such differences are statistically significant still needs to be further investigated. Therefore, the mean and standard deviation of the raster values of road and line-of-sight integration of the six gardens were firstly analyzed, and the gardens were divided into two groups according to geographic regions to conduct t-tests in order to infer the existence of the differences between the gardens in the two places. Table 2 shows the results of the t-test for the mean and standard deviation of the integration degree of the two gardens.

In terms of road integration, the p-value of the average road integration t-test results of the two groups of gardens in A and B is 0.0244, indicating that the accessibility of the gardens analyzed in the two places has a difference at a significant level of 0.0244, and that the accessibility of A gardens is significantly higher than that of B private gardens. The t-test results also showed that the standard deviation of the accessibility of the roads in the two gardens showed marginal significance at the 0.0633 level of significance. This implies that the internal accessibility of the 3 A gardens varies more, with more spaces of high and low accessibility, in contrast to the internal road accessibility of the 3 B private gardens, which is more stable.

Regarding the degree of visual integration, the p-values of the mean and standard deviation parameter tests of the two gardens are much larger than 0.05, indicating that the differences in the spatial layout of the two gardens in terms of visibility are not significant and do not show significant regularity.

Table 2: The means of the landscape integration and the standard deviation t test

Index	A		B		T	P
	Mean value	Standard deviation	Mean value	Standard deviation		
Average road conformity	2.0159	0.3485	1.2485	0.9485	-4.0452	0.0244*
Average sight integration	5.9485	0.9652	5.0486	1.4856	-0.9485	0.4152
Standard deviation of road conformity	0.4698	0.1485	0.2668	0.0245	-2.5485	0.0633
Standard deviation of sight	1.0648	0.3948	1.0348	0.3486	-0.0966	0.9485

* indicates that the level with p<0.05 is significant.

4.2 Aesthetic analysis

4.2.1 Objects of evaluation

This paper combines the classical garden space aesthetics and history and culture theme park related theories, selects the adjective pairs applicable to the space evaluation of history and culture theme parks, and applies the SD semantic difference method to derive the average scores of each adjective in each sample and the comprehensive average, so as to make the adjective pairs of the qualitative descriptions to be quantitatively processed, and thus get the data-based presentation.

The subject population, i.e., the evaluation object, is generally more representative, and the number of respondents of SD method is usually around 20-50 people, if the conditions allow it, the more the better. At the same time, a large number of studies have shown that the larger the population base of the participants, the more it can weaken the differences in aesthetic attitudes between different groups.

The best way to complete the evaluation is to place the test subjects in a real landscape environment, so that they can experience the overall space of the historical and cultural theme parks, in view of this, 40 copies were distributed in each of the above four historical and cultural theme parks in September ~ October 2024, a total of 160 questionnaires were distributed, and the age of the evaluation subjects was selected to be from 15 years old to 65 years old, and before the subjects filled in the SD questionnaires, they were first introduced to the The participants were introduced to the notes of this questionnaire and briefly explained the concepts of the relevant terms and the method of filling out the questionnaire.

In the end, 160 questionnaires were collected, with a recovery rate of 100%. Among them, 160 questionnaires were valid, with a validity rate of 100%.

4.2.2 Landscape design aesthetics

After the questionnaire was finished, the results of the questionnaire were entered into the software for statistics, and the average value of each factor and the comprehensive average value (AQ) were calculated, and then the experimental data were quantitatively quantified, the evaluation curves were plotted, and the analysis was carried out by the SD method.

Where: comprehensive average = average value of each factor / number of samples, Table 3 shows the average value and comprehensive average value of SD method investigation.

The scores are as follows: undulation change of space (0.7496) > opening and closing change of space sequence (0.5936) > hiding and revealing of space (0.5485) = sparse and dense combination of space layout (0.5485) > coordination of space color (0.5155) > atmosphere of cultural characteristics (0.5148) > clear separation of spatial layout into primary and secondary (0.5048) > permeability of space (0.4698)>Space scale appropriateness (0.4552)=degree of combination of reality and falsehood (0.4522)>historical and cultural atmosphere (0.2988)>aesthetic satisfaction (0.2548)>emotional value (0.2485)>sense of revelation (0.1969)>transcendental feeling (0.1525), from the table, we can derive that the comprehensive average of these 15 predictive evaluation factors are all The average value of these 15 predictive evaluation factors is not higher than 1. Therefore, the three levels of "physical environment", "emotional environment" and "mood" of the space of the subject's landscape design need to be optimized, among which, historical and cultural atmosphere, aesthetic satisfaction, emotional value, sense of revelation, and sense of transcendence need to be optimized. Among them, the historical and cultural atmosphere, aesthetic satisfaction, emotional value, sense of revelation, and transcendental feeling are on the low side compared to the whole, which is due to the fact that some of the park spaces do not have a good physical and emotional environment, for example, the spatial scale is not coordinated, which gives an uncomfortable spatial feeling, and the expression of emotion is insufficient, which makes it difficult to satisfy the public's spiritual and aesthetic needs.

Table 3: The average and the average of the SD method

Evaluation factor	A	B	C	D	AQ
Spatial coordination	0.8896	1.2048	0.0948	-0.1452	0.5155
Spatial scale suitability	0.6785	1.3455	0.1966	-0.3455	0.4552
Spatial layout	0.8463	1.1869	0.2485	-0.1645	0.5485
The spatial layout is clearly defined	0.7856	1.1469	0.2994	-0.2869	0.5048
The fluctuation of space	1.2488	1.6485	0.3745	-0.2496	0.7496
The hidden dew of space	1.1342	1.2648	0.0855	-0.1598	0.5485
Space permeability	0.8493	1.3458	0.0248	-0.3745	0.4698
False set	0.6785	1.2486	0.2485	-0.3485	0.4522
The opening and closing of the space sequence	0.9452	1.2452	0.2348	-0.0855	0.5936
Cultural atmosphere	1.1654	1.1645	0.4856	-0.7485	0.5148
Historical and cultural atmosphere	1.3486	0.3148	0.3485	-0.9485	0.2988
Emotional value	1.3485	0.2485	0.5296	-1.0485	0.2485
Sense of revelation	1.3185	0.2498	0.4855	-1.2486	0.1969
Transcendental feeling	1.2485	0.0485	0.6485	-1.3485	0.1525
Aesthetic satisfaction	1.3585	0.1036	0.9488	-1.3789	0.2548

5 Conclusion

Computer vision technology shows significant application value in garden landscape design, providing scientific tools for spatial layout analysis and aesthetic evaluation. Spatial syntactic analysis reveals the differences in spatial organization of different gardens, with the comprehensibility degree of garden A being 0.5234 and that of garden B being 0.5378, both of which are at the medium level, indicating that the correlation between local space and the overall space needs to be strengthened. The significant difference in road integration (p=0.0244) reflects the different concepts of accessibility design in the two gardens. The results of the aesthetic evaluation show that the comprehensive average of the 15 evaluation factors is lower than 1, among which the historical and cultural atmosphere is only 0.2988, indicating that there are deficiencies in the creation of cultural connotation in the current gardens. There is a complex correlation between the physical characteristics of space and aesthetic experience, and it is difficult to satisfy the deep spiritual needs of tourists by simply pursuing formal beauty. Future garden design should make full use of the analytical ability of computer vision technology to ensure the functionality of space on the basis of strengthening cultural expression and emotional resonance, to realize the organic integration of technical rationality and artistic sensibility, and to promote the development of garden landscape design to a higher level.

About the Author

Junjie Liao was born in Yichun City, Jiangxi Province, China. She is currently employed at Yichun University in Jiangxi Province and serves as a teacher for design courses such as Composition Design and Sketchup Assisted Landscape Design in the School of Life Sciences and Resource Environment. His main research areas are landscape art design and environmental art design.

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