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Application of Parametric Design in the Optimization of Traditional Landscape Architecture

Yue Han [1,*], Kejia Zhang [1,*], Yanyan Xu [1], Hao Wang [1] and Tianlong Chai [2]

1 Department of Landscape Architecture and Construction Engineering, Woosuk University, Jeonju 55338, Republic of Korea
2 College of Civil and Architecture Engineering, Guangxi University of Science and Technology, Liuzhou 545006, China
* Correspondence: hanyue510242932@163.com (Y.H.); jiajiazz1228@163.com (K.Z.)

Abstract: Parametric design, with its unique scientific and logical nature, is gradually applied in the field of landscape design. Therefore, the GIS (geographic information systems) technology of parametric software was applied to the optimization of traditional landscape architecture, and its practical application quality was discussed. The actual analysis results showed that the evaluation result of parametric design had the highest score of 7.71 in behavioral perception. The overall score was 7.28, showing a high scientific nature. In the evaluation of landscape environmental benefits, after the optimization of landscape greening by parametric design, the air cleanliness and living comfort were generally improved, compared with those before optimization, and the highest values were 11.97 ± 6.01 and 5.86 ± 2.11 respectively. In the evaluation of the economic benefits of gardens, the economic income of gardens in the past 8 years generally increased, reaching the highest of 3.5795 billion yuan, with a growth rate of 78.92%. At the same time, the return on investment reached 26.17%, far exceeding the expected 20%. Among the social benefits, the weight of increasing employment opportunities was the largest at 0.36. In summary, parameterized optimization of traditional landscape design can effectively improve its social, environmental, and economic benefits and has good practical value.

Keywords: parametric design; landscape architecture; GIS technology; master plan

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1. Introduction

The development of computer technology promotes the coming of the digital and information age, and parametric design, as the most important technology in the information age, has gradually become more widely used in some design fields [1]. In addition, parametric design, as a new design method with strong logic and science, has been widely used in landscape design with its unique functionality. At the same time, its internal complexity and inclusiveness also promote the reform of traditional design methods [2]. Deng et al. realized the digital planning of the urban landscape by using parametric technology to enhance the ecological value of the city [3]. Yoffe et al. realized the landscape sustainable development of professional communities in Israel through parametric design [4]. Henriques et al. combined parametric design with visual language, thus effectively promoting the improvement of architectural computing design [5]. Under this background, this research selected geographic information system (GIS) technology in the parametric design software and applied it to the optimization design of the traditional garden landscape. Different from the traditional parametric design method, GIS technology can explore the seemingly disordered landscape system of traditional landscape design and understand its logic and internal relationship. The purpose of the study is to improve the social and economic benefits of landscape architecture and promote its economic development while ensuring its environmental sustainability.

2. Related Work

The essence of landscape design is to discuss the relationship between the human living environment and nature, and the name of landscape design has a long history [6]. With the development of the landscape design discipline and parameterization, parameterized design has gradually become a new design method with objectivity, logic, and order, and its concept has gradually been integrated into landscape design [7–9]. Therefore, the majority of domestic and foreign scholars have carried out in-depth analysis on it. Parker et al. innovatively designed the habitat of coelenterates with parametric software to effectively reduce the threat to the survival of this type of birds in view of the decline in the structure of major habitats [10]. Veisi and Shakibamanesh optimized the distance between urban buildings and the location of units by using parametric design to solve the problem of the solar radiation range of urban unit communities, thus effectively improving the comfort of residential buildings [11]. In order to maintain the temperature of urban buildings, Loh and Bhiwapurkar used the actual function of parametric design to re-optimize the facade architecture of buildings, thus strengthening the insulation role of urban buildings [12]. In view of the solar radiation problem of urban boulevards, Shareef used the way of parametric landscape design to effectively improve the heat of the boulevards and enhance comfort [13]. Li et al. optimized the landscape elements of the humid subtropical residential area by using parametric design in view of the thermal comfort problem in the subtropical area, thereby enhancing the comfort of the residential area [14].

In addition, Anindita et al. used parametric technology to build a unified system for the optimization of landscape architecture, thus effectively improving the performance of landscape architecture design [15]. In order to achieve urban heat mitigation, Park et al. optimized the design of small urban green space by using parametric design, thus effectively expanding the cooling range of green space [16]. Guo et al. optimized the residential design with the concept of parameterization in view of the thermal environment effect of Shanghai residential buildings and proposed corresponding design strategies to effectively improve the comfort of open residential areas [17]. Tan et al. optimized the combination of different urban vegetation by using parametric design and accurately calculated the air and radiation temperatures of the city so as to effectively improve its refrigeration performance [18]. Salmanian and Ujang reviewed the urban demand design in order to improve the comfort of urban climate and optimized the urban system structure by using parametric design, thus effectively improving the urban landscape [19].

From the research of scholars at home and abroad, previous research was involved less in the optimization of traditional gardens and more in the parametric design of the whole architecture and garden. Therefore, this research focuses on the application of GIS technology in the optimization of traditional landscape architecture, which is more innovative than the traditional landscape planning and design. At the same time, this study applied GIS technology to the actual ecological garden in Lanshan Mountain, realized the organic combination of theoretical concepts and actual projects, and verified the effectiveness of parameter design from the design level, which has important reference significance for the improvement of current mountain gardens.

3. Application of Parametric Design in the Optimization of Traditional Landscape Architecture

3.1. Parametric Design and Theoretical Basis of GIS Technology

To discuss the application of parametric design to the optimization of the traditional garden landscape, GIS technology in parametric design was introduced into the optimization of the traditional garden landscape design, and its optimization quality was evaluated. GIS technology is a special spatial information system that can collect, store, manage, and calculate the relevant geographical data in the whole or in part of the earth's surface space, with the support of computer software and hardware. Parametric design transforms the design process into a parametric model, which can control or affect the production of a design result, and changes its design effect by changing its parameters. Parametric design is a new design method that improves the designer's ability to respond to complex environments and create new objects, bringing new ways of thinking to design. Parametric design focuses on the integration and the collaborative work of multiple disciplines. Its internal complexity, diversity, and inclusiveness have brought great impact to the traditional design process and design mode and also brought great changes to people's ideas [20,21].

The parametric method was applied to landscape planning, taking into account the project background, history and culture, functional positioning, and user needs. At the same time, the primary and secondary elements and secondary elements that affect the project were imported into the appropriate parametric software and converted into parametric programs so that the relationship of each parameter could be unified through the program language to form a parametric model and execute the corresponding algorithm instructions. Finally, we received a simple prototype of the garden landscape design [22]. In practical application, the parametric drawing software can make designers' designs more refined. Among them, software that have greater impacts on parameterization are shown in Figure 1.

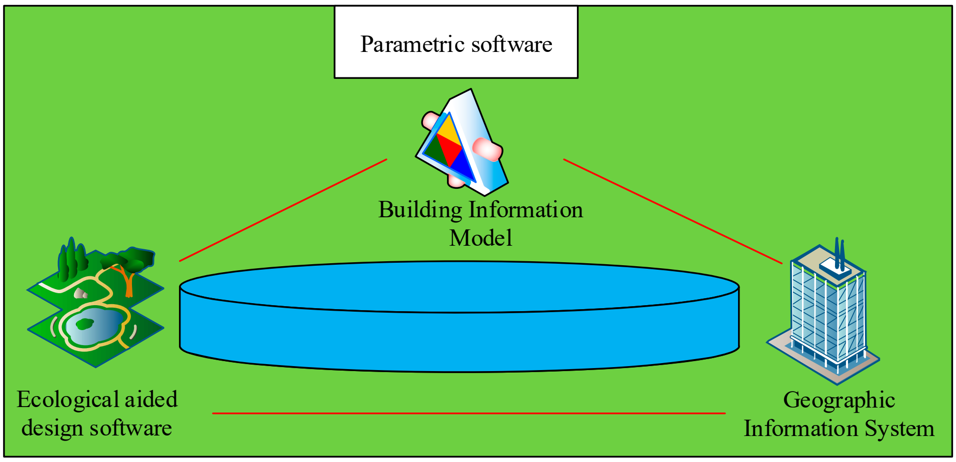


Figure 1. Software with large parameterization impacts.

From Figure 1, it can be seen that conventional parametric software that have the greatest impacts on parameterization include the Building Information Model (BIM), GIS, and the ecological-aided design software. All the information under the BIM technology can be integrated into a three-dimensional model information base so that the design team, the construction unit, the owner, and other staff can improve their work efficiency and save resources on the basis of BIM to achieve sustainable development. The application of BIM technology in landscape architecture can effectively avoid errors in the process of converting design drawings from two-dimensional pictures to three-dimensional physical drawings during actual construction so as to solve the problem of mutual cooperation among multiple drawing personnel. Ecological-aided design uses the environment as an important measurement means and incorporates it into the project so as to ultimately affect the production of design results.

The software selected for the study was GIS technology. GIS is a computer information system built on the basis of a spatial database, which is an interdisciplinary subject between earth science, information science, space science, and other disciplines. Based on the geospatial database, GIS uses computers to collect, manage, store, process, and analyze data to build a geographic model and provide technical support for geographic research and decision-making. Because GIS can conduct multi-dimensional and multi-faceted analyses on the project site, it is feasible in the field of landscape architecture planning and design [23–25]. At the same time, there is less application of GIS technology in traditional landscape architecture in previous studies. This research applied this scientific technology with strong spatial and attribute analysis capabilities to the planning and design of traditional landscape architecture. On the one hand, it can achieve visual dynamic simulation, and on the other hand, it can also lay a theoretical foundation for the development of the subsequent parameterization concept of traditional landscape architecture. Among them, the multi-dimensional analysis content of GIS in landscape architecture is shown in Figure 2.

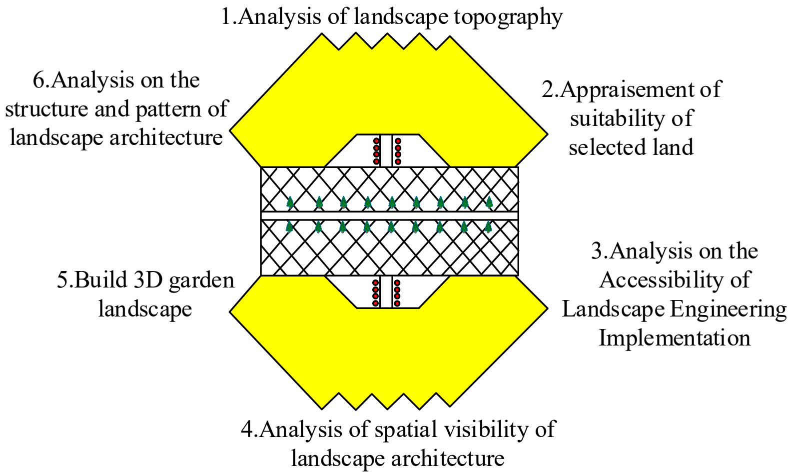


Figure 2. Multi-dimensional analysis content of GIS in landscape architecture.

From Figure 2, it can be seen that in landscape architecture, the multi-dimensional analysis of GIS includes the analysis of landscape topography, the suitability evaluation of selected land, the accessibility analysis of landscape engineering implementation, the spatial visibility analysis of landscape architecture, the construction of three-dimensional landscape architecture, and the analysis of the structure and pattern of landscape architecture. Because GIS technology comprehensively analyzes the elevation, slope, aspect, shadow, hydrology, and other aspects of the site, it has great advantages in the analysis of terrain and landform. The suitability evaluation of land selection is a standard to measure the suitability of land use, which provides a basis for formulating land-use policies and scientific land-use planning. Using GIS technology to evaluate land suitability can effectively improve the overall beauty of the landscape architecture. Garden accessibility analysis is mainly aimed at the economic indicators of the implementation of garden projects, which can effectively weigh the economic benefits obtained by specific garden projects.

Visibility analysis is mainly used to analyze the scenery that can be seen on the roads in the park and the layout position of each node to form a landscape space and control the building height. The GIS technology analysis tool can be used to analyze the visibility of the field of vision in a specific area and the visibility on the scenic line, which provides a reliable basis for scenic spot location and route optimization and upgrading. In addition, GIS can be used to transform the two-dimensional landscape planning map into three-dimensional time so users can get a better sense of immersion and communication. Finally, in the analysis of the landscape structure and pattern, GIS mainly introduces the concept of ecological sustainability, uses the idea of overall development to design the landscape, and uses the principle of landscape ecology to provide suggestions for the implementation of the project.

3.2. Parametric Design of Traditional Landscape Based on GIS

Aiming for the parameterized design of the traditional garden landscape, this research took Lanshan Mountain Ecological Garden Tourist Attraction as the base sample. The reasonable layout of the tourist attraction network should establish a reasonable network system, connect the main landscape nodes in a series, and make them consistent with the architectural style of the garden. At the same time, the terrain of the site should be taken into account as much as possible to avoid the handling of a large number of earthworks in order to achieve the aesthetic and economic balance of the tourist attractions. In addition, the optimal design of the site road network using GIS was studied. The implementation path first used the analytic hierarchy process to classify the terrain, water body, vegetation, and other factors of the garden road and to obtain the weight of each factor, thus obtaining a complete total cost map. Then, it input the starting point and ending point of the road into GIS together with the total cost map to obtain the road network. Finally, the best route selection scheme of the site's road network was obtained through optimization and screening. Lanshan Mountain Ecological Garden is located on Gaolan Mountain, with high altitude and a large topographic relief. Therefore, the details of some roads can be further optimized by using GIS tools, and the automatic computer-aided design software (Autodesk Computer Aided Design, Auto CAD) can be imported later [26]. The parameterized network design diagram of Lanshan Mountain Ecological Garden is shown in Figure 3.

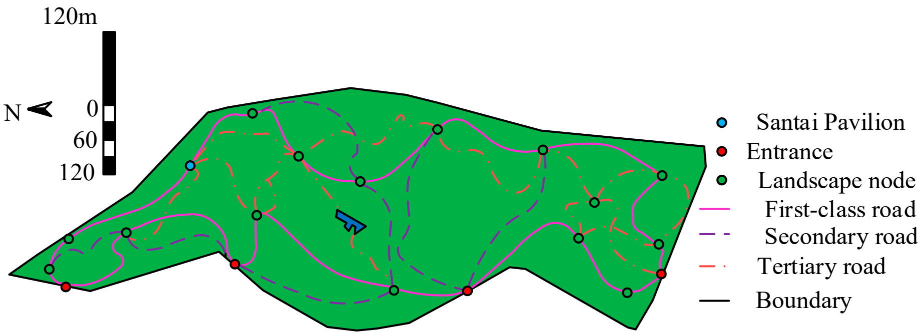


Figure 3. Schematic diagram of the parametric network design of Lanshan Mountain Ecological Park.

From Figure 3, it can be seen that the construction of the road network should conform to three standards, according to the characteristics of the terrain and tourist attractions of the ecological garden on Lanshan Mountain. First, we need a set of perfect highway sign systems, and we need to draw corresponding road signs based on them; second, it is necessary to set up basic service facilities on the highway, such as toilets, rest areas, etc.; finally, because the terrain of the scenic spot is steep and undulating, stone steps + cement + gravel road can be selected as a buffer. We can enrich the road landscape according to the scenery and natural environment along the way and build the road into a variety of walking paths, such as deciduous trails, gravel trails, wood plank trails, etc. At the same time, ecological construction methods should be adopted as far as possible to maintain the original style and features. On this basis, the building height of the Lanshan Mountain Ecological Garden site needs to be controlled to meet the actual demand of the landscape sight, that is, the visibility of corresponding landscape nodes and landscape lines.

In addition, based on the needs of the field, the research used GIS technology to select and design landscape plants. In landscape design, the role of the light environment cannot be ignored, and the source of outdoor natural light is solar radiation. Therefore, by analyzing the solar radiation in the garden area, we can not only better understand the behavior, perception, and comfort of tourists but also the sunshine conditions of the project at a specific time [27–30]. This method can select suitable planting sites for specific plants to make them grow in different environments to achieve the best growth conditions. By importing the relevant data of Lanshan Mountain Ecological Garden into the GIS software, it was found that the southwest and central regions were in high-radiation areas, so some positive plants can be planted; the northern area was in the medium-radiation area, and shade-tolerant plants can be selected to be planted there. For plant design, it was mainly affected by soil, temperature, and humidity, etc. Parametric plant design was completed under the superposition analysis of multiple parameters. Therefore, when using GIS to carry out the overall planning of Lanshan Mountain Ecological Garden, it was necessary to follow the corresponding principles, and its contents are shown in Figure 4.

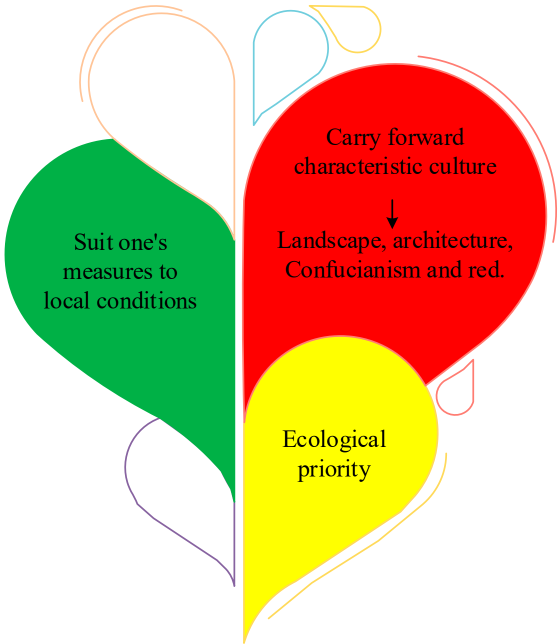


Figure 4. General planning principles of Lanshan Mountain Ecological Park based on GIS.

From Figure 4, it can be seen that the overall planning principles of the ecological garden in Lanshan Mountain mainly included ecological priority, adaptation to local conditions, and promotion of characteristic culture. As the modern expression of traditional landscape architecture, the core of urban mountain ecological park construction is to maintain the natural ecological restoration, take improving the ecological environment as the first priority, and scientifically divide the landscape engineering into different levels of ecological divisions. At the same time, reasonable planning and construction strategies should be carried out for each subarea to achieve the goal of sustainable development. In view of the principle of adjusting measures to local conditions, it is necessary to formulate a scientific strategy in line with local environmental policies and an executable plan in line with local development requirements according to the actual situation and resources of the project location. A complete plan and design must decorate a cultural rhythm, and the exploration of regional characteristics is an indispensable part of it. Therefore, it is necessary to conduct in-depth research on it and to integrate it into the entire design using culture as the carrier and protecting and carrying forward the local characteristic culture, as well as inheriting the historical context. In view of the ecological garden in Lanshan Mountain, this cultural feature includes landscape culture, architectural culture, Confucian culture, and red culture.

Therefore, under the planning principle, the ecological landscape of Lanshan Mountain followed the structure of “two axes and one belt, five zones and three cores”. See Figure 5 for details.

From Figure 5, it can be seen that the two axes were the landscape axis along the mountain on the east side of the plot and the characteristic culture axis on the south side; the belt was located in the southwest of the plot and near the village; the five areas were recreation, ecological restoration, cultural display, children’s entertainment, and farmhouse recreation picking areas; the “three cores” were the “landscape core”, “popular science education center”, and “economic center”. According to the parametric analysis of the five areas, the rest area needs to be set up in a densely vegetated area to increase the tourists’ sense of experience and fun. The establishment of the ecological restoration area is mainly to increase the green area of the park, protect the ecological environment, promote sustainable ecological development, and slow down soil erosion. The main function of the cultural exhibition area is to popularize the local characteristic culture to tourists to promote the historical context. The children’s entertainment area needs to be located in a flat and open area with natural characteristics and educational significance. As the economic core of the park, the Nonjiale Picking Area also needs to improve the safety of tourists, as well as the interaction between the Jiaqing people and nature. On this basis, due to high traffic density and other reasons, it is necessary to ensure the completeness of basic services.

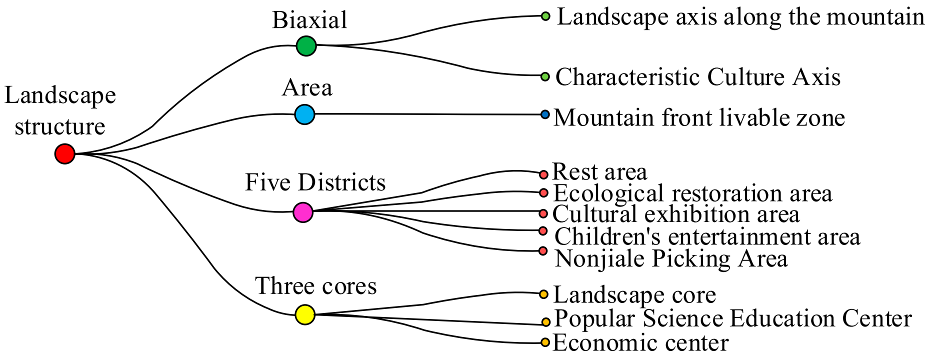


Figure 5. Landscape structure of Lanshan Mountain Ecological Park.

Aiming at the application quality evaluation of GIS technology in landscape optimization, the fuzzy comprehensive evaluation method was used to evaluate the weight of each index. The model expression and function expression of fuzzy comprehensive evaluation are shown in Formulas (1) and (2).

$$F = W \circ R = (\omega 1, \omega 2, \cdots, \omega m)\begin{bmatrix} r11 & r12 & \cdots & r1n \\ r21 & r22 & \cdots & r2n \\ \vdots & \vdots & & \vdots \\ rm1 & rm2 & \cdots & rmn \end{bmatrix} = (f1, f2, \cdots, fn) \quad (1)$$

In Formula (1), F represents the evaluation result vector; W represents the weight set; R represents the fuzzy relation matrix; and r indicates its internal element.

$$A = \sum_{k=1}^{m} B_k = \sum_{k=1}^{m}\left(\sum_{j=1}^{n} C_j D_j\right) E_k \quad (2)$$

In Formula (2), A represents the total score of satisfaction evaluation of the landscape quality; B_k represents the score of each landscape in the first-level indicators; E_k represents the weighted value of each landscape in the first-level indicators; C_j represents the score of each landscape in the secondary indicators; D_j represents the weighted value of each landscape in the secondary indicators; m represents the number of evaluation indicators in the first-level indicators; and n represents the number of evaluation indicators in the secondary indicators.

At the same time, in view of the multi-dimensional parametric design of traditional landscape architecture, corresponding theoretical models are needed for parametric analysis and feature extraction. Based on the introduction of GIS technology, a multi-dimensional, nonlinear, geometric, moment invariant generation model of the traditional garden landscape was studied and constructed, and its digital expression is shown in Formula (3).

$$Dif(F_1, F_2) = \min_{v_i \in F_1, v_j \in F_1, (v_i, v_j) \in W} \omega\left[(v_i, v_j) + R_W\right] \quad (3)$$

In Formula (3), F_1 and F_2 represent pixel dimension points, and v_i and v_j are its internal elements; ω represents training function; and R_W represents the sampling points of multi-dimensional nonlinear landscape image features. At the same time, in view of the problem of the parameterized design structure of traditional landscape architecture, in addition to collecting the relevant data of the actual mountain ecological landscape, the research also used the virtual simulation scene space for parameterized simulation and combined the relevant pixel points to obtain the model of spatial region feature matching of traditional landscape architecture; its expression is shown in Formula (4).

$$R = \overline{q}(x,y) = q(x,y)\left(\frac{v(x)}{v(y)}\right)^{\frac{1}{2}} \tag{4}$$

In Formula (4), $\overline{q}(x,y)$ represents the actual position of the key pixel. On this basis, the parametric design of the multi-dimensional, nonlinear traditional garden landscape was realized, and the foundation for the subsequent GIS technology in the simulation and optimization evaluation of the ecological landscape on Lanshan Mountain was laid.

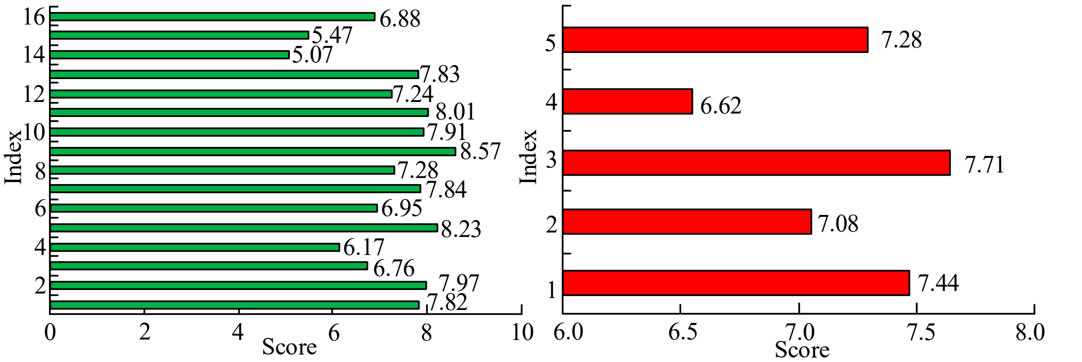
4. Evaluation and Analysis of Application Quality of GIS Technology in Traditional Landscape Optimization

To objectively and comprehensively evaluate the application effect of GIS technology in traditional landscape optimization, the study conducted simulation and optimization on the ecological landscape design of Mount Lanshan and carried out the corresponding evaluation. Before the evaluation experiment, the study used field research to understand the actual satisfaction of the population with the ecological garden, and, through communication with nearly 30 garden ecological experts, built a framework table of the quality evaluation system and obtained the weighted values of each index. Its contents are shown in Table 1.

Table 1. Quality assessment framework of the urban, mountainous ecological gardens.

Level I Indicators	Weighted Value	Secondary Indicators	Weighted Value
Ecological benefit (B1)	0.351	C1	0.106
		C2	0.175
		C3	0.070
Aesthetic experience (B2)	0.169	C4	0.071
		C5	0.054
		C6	0.026
		C7	0.018
Behavioral perception (B3)	0.273	C8	0.016
		C9	0.076
		C10	0.057
		C11	0.067
		C12	0.047
		C13	0.010
Social function (B4)	0.207	C14	0.041
		C15	0.098
		C16	0.068

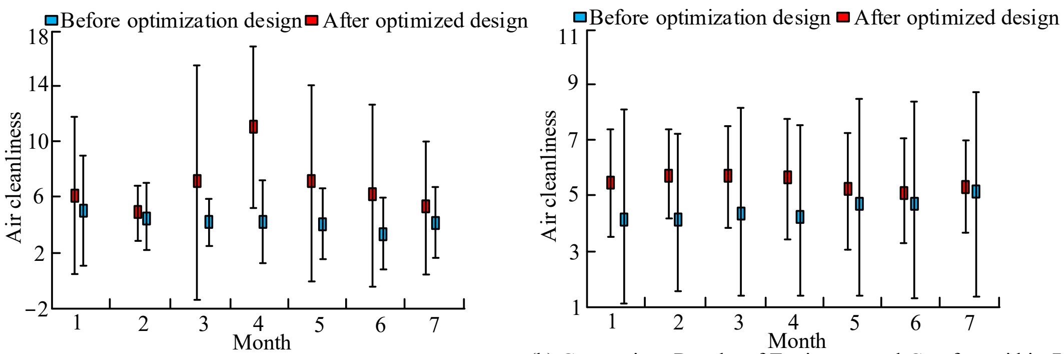
In Table 1, C1–C16 represents the diversity of vegetation, green coverage, diversity of species, change of plant layers and colors, ornamental diversity, enrichment of terrain and geomorphology, spatial coordination rate of terrain, road density, accessibility of tourist attractions, distance to water, safety and confidentiality of garden space, comfort of landscape scale, proportion of leisure activity areas, sports and leisure facilities, layout of rest service facilities, and leisure service places. It can be seen from the table that the weighted value of ecological benefits in the first-level indicators is the largest at 0.351. The weighted value of green coverage in the second-level indicators is the largest at 0.175. It shows that the ecological greening effect of gardens accounts for a large proportion of the actual score. On this basis, the research used Formulas (1) and (2) to score the indicators of the parametric design based on GIS. Among them, 1 to 2 points was set as very dissatisfied, 3 to 4 points as dissatisfied, 5 to 6 points as basically satisfied, 7 to 8 points as relatively satisfied, and 9–10 points as very satisfied. The scoring results are shown in Figure 6.



(a) Scoring results of secondary indicators (b) Scoring and total score results of all first level indicators

Figure 6. Scoring results of each index of parametric design based on GIS.

In Figure 6a, the ordinate is the secondary indicator; in Figure 6b, ordinates 1–4 are the indicators of Level I, and five is the total score. From the comprehensive Figure 6, it can be seen that the ecological benefit and behavioral perception scores in the first-level indicators are high at 7.44 and 7.71, respectively. Under the ecological benefit index, the scores of the parametric design on vegetation diversity and green coverage are higher: 7.82 and 7.97, respectively. Under the behavioral perception index, the parametric design scored higher in the accessibility of tourist attractions, the distance to the water area, and the safety and confidentiality of the garden space, which were 8.57, 7.91, and 8.01, respectively. In summary, the overall score was 7.28, which shows that the parameterized design of the ecological garden in Lanshan Mountain has a strong scientific nature in zoning and node location, route selection, height control of the buildings, plant selection and design, etc. According to the scoring results, the research focused on the evaluation of landscape environmental benefits after the optimization of the parametric design simulation. The results are shown in Figure 7.



(a) Comparison Results of Air Cleanliness within 7 Months before and after Landscape Optimization Design (b) Comparison Results of Environmental Comfort within 7 Months before and after Landscape Optimization Design

Figure 7. Environmental benefit evaluation of the landscape architecture after parametric optimization design.

Figure 7 shows the comparison of the scores of air cleanliness and environmental comfort in environmental benefits before and after the optimization of the parametric design. The full scores were 20 and 10, respectively. In order to more clearly compare the results, the study selected January to July for observation, which included spring and summer. From Figure 7a, it can be seen that the air cleanliness after the optimization design was generally high, and the highest cleanliness was 11.97 ± 6.01 points. From Figure 7b, it can be seen that the environmental comfort after the optimization design was higher than that before the optimization design, with the highest score of 5.86 ± 2.11 points. In other words, the garden environment benefit after the parametric design was improved and was effective. Finally, according to the actual benefits, the economic and social benefits of the optimized parametric design of the ecological garden in Lanshan Mountain were evaluated. In view of economic benefits, the research carried out corresponding predictions of the optimized economic data of the past eight years, based on the data of previous years, and the results are shown in Figure 8.

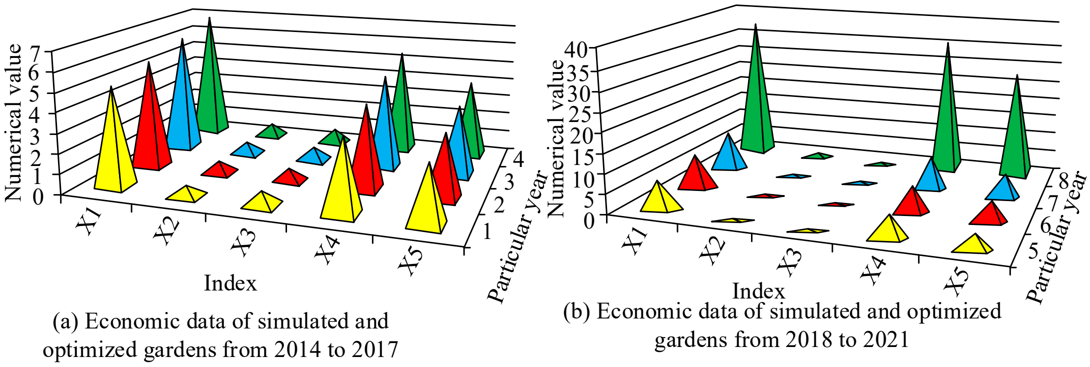


Figure 8. Economic benefits of the ecological garden in Lanshan Mountain after parametric design optimization.

In Figure 8, X1–X5 represents current inflow, current outflow, the depreciation expense of fixed assets, profit before interest and tax, and net profit, respectively. From Figure 8a, it can be seen that the cash inflow in the first four years showed a growth trend, but it was relatively slow, reaching 685.94 million yuan in 2017, with a growth rate of 24.87%; net profit also showed a growth trend, reaching 414.3 million yuan in 2017. From Figure 8b, it can be seen that the growth was relatively rapid at this time, reaching 3.5795 billion yuan by 2021, with a growth rate of 78.92%. In summary, the depreciation cost of the fixed assets of the garden always remained at 68.32 million yuan, indicating that it was well-maintained and had a low wear rate. At the same time, the calculated return on investment was 26.17%, which was more than the expected return of 20%, indicating that the economic benefit of the landscape architecture after parametric design optimization was good, and the return on investment was high. In addition, the social benefit evaluation grades of the garden were set as excellent, good, average, low, and poor. The evaluation results of 30 ecological garden experts are shown in Figure 9.

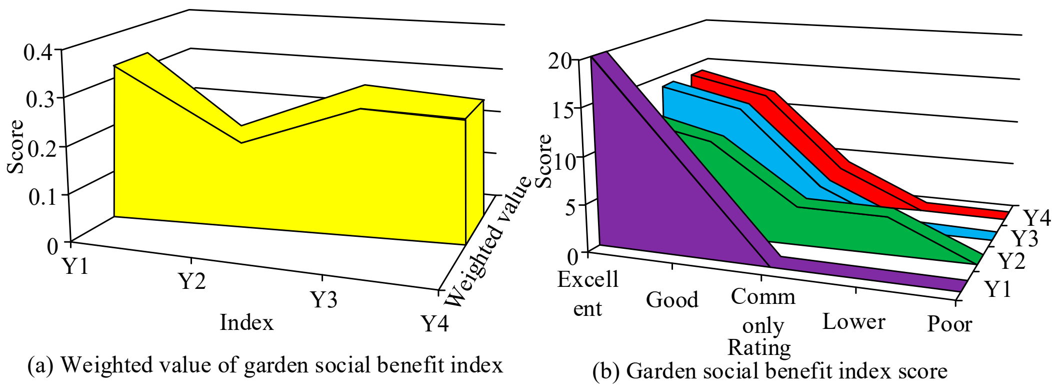


Figure 9. Evaluation results of the social benefits of Lanshan Mountain landscape architecture.

In Figure 9, Y1–Y4, respectively, represents increasing employment opportunities, improving the ecological level, improving the quality of life of local residents, and promoting economic growth. From Figure 9a, it can be seen that among the four indicators of social benefits, the weight of employment opportunities was the largest at 0.36. From Figure 9b, it can be seen that for the four indicators, the scoring grades are mostly concentrated on excellent and good, and the lowest grades among excellent were from 12 experts. In summary, the optimized design of the garden using parametric design will bring high social benefits and promote the economy, as well as the living standards of local residents.

5. Conclusions

To effectively improve the actual benefits of the traditional garden landscape, the GIS technology in a parameter design was applied to the optimization design of the actual ecological garden in Lanshan Mountain, and its environmental, economic, social, and other benefits were actually discussed. The actual results showed that in the overall evaluation of its application quality, the ecological benefits and behavioral feelings of parametric design in the first-level indicators scored higher at 7.44 points and 7.71 points, respectively. In the evaluation of garden environmental benefits, the air cleanliness and living comfort after the optimization of the garden landscape by parametric design were generally higher than before, with the highest scores of 11.97 ± 6.01 and 5.86 ± 2.11, respectively. In the evaluation of the economic benefits of gardens, the overall economic income of gardens in the recent 8 years showed a growth trend, reaching the highest of 3.5795 billion yuan, with a growth rate of 78.92%. At the same time, the rate of return on investment reached 26.17%, exceeding the expected rate of return of 20%. For the evaluation of the social benefits of landscape architecture, the weight of increasing employment opportunities in the four indicators was the largest at 0.36. At the same time, the scoring grades of all indicators accounted for a large proportion of excellent and good scores, with a minimum of 12 experts. In general, parametric design highly affected the optimization of traditional landscape architecture, effectively improving its social, environmental, and economic benefits; it had strong application effectiveness and practicality. It is worth noting that although parametric design has advantages in objective science and logic, landscape architecture design should also be integrated with aesthetics; the discussion about artistic aesthetics can be strengthened in the future.

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Conflicts of Interest: The authors declare no conflict of interest.

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