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Research Article

Research on Digital Design of Urban Public Landscape Based on Morphogenesis

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With the development of digital technology, it is possible to organize the deep relationship of public landscape elements. Design inspiration is no longer static and manual imitation of natural representations but can be dynamically self-organized. The design under the digital design theory shows obvious characteristics: multiparameter action, bottom-up, dynamic iteration, and optimal result orientation. The design chain, or meta-design, has since formed the basic digital design chain. Based on morphogenesis and combined with the existing landscape design creation methods, this study summarizes an operable logic system of digital design based on morphogenesis. It is hoped that through digital technology, it is possible to establish the relationship between various spatial organizations in the public landscape system. It uses the theory of morphogenesis and digital research to expand the cognition of landscape morphology and stimulate the innovation of design methods and build a landscape design logic system based on program algorithms. This study uses the subsystem design and completes the generation process from the design concept to the space formation from the graphic concept, which proves that this design logic system is feasible and has obvious advantages to a certain extent.

1. Introduction

With the development of the economy and the improvement of computer technology, people's requirements for landscape design are also constantly increasing. The traditional landscape design methods can no longer meet the needs of urban development. Our country's landscape design has entered the stage of digital design. However, there are still some deficiencies in the current domestic landscape design, such as how to combine computer technology with landscape design? How to more rationally present every aspect of landscape design, instead of relying on intuitive design and empirical design? The essential problem of morphogenesis is to explore how to establish living systems. Through the research and summary of plant morphology, two different discussions have been drawn, namely, "the theory of preformation" and "the theory of postformation." With the development and extension of postformation theory, it has gradually become the ideological basis of morphogenesis. In a research discussion meeting on urban renewal in New York, it was proposed that "it is necessary to pay attention to the application of morphogenetic concepts and learn the growth process of life, so as to produce excellent landscape design, which is always in dynamic like a dynamic city." Digitization is to build a model of a complex system or process with the help of a computer, to test the model, then, to have an in-depth understanding of the various behavior mechanisms of the model system, and to control the various means and methods of the model system. Modern computer simulation application technology is an emerging discipline based on operations research, mathematical statistics, and computer science. Based on the methods and concepts of morphogenesis and digital design, this study is reading the existing theories of morphogenesis and digital graphics, especially the related theories of landscape digital graphics and the research theories and research results of landscape morphogenesis, and summarizes the process methods of morphogenesis and digital graphics in landscape design. Based on the two theories of complex adaptive system and morphogenesis, using bottom-up and digital design thinking, using algorithm design and digital design methods, and the methods and methods of digital design of landscape design based on morphogenesis are studied [1–5]. This study mainly summarizes the development, characteristics, and logic of morphogenesis and digital diagrams. Combined with the existing landscape design creation methods, it summarizes an operable logic system of digital diagram design based on morphogenesis.

2. Related Work

At present, in the exploration of complexity science, designers represented by Steven Johnson have published a series of papers, such as "emergence-connecting with the life, brain, city, software of ants," which has an impact on reality in this study, and the application mode of digital technology has been deeply analyzed, which has an important impact on the morphogenesis mechanism. With the gradual development of diagrams and other spatial theories, it has brought new promotion to the thought and biological logic of digital design. Second, in the research of digital design, designers represented by Rego Lynn published a series of works, such as "Folding, Body and Bubbles," on "dynamics" and "force field". The application of the theory in the process of morphogenesis is described in detail, and it is believed that any design based on the coordinate reference system will show a continuous expansion of the internal logic system and the corresponding information place. At the same time, the UK's AD magazine also summarizes the thinking of contemporary designers and conducts in-depth research on theories such as skin, folding, and emergence. Based on the two theories of complex adaptive system and morphogenesis, this study uses bottom-up and digital design thinking and uses the methods of algorithm design and digital design to study the methods and methods of digital design of landscape design based on morphogenesis [6–11]. The research contents include the following: (1) theoretical thinking and design thinking of landscape design under morphogenesis, (2) digital morphogenesis of landscape under morphogenesis, (3) theoretical thinking and design thinking of landscape design digital illustration, (4) landscape methods of designing digital graphics, and (5) digital graphical program for landscape design.

3. Related Theoretical Methods

3.1. Morphogenesis

3.1.1. Overall Design Thinking. As the sum of individual relationships, only when the landscape system is deeply analyzed from the overall level, its characteristic attributes and general laws will be highlighted. In the process of analyzing the landscape system as a whole, it is necessary to add a linked relational network, a progressive operation mechanism, and events from a time and space perspective, so as to ensure that it will not lose its original relationship and performance. Therefore, it is necessary to integrate the overall design thinking in order to include the dynamic evolution process of the landscape system [12].

3.1.2. Bottom-Up Process Thinking. Combined with the processing logic of morphogenesis, designers need to find out various influencing factors in the landscape system and use them as a bottom-up driving mechanism. This requires designers to screen the initial information and, at the same time, conduct an in-depth analysis of the project, in order to obtain the correct direction of morphological evolution [13].

3.1.3. Relational Thinking of Interactive Adaptation. In traditional theoretical cognition, it is customary to disassemble the system into different individuals and then explain this hierarchical relationship through linear thinking. As a nonlinear system, each factor in the landscape system is not independent but a system that restricts each other and finally reaches a balanced steady state. The landscape needs to be regarded as a complex system rather than a specific object, and its internal nonlinear spatial logic needs to be correctly constructed [14].

3.2. Digital Morphogenesis of Landscape

3.2.1. Topology Occurrence. Topological geometry is the basic property of how geometric figures remain unchanged in continuous homeomorphic deformation, and it is a geometric theory specializing in the study of the continuity of geometric figures. Homeomorphic deformation means that in the process of deformation, as long as the deformation does not break or overlap, the overall structure of the original topology will not be destroyed. The homeomorphic deformation of landscape topology is a series of topological structure levels derived from the original topological level based on the prototype of the original diversity and unity. In terms of design, the enlightenment of topogenesis is not only in geometric shape but also has an important influence on its logical thinking, and it is used as the theoretical basis and internal mechanism of morphogenesis. For some time, the digital design practice of landscape has stayed in the exploratory stage. It is hoped to use topology generation as a way of spatial structure layout to realize the transformation from the natural landscape to artificial landscape and to create a new landscape design method to make people aware of topology [15–18].

3.2.2. Parameters and Algorithm Generation. The algorithm is to use the overall method to describe the mechanism of dealing with the problem, and it is one of the important contents of the parametric design method. The program of parametric design is to convert the design elements and requirements into computer programs and use the corresponding calculation rules to express the generation process of the shape, so as to obtain the final program shape. The algorithm only needs to calculate the logic with the help of simple rules, so as to obtain complex results, and the designer only needs to select and optimize the results. Due to the large amount of information in the landscape system, it is difficult to completely express the landscape system by using traditional design methods. With the help of algorithms and parametric technology, a corresponding digital landscape model can be built to simulate and express the relationship between the internal and external influencing factors of the landscape, which can effectively allow designers to obtain the most suitable landscape in a short time [19–21].

4. Construction of a Digital Design Program for Urban Public Landscape Based on Morphogenesis

4.1. Digital Design Based on Program Algorithms. No matter what kind of diagram logic is, it all depends on the program algorithm. This design method based on a program algorithm is the basic design chain of the digital diagram—"meta-design." Since the process of landscape design is preliminary analysis-asking questions-design concept-design plan-preliminary design-construction drawing design, it has much in common with the process of architectural design, so its design method and process are inspired by landscape design. It should be noted that the main content studied in this study is in the generation stage of the general landscape plan design. Three elements must be included in the meta-design: a parameterized prototype, a measure of the performance evaluation of the solution, and a machine algorithm that controls the loop in the direction of optimization, as shown in Figure 1. No matter what kind of diagram logic is, it all depends on the program algorithm. This design method based on a program algorithm is the basic design chain of the digital diagram—"meta-design."

In the meta-design system, it is necessary to separately classify the landscape system according to the basic research of the landscape and the objects of its role (the actors in the landscape system). In the landscape digital design system of meta-design, the landscape parameters are completely included in a system where the three systems of people, landscape, and environment adapt to each other, so the landscape system is divided into two basic levels, namely, the internal system (landscape system) and external system (environmental system and human system), as shown in Figure 2.

Using a computer programming language, combined with digital design methods to build an automatic decision-making model, at the same time, according to specific constraints, the relationship between different types of landscape units and adjacent units is calculated, and the individual coordination index is obtained, on this basis, the optimal next-generation individuals are selected, repeated in this way, a population composed of individuals after the global optimal convergence can be finally obtained, and the most suitable design scheme is found. Program algorithm design fundamentally puts forward the basic logic of digital design, but the design process is still largely influenced by the designer's subjective experience and esthetic concepts. Under the existing conditions, computer logic and subjective logic jointly affect the composition of graphic design. Results: The judgment and feedback of meta-design results based on subjective experience and esthetic concepts have become an important part of the digital graphical design system. In particular, the esthetic value is the long-term precipitation of designers based on design feedback, which is more in line with the public's cognition than program algorithm design results. At the same time, the designer's subjective concept is preconceived, and the program algorithm design based on this construction also constitutes a digital design method in a broad sense.

4.2. Digital Design Procedures

4.2.1. Digital Design Method and Selection of Simulation Platform. After the design concept is determined, an overall analysis of the project is required to determine the digital design approach. There are two types of digital design methods: one is to start from the design concept and use traditional landscape design methods and procedures to divide the landscape system into traffic system, functional system, landscape node system, and plant system, and perform parametric simulation, respectively. The prototype of the design scheme is obtained, combined with the simulation analysis of the sunlight and wind environment, and the basic shape of the design is obtained; the other is to start from the design concept, determine the relationship between the various influencing factors in the system, convert them into parameters, input them into the simulation model in the environment, and then simulate to get the prototype of the design. According to the basic design conditions of the project, the digital design method must be reasonably chosen, specifically as shown in Figure 3. This study prefers the latter.

In the selection of simulation platform, the development of computer-aided design platform has become more and more mature, but the industries targeted by each software platform are different, and the computer software platform for landscape professional has not yet been determined. Therefore, for the landscape major, the most direct solution strategy is to comprehensively use the currently developed computer software platform to assist the landscape design and achieve the design purpose. According to the basic situation of the project, the main digital simulation platform selected in this article is Rhinoceros + Grasshopper.

4.2.2. Subsystem Simulation Analysis. With the help of the site prototype theory, according to the composition characteristics of the landscape system itself and the traditional landscape design method and process, this study divides the landscape design process into four steps: traffic system design, functional system design, landscape node system design, and plant system design. The key point is to determine the corresponding digital simulation method for the system corresponding to each step after determining the design concept of the project and the digital diagram method, extract the influencing factors in each system, conduct a separate parametric simulation analysis, and then, fit the simulation analysis results of each subsystem to get the basic prototype of the design. It is a landscape design logic

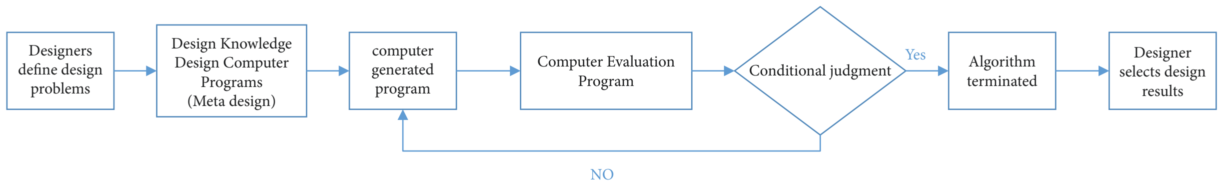


Figure 1: Meta-design—basic design chain.

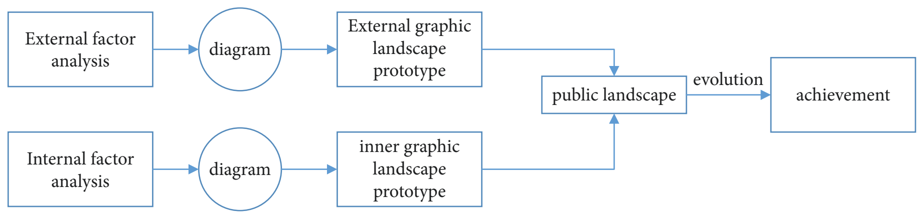


Figure 2: Hierarchical decomposition of landscape system.

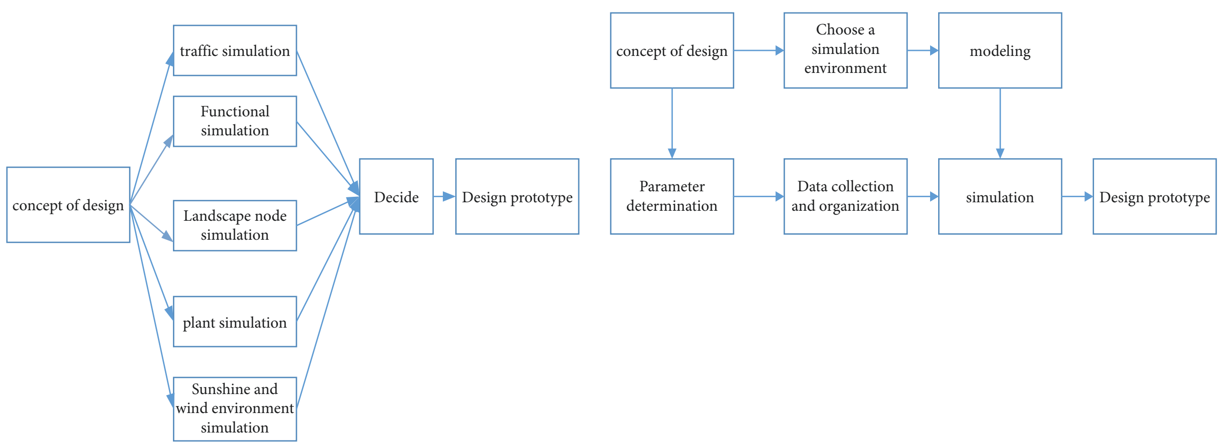


Figure 3: Two ways of digital design.

system based on morphogenesis as the basic theory and digital graphic design method, as shown in Figure 4.

4.2.3. Sunshine and Wind Environment Simulation Optimization Design. The sunshine environment of the site affects the layout of the internal functional system, landscape node system, and plant system to a certain extent, while the wind environment of the site determines the layout of the interior landscape space to a certain extent. By simulating and analyzing the sunlight and wind environment of the original site, it can play a guiding role in the formation of the prototype of the landscape design scheme. After the preliminary plan of landscape design is generated, the sunshine and wind environment should be simulated and analyzed again to check the rationality of the design plan, and the design plan should be optimized and adjusted according to the analysis results to obtain the prototype of the final design plan, as shown in Figure 5.

4.2.4. Generation of Landscape Morphology. After the simulation analysis of the subsystem and the simulation analysis of the sunlight and wind environment, the corresponding design prototype is obtained. Combined with the designer's subjective experience and esthetic concept, the design scheme is subjectively adjusted and optimized to obtain the final design scheme shape, as shown in Figure 6.

5. Landscape Digital Design Practice Based on Morphogenesis

In the digital graphic design logic system, it is suitable to use the graphic concept as the starting point of the design, combine the program algorithm to design the subsystems, and finally find the optimal design scheme through the fitting between the various systems.

5.1. Digital Design Logic Mining

5.1.1. Analysis of Influence Factors of Landscape System. During the whole project development process, there are many factors outside the site that affect the landscape design: local cultural environment, geographical environment, surrounding environment, business distribution, traffic relationship outside the site, sunlight, wind direction, and the owner's functional requirements for the entire park. Among

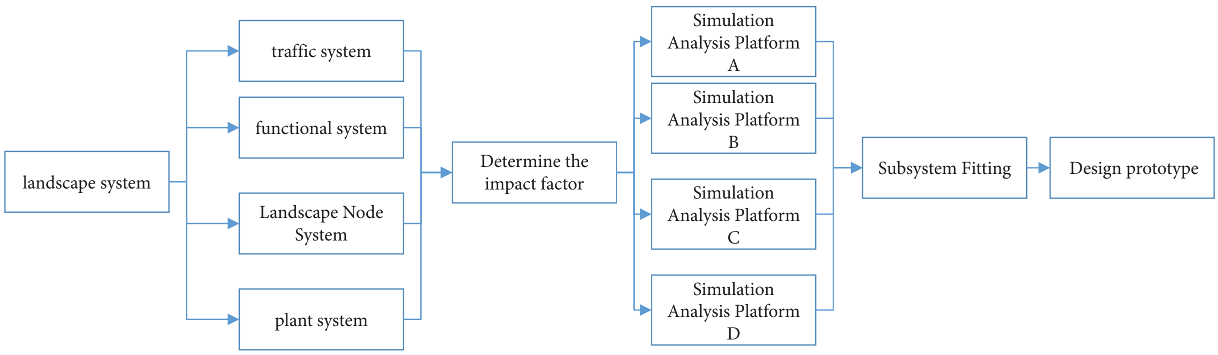


FIGURE 4: Flowchart of subsystem simulation analysis.

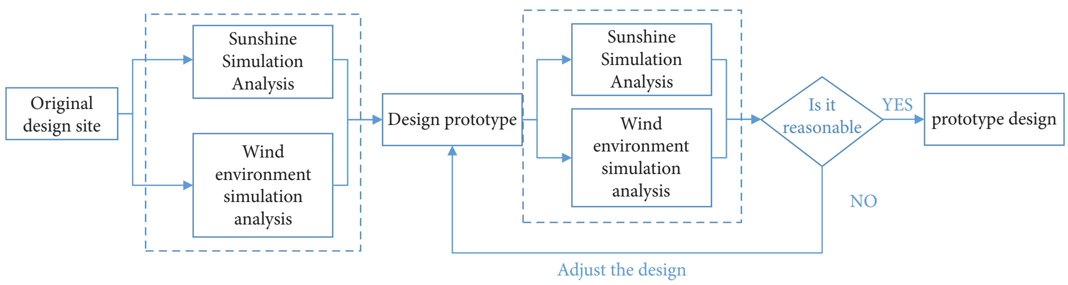


FIGURE 5: Flowchart of optimal design of sunshine and wind environment simulation.

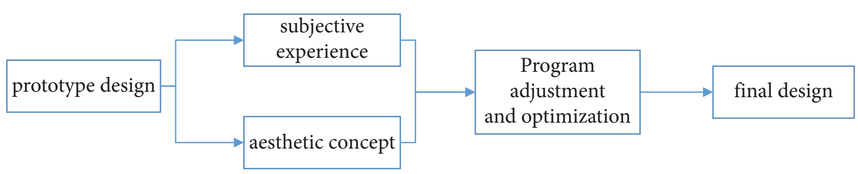


FIGURE 6: Landscape morphology optimization process.

them, the context and geographical environment will directly affect the extraction of design elements and the formation of spatial texture; the surrounding environment, business distribution, and external traffic on the site will affect the direction of the flow of people and have a direct connection with the internal traffic on the site; the owner's function of the project demand determines the prototype of the functional partition; and the sunlight and wind direction will affect the layout of the interior space of the site and the design of landscape sketches, which will guide the entire design, as shown in Figure 7.

5.1.2. Influence Factor Analysis of Landscape Internal System. During the whole project development process, there are many factors that affect the landscape design inside the site: functional system, traffic system, landscape node system, and plant system. Among them, the functional system inside the site determines the relationship between the functional space and users; the traffic system inside the site determines the flow of people in the park, which directly affects the user's experience in the park; and the landscape node system is affected by the user's viewing experience. The influence of sight line needs to be combined with ergonomics to carry out a reasonable line of sight section design, while the plant system has an inseparable relationship with the landscape effect of the entire park, and the use of plant landscaping has a direct impact on the park landscape, as shown in Figure 8.

5.2. Design Process and Design Results of Digital Design. The diagram of the traffic system diagram process is shown in Table 1. A global coupling path across the site is established as shown in Table 1, representing all possible paths of the site. The east-west direction is the image surface of the site, with fewer openings, retaining the integrity of the interface, and more openings in the north-south direction. According to the opening spacing greater than or equal to 150 meters, too many unnecessary paths should be avoided. As shown in b in Table 1, the screening rules are as follows: the connection between the site and the original urban road is too small ($<20°$) as a redundant road; the connection with the corresponding point on the opposite side is too large ($>60°$). A plausible semicoupled traversal path is thus generated. As shown in c in Table 1, random points are generated in the field to represent the possibility of any position in the field. After testing, the random point is at a certain threshold, which does not affect the final result, but the distribution state of

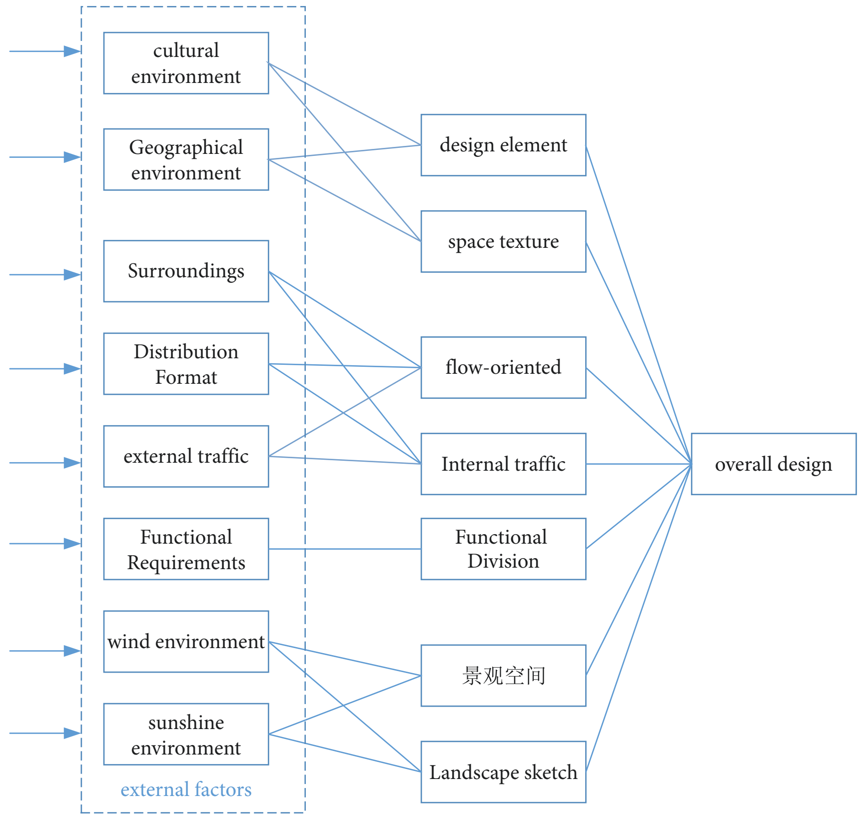


Figure 7: Analysis of external influence factors.

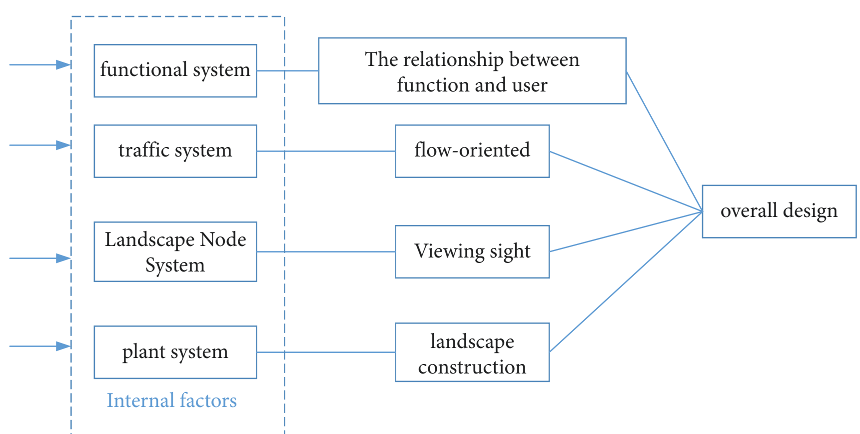


Figure 8: Analysis of internal impact factors.

the random point affects the result. As shown in d in Table 1, the filtered semicoupling path is divided into equal parts, and the divided points in turn constitute the path of the path, control point. After testing, the bisection point does not affect the final result within a certain threshold. As shown in e in Table 1, the optimal road network is fitted. The path bisection point moves to the nearest random point, and the new bisection point becomes the control point of the path, which generates a new path.

For a comprehensive comparison, result 4 in Table 2 is selected as the path network of the site, the path is taken as the basic structure, it is optimized as the road according to the subjective esthetic feeling, and then, the function and density of each block are judged according to the subjective analysis to generate the road network structure of the entire site. Among them, the center of the structure becomes the central landscape of the site, and the path from south to north through the core landscape is selected as the landscape avenue and the pedestrian entrance.

Table 1: Route optimal graphic design process.

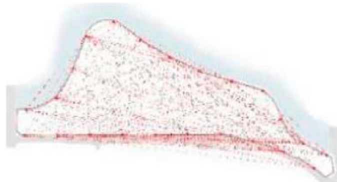
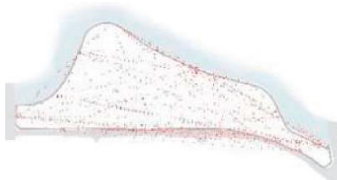
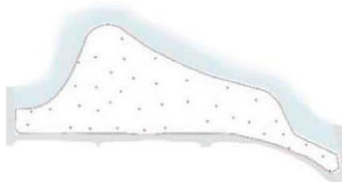
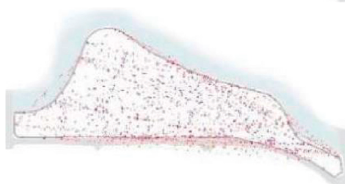
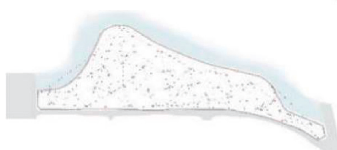
No.	Icon	Description
A		Global coupling network
B		Half-coupling network
c		Arrange random points
d		Path control point
e		Fit path

Table 2: Comparative analysis of design results.

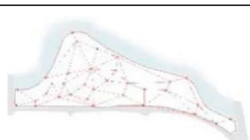
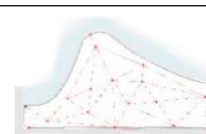
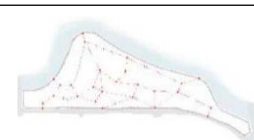
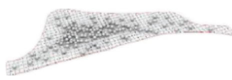
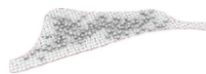
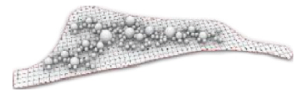
Serial number	Result 1	Result 2	Result 3	Result 4
Result				
Advantage	The plot division is relatively compact, which is convenient for spatial organization.	The site structure is reasonable, with obvious primary and secondary traffic	There is obvious primary and secondary traffic, and the structure is reasonable.	The central area is obvious. The road runs through most of the site and is closely related to the main road. The site is reasonably divided, so as to generate the optimal path of the plot.
Shortcoming	The road network and plots are too complex, which are not conducive to traffic.	North-south openings are dense and do not meet relevant regulations.	South-facing openings are dense with no apparent center.	—

Table 3: Functional simulation graphical process.

Serial number	A	B	C	D
Icon				
Illustrate	Initial placement of each functional space	Each function restricts and combines with each other	Primary and secondary functional space fitting	Final fitting result

The diagram of the functional system diagram process is shown in Table 3:

(1) Before selecting a parametric model, the utility of each function point should be individually evaluated, and then each function point should be fit.

(2) When choosing a parameter model, the utility evaluation function of a function point is as follows: $F = \alpha * A + \beta * B + \gamma * C + \delta * D + \theta * E * \ldots * \xi$ Among them, A represents the importance of a function to the crowd, B represents the attractiveness of the function points near the function corresponding to the A parameter, C represents the lighting conditions of the function point in the lot, D represents the accessibility of the function within the site range. E represents the accessibility degree of the function point within the lot range, and F represents the visibility of the function point and the visibility of the surrounding structures.

(3) As shown in a in Table 3, by establishing a parametric model, different functional spheres represent different functional spaces, and each functional space is initially placed according to its own attributes.

(4) As shown in *b* in Table 3, according to the connection between functional spaces, different functional spheres are restricted and combined with each other.

(5) As shown in *c* in Table 3, according to the relationship between the primary and secondary functional spaces, the functional space is fitted by setting different parameters.

(6) As shown in *d* in Table 3, each functional space is fitted to form the final design result.

The simulation of the functional space is carried out through the computer, combined with the adjustment of the subjective intention, and finally, a reasonable design of the functional space is obtained, as shown in Figure 9. Among them, the corresponding open space is arranged along the north side of the waterfront; the south side is arranged with a small outdoor sports space to meet the needs of users; and the middle of the site is arranged with a point-like activity space. Through different point-shaped activity spaces, each space is reasonably connected in series.

The schematic diagram of the landscape node system is shown in the table as follows:

(1) As shown in a in Table 4, in the semiopen space, the corresponding landscape nodes should be placed. Considering that the best viewing angle is 30° for elevation and 30° for looking down when the human body is lying down, the best view should be arranged within this line of sight.

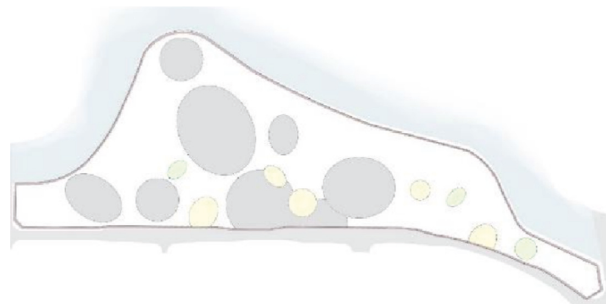


Figure 9: Final functional bubble diagram.

(2) As shown in *b* in Table 4, when the user is walking, the best line of sight is straight ahead, and at this time, it is best to use the garden route as the layout route of the landscape nodes.

(3) As shown in *c* in Table 4, at the resting place of the landscape node, the landscape should be arranged for the shade on the back, and the viewing line should be opened from the front to enrich the viewing experience of users.

(4) As shown in *d* in Table 4, in an open space, the best viewing line of sight for the user is straight ahead, that is, effect landscape.

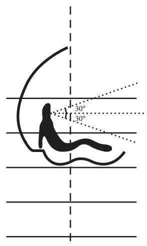
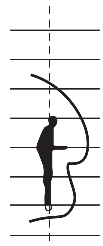
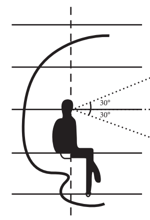
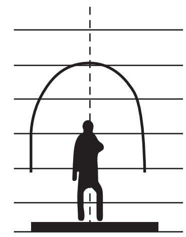
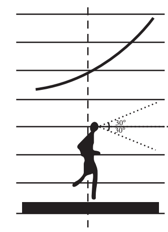
(5) As shown in *e* in Table 4, when the user is exercising, the range of sight is 30° in elevation and 30° in top view. The layout of landscape nodes should be dominated by trees with upper contour lines.

According to the structure of the optimal path in the site and the rational arrangement of the functional space, each landscape node can be preliminarily arranged. After the preliminary arrangement, through the establishment of the corresponding parametric model, the landscape line of sight is reasonably designed. Using the principle of ergonomics, the landscape section design is carried out, and finally, it is fitted with the traffic system to generate the prototype of the shape. The design result of landscape node distribution is shown in Figure 10.

Diagram of the process of a plant system diagram, as shown in Table 5:

(1) As shown in a and *b* in Table 5, since the road network structure and functional space will directly affect the formation of plant space, the site road

Table 4: Sight line design diagrammatic process.

Serial number	a	b	c	d	e
Icon					
Illustrate	Line of sight when lying down	Line of sight when standing	Line of sight when sitting	Half-open standing line of sight	Line of sight during exercise

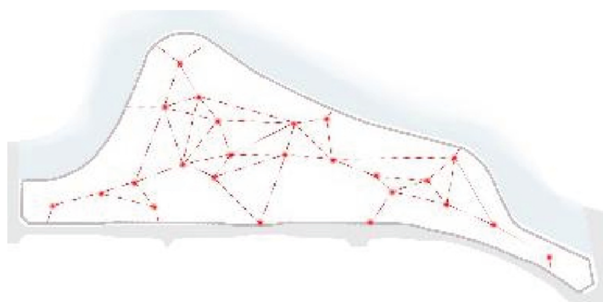
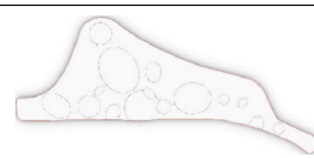


Figure 10: Landscape node distribution results.

Table 5: Illustration of plant space design.

Serial number	A	B	C
Icon			
Illustrate	Site road network structure implantation	Site functional space implantation	Site meshing

network structure and functional space are implanted in the site as key influencing factors

(2) As shown in *c* in Table 5, the site is divided into grid units of $10\,\text{m} \times 10\,\text{m}$, the site is divided into grids, and the plant space of the site is divided according to the two key factors of road network structure and functional space

According to the road network structure and the site space model, the corresponding parametric model is established. Combined with the program algorithm, the parameters of the influencing factors are adjusted, and the preliminary arrangement of the site plant system is carried out. Then, through subjective adjustment and optimization, the prototype of the plant system space is generated, as shown in Table 6.

The graphic process of the site sunshine analysis is shown in the table: the light environment of the site affects the layout of the site's internal functional system, landscape node system, and plant system to a certain extent. Through the analysis of the light environment of the site, it can play a guiding role in the overall design of the site. Through parametric technical means, the simulation analysis is carried out on the sunlight environment inside the original site and the site sunlight environment after preliminary design, and the layout of each system is further adjusted. The analysis and simulation process are as follows:

(1) As shown in a in Table 7, the original design site is divided into grids with a unit of $10\,\text{m} \times 10\,\text{m}$, the analysis precision is set to 0.01, and the simulation analysis of the sunshine hours on the summer solstice of the original site is carried out.

(2) As shown in *b* in Table 7, the original design site is divided into grids with a unit of $10\,\text{m} \times 10\,\text{m}$, the analysis precision is set to 0.01, and the simulation analysis of the winter solstice sunshine hours of the original site is carried out.

(3) As shown in *c* in Table 7, the original design site is divided into grids with a unit of $10\,\text{m} \times 10\,\text{m}$, the analysis precision is set to 0.01, and the simulation

Table 6: Plant space design results.

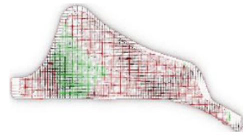
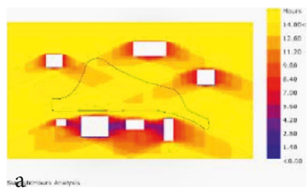
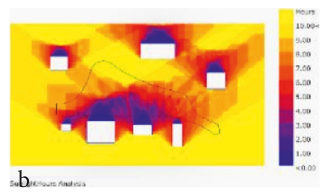
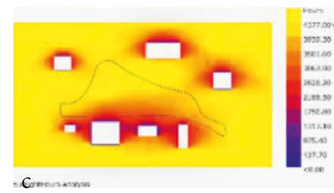
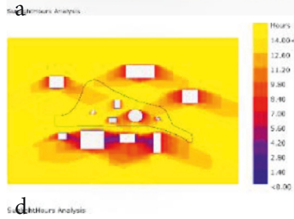
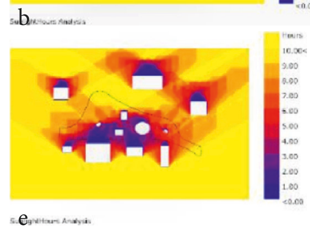
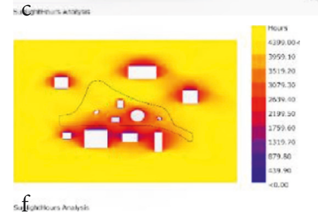
Serial number	A	B	C	D
Icon				
Illustrate	Site plant space division	Site plant space division	Site plant space division	Final plant space bubble chart

Table 7: Sunshine simulation analysis.

Period	Summer solstice sunshine hours	Winter solstice sunshine hours	Year-round sunshine hours
In situ simulation analysis results			
Design site simulation analysis results			

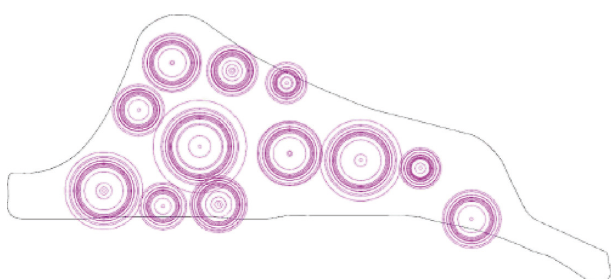


Figure 11: "Cell flow" plane with the central landscape is the core.

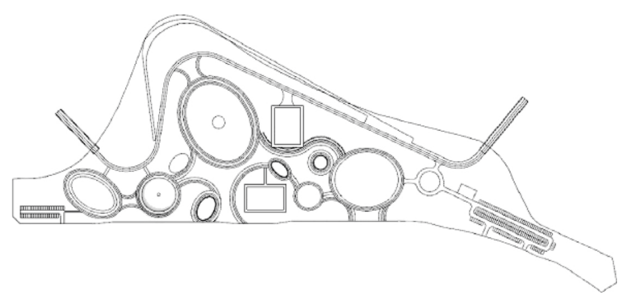


Figure 12: Design floor plan after optimization.

analysis of the annual sunshine hours of the original site is carried out.

(4) As shown in *d* in Table 7, the preliminary design site is divided into grids in units of 10 m × 10 m, the analysis accuracy is set to 0.01, the structures and buildings are modularized, and the summer solstice sunshine of the preliminary design site is determined, that is, time for simulation analysis.

(5) As shown in *e* in Table 7, with a unit of 10 m × 10 m, the preliminary design site is divided into grids, the analysis precision is set to 0.01, the structures and buildings are modularized, and the winter solstice sunshine of the preliminary design site time for simulation analysis is determined.

(6) As shown in *f* in Table 7, with 10 m × 10 m as the unit, the preliminary design site is divided into grids, the analysis precision is set to 0.01, the structures and buildings are modularized, and the annual sunshine of the preliminary design site is checked, that is, time for simulation analysis.

Figure 13: Overall effect diagram.

According to the above simulation design results, with the central landscape as the core, the field of the space unit is constructed, as shown in Figure 11.

The design plane is optimized, combined with subjective adjustment, the overall design plane is fine-tuned, and the design result is shown in Figure 12:

The entire park is a sports park, and combined with the needs of the use of the site, a landmark landscape gallery is designed that integrates sports function and viewing. The final design result is shown in Figure 13.

6. Conclusions

By summarizing the development of digital design, combined with most of the design processes and methods at this stage, this basic design chain of meta-design is summarized. On the basis of meta-design, through subsystem design, the traffic system, functional system, landscape node system, and plant system are designed and optimized, and then, the fitting between each system is carried out. Finally, according to the value judgment and general plane control, the indicators of each space are configured, the basic park design is completed, and it is supplemented and summarized into a feasible digital graphic design system that takes into account both objective factors and subjective experience. At the same time, through the preliminary use of digital design and design in the Xiangyang Dongjin Sports Park project, it guides the design generation process of the park. Compared with the traditional design process, the digital design and design logic system can quickly generate a variety of comparison schemes based on the same logic. Or based on a certain quantitative index to form an optimal solution, the process of continuous trial and error and correction in traditional design is completed in an instant on the digital platform. This dynamic and efficient design system that generates multiple solutions in a short period of time has become a realistic and feasible design framework. In this study, the author has completed the generation process of the park from the design concept to the space formation by using four kinds of meta-designs: subsystem design, wool thread path network simulation, "cellular flow" graphic concept park texture generation, and cellular automata. This design logic system is feasible to a certain extent and has obvious advantages. For the construction of the digital graphic design system of the project and the base itself, the plot design is completed in a complete and reasonable manner, forming a unified park form, and the whole and parts are harmonious and unified.

Data Availability

The dataset can be accessed upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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