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Computer-Aided Design AND APPLICATIONS

Artificial Intelligence Based Garden Landscape Design System and 3D Visualization Technology

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Abstract. Urban open space is an important image window of a city, and the landscape design of open space plays a decisive role in improving the image of the city, and garden landscape is the most basic and key part of landscape design. It runs through the whole design process and directly affects the realization of the final design goal. Reasonable planning of high-quality garden landscape can not only represent the overall image of the city, but also represent the cultural heritage of the city. In order to improve and apply the computer aided design (CAD) system of 3D garden landscape, this article puts forward an optimization model of spatial pattern of garden landscape based on artificial intelligence (AI) algorithm, and uses artificial neural network (ANN) to realize the rendering process of polygon processing, coloring, blanking, lighting and projection, so as to generate a realistic landscape model and realize the visual design of 3D garden landscape. The test results show that the algorithm has higher accuracy for optimizing the spatial pattern of garden landscape, which is more than 20% higher than the layout optimization algorithm based on SVM algorithm. The planning and construction department of garden landscape can use the CAD model of landscape to understand the construction pattern of landscape comprehensively and intuitively, and provide auxiliary decision-making for the overall planning.

Keywords: Artificial Intelligence; Computer Aided Design Garden Landscape; Pattern Optimization
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1 INTRODUCTION

With the rapid development of technology, artificial intelligence (AI), 3D modeling, and visualization technologies have been widely applied in various fields. Especially in the field of landscape design, the artificial intelligence-based 3D landscape Computer-aided design system and its visualization technology application provide designers and decision-makers with more intuitive

and accurate design schemes and decision-making basis. This paper will summarize the application of artificial intelligence-based 3D landscape Computer-aided design system and its visualization technology. The development of 3D landscape Computer-aided design system based on artificial intelligence can be traced back to the end of the 20th century. With the continuous progress of computer graphics, artificial intelligence and other technologies, more and more researchers are trying to apply AI technology to landscape design. The computer-aided design system of 3D garden landscape based on artificial intelligence mainly depends on deep learning algorithm and computer vision technology. By learning from a large amount of landscape data, AI systems can automatically recognize and generate 3D models that comply with design rules. At the same time, with the help of computer vision technology, the system can also achieve precise adjustment and optimization of 3D models. This kind of artificial intelligence-based 3D garden landscape Computer-aided design system is suitable for a variety of application scenarios, such as urban planning, park design, architectural interior Garden design, etc. In addition, the system can also provide effective design assistance for landscape architecture students and beginners, improving design efficiency.

Garden landscape design is a process of close combination of aesthetics and technology, science and environment. As a key component of garden landscape spatial information, garden landscape is the key content of 3D modeling, and it is the key point of modeling to establish a CAD model for garden landscape quickly and realistically. Carbonell et al. [1] conducted a visual landscape assessment of two-dimensional and three-dimensional geographic information spaces. By using CAD virtual space technology, the exploration between components has been carefully improved in different perspective environments. At the same time, 3D strategy landscape planning was conducted for different personal perspectives to facilitate the development of targeted skills. Garden landscape design is a process of close combination of aesthetics and technology, science and environment. Reasonable planning of garden landscape can effectively improve the overall image of the city and increase people's comfort to the living environment. Chen and Stouffs [2] explored the scope design of spatial concepts. It conducts advanced visual analysis of spatial themes based on traditional architectural landscape image design. This computer vision exploration analysis utilized the potential entanglement of spatial coverage for supervised possibility analysis. Compared innovative designs with different spatial structural features. Because garden landscape design, regardless of its scale, hopes to achieve the effect of one scene at a time and the scene moves with the steps, it is very important for designers to show the design works in an all-round, real and even dynamic way. As the basic content of landscape design, with the growth of AI. Da et al. [3] carried out an analysis on the research ideas of the mechanism reform of Flipped classroom landscape teaching with intelligent teaching tools. It has designed a new computer-aided landscape design teaching method and analyzed the differences between traditional classrooms and practical classrooms through a questionnaire survey of classroom learning. The results showed that participating in intelligent classroom landscape design improved the learning control differences of team design. In landscape planning, AI-based CAD technology can provide the most intuitive expression for landscape planning and design, and help planners design a more beautiful landscape environment.

CAD model is faster and more realistic in the expression of 3D spatial information, and gradually becomes the research focus in the design of garden landscape. 3D landscape reconstruction and 3D visualization technology is one of the important research contents of geographic information system at present. Its main significance lies in that the description of landscape gets rid of the expression of 2D map and gives people a more intuitive 3D feeling with computer-aided 3D expression. With the rapid growth of CAD technology, remote sensing technology, photogrammetry technology and GIS technology, it has become a reality to reproduce the 3D surface landscape and has been widely used. The key to establish these realistic 3D virtual scenes is to establish CAD models based on real landscapes, which describe the geometric information of terrain and ground objects' spatial positions and the texture image information describing the real coverage of the ground. Driven by many factors such as economy, culture, science and technology, CAD technology is no longer a technology that is used in a single state

and focuses on computing function, but a technology that provides "auxiliary value" in various operational fields and application scenarios such as architectural space design, architectural structure design and landscape construction. In order to improve and apply the CAD system of 3D garden landscape, this article puts forward an optimization model of spatial pattern of garden landscape based on AI algorithm to realize the visual design of 3D garden landscape.

The scheme deduction of traditional garden landscape planning and design usually uses sketch drawing and model scrutiny. With the change of planning and design scale and the update of planning and design content, the traditional scheme deduction method can no longer meet its needs. 3D modeling of garden landscape should complete data collection, 3D modeling, model release and other procedures to realize the visualization of CAD model and provide convenient conditions for the application of CAD model. Based on the design requirements, artificial technology can test various styles of space in a short time, and at the same time, carry out many iterations to achieve excellent design schemes. And the generated design scheme can be further optimized with the help of CAD technology after manual review and adjustment to improve the design quality. In this article, the application of AI in CAD of garden landscape is studied, and the following work has been done in this article:

(1) In order to improve and apply the CAD system of 3D garden landscape, this article puts forward an optimization model of spatial pattern of garden landscape based on AI algorithm.

(2) The model uses ANN to realize polygon processing, coloring, blanking, illumination and projection, and so on, which produces a realistic landscape model and realizes the visual design of 3D garden landscape.

(3) In the research, an improved color histogram algorithm based on the region of interest is proposed, which optimizes the traditional image segmentation and color quantization methods.

The rest of the paper is structured as follows: firstly, the related research on landscape design and optimization is summarized, and the improvement ideas of this article are put forward on the basis of summarizing its contributions and shortcomings; Then, the optimization and visualization model of garden landscape pattern is constructed by combining AI algorithm and CAD technology. Then, the running efficiency and modeling performance of the model are tested to verify its feasibility in garden landscape design. Finally, the contribution and achievements of this study are summarized, and its limitations and future research direction are pointed out.

2 RELATED WORK

At present, computer-aided drawing for architectural landscape design cannot be separated from computer-aided design. Traditional architectural landscape drawing design has procedural differences and deficiencies, which cannot effectively carry out centralized project planning. Denerel and Anil [4] conducted computer-aided drawing program design in interior architecture education, which collected data from different tutorials on interior architecture and environmental design through software processing. The current landscape design and scene element rendering cannot be separated from computer-aided design. Du [5] explored the application of assisted intelligence technology in landscape rendering of terrain planning and planting design elements. By designing and displaying the scene from multiple angles and angles, it has built an image library function for 3D graphics engine rendering. Compared to traditional landscape design techniques, this method improves the diversity of plants and greatly improves the landscape pattern. Garden structural design is an important component of a cultural landscape heritage. The maintenance of these resources is increasing day by day. With the continuous development of computer technology, digital development for handling cultural heritage has received unique point cloud image validation. Herrero et al. [6] conducted image capture of sensor images on unmanned platforms. With the continuous development of society, the construction and improvement requirements of the current landscape Ecological design are constantly improving. Hu et al. [7] conducted a quality analysis of landscape functional positioning design. This analysis has improved the planning quality standards of landscape architecture design and helped improve the spatial

expression ability of landscape construction. This article conducts a rational expression analysis of the policy direction of non-linear landscape expression based on parameterized models. Computer assisted intelligent planning and design has become a necessary technical requirement for graphic processing in current landscape planning. Jia [8] conducted a parameter planning experiment on architectural landscape target design, which brought a new thinking mode for rigorous simulation data evaluation. Jian and Hao [9] conducted a quantitative urban analysis of ecological civilization on the landscape design of the park. It constructed corresponding strategy optimization differential index analysis and explored the distribution balance of landscape fragmentation based on its spatial distribution characteristics. The research results found that the spatial distribution of many landscapes is severely imbalanced and the landscape structure is unreasonable. This article aims to provide constructive references for park green space landscape. The current CAD based Computer-aided design has completely changed the traditional way of landscape architecture design. Different massive data provide an enhanced mode of drawing design for Computer-aided design. Lallawmzuali and Pal [10] provide a high-quality landscape architecture design for computer-aided design and production through 3D modeling. By enhancing the visualization effect of landscape architecture, the productivity of two-dimensional drawing has been changed. The continuous development of computer network technology provides a good help for the three-dimensional visual Dynamic simulation analysis. Li [11] conducted a dynamic visualization of the 3D geographic perception visualization analysis model construction. Corresponding changes have been made to the challenges of transportation, providing guarantees for real-time positioning. Liang et al. [12] carried out the analysis of 3D modeling rock rockery Garden design. It recorded and measured the morphology of classical gardens using 3D laser scanning and digital technology. By investigating, measuring and analyzing garden rockeries in different situations, a digital literature research method was constructed. Safik Hani et al. [13] analyzed the Digital transformation of the management process of digital resources in the field of architectural landscape construction engineering. Shan and Sun [14] Through the construction of CAD digital models, it fills the gap where virtual technology was not previously applied to landscape resource protection. Around the application of BIM technology, it has repaired resource management through digital building information. Tai [15] conducted a low energy application analysis of CAD virtual assisted design in landscape design. The research aimed to address the issue of poor power image control due to marginalization in current data acquisition and control systems, and effectively reduced energy consumption through the use of sub algorithms. At the same time, the power system of the virtual image was established to control the rendering process, and the stability of landscape image batch processing was detailed and optimized. Tang [16] conducted an integrated virtual landscape design environment construction analysis. It improves the distributed geographic model through the restorative effect of Computer-aided design. At the same time, the actual effect of feature extraction in the scheme data was transformed in terms of public interest and evaluation coefficients. The research results indicate that distributed integrated models have significant accuracy advantages in landscape design. Xu and Wang [17] analyzed and explored the color effects of low-cost plant landscape design in computer-aided collaborative design systems. With the increasing application of Computer graphics landscape, the color application of image landscape has been constantly improved. Landscape design and environmental landscapes can be rapidly developed in different fields. This experiment integrates CAD virtual technology into the virtual environment design and production of landscape design, fully developing the application value of landscape design. As the application edge of Computer-aided design continues to deepen, the effect of VR based urban information rendering mechanism is constantly deepening. Zhang and Kou [18] conducted research and application on new media urban landscape design methods based on 5G virtual reality. It constructs an information transmission channel for the virtual reality world of new media urban landscapes in a 5G environment. In the development environment of 5G, CAD based new media landscape design has been further strengthened. Zhang [19] used an improved Analytic Hierarchy Process (AHP) to analyze the spatial improvement of vegetation landscape unit environment. It proposes an efficiency optimization of landscape spatial pattern and optimization of ecological environment. Using the principle of landscape optimization design,

semantic analysis superior to traditional aesthetic evaluation was explored in order to achieve the goal of improving the ecological environment and beautifying the living environment.

The traditional method firstly plans the landscape rationally and analyzes the balance of landscape resources, but ignores the calculation and update of landscape pheromone concentration, which leads to the unsatisfactory research effect of landscape planning distribution. In this article, a CAD method of garden landscape based on AI algorithm is proposed. The garden landscape is modeled and visualized by ANN, and the architectural layout scheme that can be referenced by professionals is obtained.

3 OPTIMIZATION MODEL OF SPATIAL PATTERN OF GARDEN LANDSCAPE

The advantages of the artificial intelligence-based 3D landscape Computer-aided design system are mainly shown in the following aspects: First, the AI system can quickly generate and adjust 3D models, greatly improving the design efficiency; Secondly, with the help of deep learning technology, the system can automatically optimize design schemes and improve design quality; Finally, the system can reduce design costs and reduce waste of human resources. However, the system also has certain drawbacks, such as relying on a large amount of data and algorithms, and currently there are few related products on the market, with low popularity. Visualization technology mainly uses computer graphics and image processing technology to transform two-dimensional drawings into three-dimensional models in landscape design. Through visualization technology, designers and decision-makers can browse and interact with design proposals in real-time in a virtual environment. The application scenarios of visualization technology are also extensive, including urban planning, park design, building interior Garden design, etc. With the help of visualization technology, designers can transform abstract design concepts into concrete 3D models, thereby better conveying design intentions and displaying design results. Visualization technology can improve the intuitiveness and operability of design, enabling designers and decision-makers to more accurately understand and grasp design solutions; Secondly, visualization technology helps to identify and solve problems during the design phase, avoiding resource waste and improving design efficiency; Finally, visualization technology can enhance communication and collaboration between designers, teams, and clients. In a word, the artificial intelligence based 3D landscape Computer-aided design system and visualization technology have important application value and potential in landscape design. They can help designers improve design efficiency and quality, while also providing decision-makers and customers with a more intuitive and accurate design experience. However, there are still relatively few related products on the market, and some technical bottlenecks and market promotion issues need to be overcome. Therefore, more research and practice are needed in the future to promote the development of this field.

3.1 Feature Extraction of Garden Landscape Images

As a related discipline of planning discipline, the garden landscape discipline's drawing expression ability is an important means to show the planning and design achievements. In the planning and design of garden landscape, we need to follow the principles of culture, science, artistry and practicality. All kinds of spatial dynamic data mining algorithms have high complexity, and with the continuous expansion of data scale, their computational workload is also increasing. Obviously, these computational tasks cannot be separated from computer support. With the growth of computer graphics, 3D representation technology can be realized. These 3D representation technologies enable us to reproduce the objects in the real environment in the computer and express this complex information with 3D shapes. This technology is visualization technology. Under the traditional digital mapping operation mode, all digital mapping operations are aimed at drawing output, and from the purpose of use, this operation mode is mainly biased towards drawing and expression. In computer graphics, a viewport is a rectangular area for drawing an image, which is measured by window coordinates. The purpose of viewport transformation is to transform 3D space coordinates into 2D coordinates on the computer screen.

Visualization of 3D landscape model is a method and technology to transform 3D landscape model into graphics or images displayed on computer screen by using computer graphics and image processing technology. Visualization technology enables people to operate and interact with 3D graphics in computers. The garden landscape image feature analysis network proposed in this article uses multi-level conditional generation to generate high-definition natural images from low pixel level to high pixel level, as shown in Figure 1.

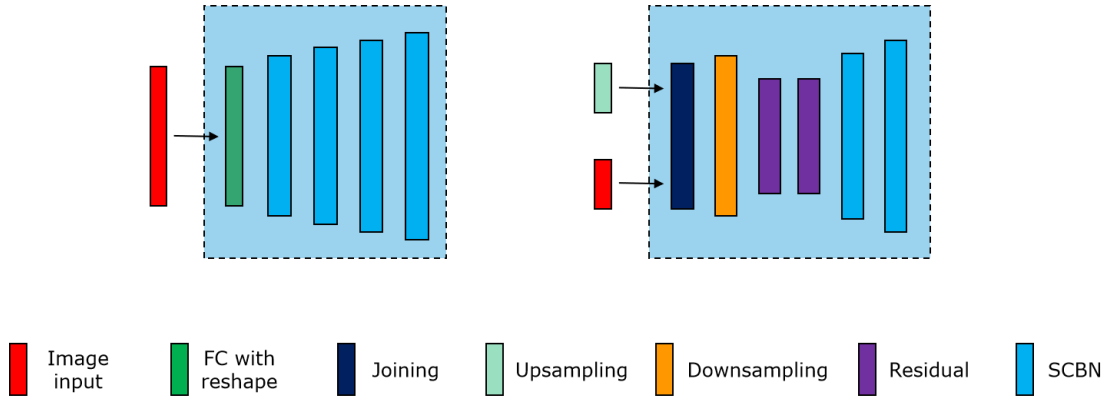


Figure 1: Image feature analysis network.

Compared with 2D data, 3D spatial data is not only much more complicated in organizational structure and expression, but also has a very large amount of data. Generally speaking, the amount of 3D spatial data managed by a perfect 3D database can reach hundreds of billions of bytes, including spatial coordinate data, image data, feature texture data and feature attribute data. A large quantity of neurons collectively learn the patterns in the data to be analyzed through training, and form a nonlinear function to describe complex nonlinear systems, which is suitable for mining classification knowledge from nonlinear spatial systems with complex environmental information, fuzzy background knowledge and unclear reasoning rules. The template matching model of garden landscape design and spatial pattern optimization is shown in Figure 2.

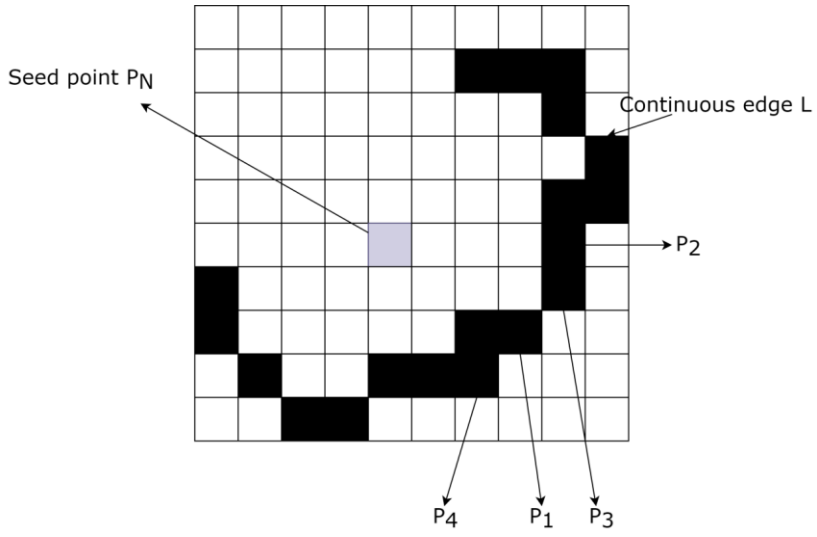


Figure 2: Template matching model of garden landscape design and spatial pattern optimization.

Spatial structure is the distribution, combination and evolution of landscape elements in space. In the planning and design of landscape spatial structure, its manifestations usually include different combinations of points, lines and surfaces, showing the overall layout and the relationship between different landscape elements. From the point of view of batch modeling of 3D geographic information system, data management of GIS and solving spatial problems, there are many problems in this digital map oriented to cartographic output. In order to display the objects in the 3D scene on the 2D window plane, a certain operation must be performed, which is the projection transformation. Projection transformation determines how objects are projected on the window plane through the defined viewfinder, and defines which objects or parts of objects are displayed in the window.

In order to extract the local features of different garden landscape images, an image feature extraction method based on multiple convolution kernels is proposed. The variance of the activation value h of each layer should be consistent, as shown in the formula:

$$\forall(i,j): Var\left(h^i\right) = Var\left(h^j\right) \tag{1}$$

The variance of the gradient of each layer to the state Z should be consistent, as shown in the formula:

$$\forall(i,j): Var\left(\frac{\partial Cost}{\partial z^i}\right) = Var\left(\frac{\partial Cost}{\partial z^j}\right) \tag{2}$$

In ANN, the perceptron takes $(x_1, x_2, x_3, \ldots)$ as input and gets an output after calculation.:

$$z = \sum w_i x_i + b \tag{3}$$

Where w_i is the weight and b is the bias. The ReLU function is a function that takes the maximum values:

$$f(x) = \begin{cases} x, & if\ x > 0 \\ 0, & others \end{cases} \tag{4}$$

3.2 Landscape Image Feature Recognition and CAD 3D Modeling

Landscape image feature recognition is the foundation of CAD 3D modeling. In the process of CAD 3D modeling, it is first necessary to perform feature recognition on landscape images to obtain information about different objects and elements in the images. Through feature recognition, various shapes, textures, colors, and other features in landscape images can be extracted, which will be used for further processing in CAD 3D modeling. Landscape image feature recognition helps to improve the accuracy of CAD 3D modeling. Through landscape image feature recognition, various objects and elements in the image can be accurately identified, thereby achieving more accurate modeling effects in CAD 3D modeling. For example, in landscape design, different plants have different shapes, sizes, and texture features. Through image feature recognition, these features can be accurately extracted, thus achieving realistic simulation of plants in CAD 3D modeling. CAD 3D modeling is the application goal of landscape image feature recognition. The ultimate goal of landscape image feature recognition is to achieve more realistic and accurate modeling effects in CAD 3D modeling. By applying landscape image feature recognition to CAD 3D modeling, the modeling results can be more in line with practical needs and design requirements, thereby improving design quality and effectiveness. In short, landscape image feature recognition and CAD 3D modeling are interdependent and mutually reinforcing relationships. Landscape image feature recognition is the foundation of CAD 3D modeling, which can improve the accuracy of CAD

3D modeling. CAD 3D modeling is the application target of landscape image feature recognition, which can make the modeling results more realistic and accurate.

The long-term communication between garden landscape, urban planning and even computer, ecology, economy, art and other disciplines makes the scope of garden landscape planning and design as small as gardens, as large as city squares, parks, urban open space systems, land use and development, natural resources protection and a series of important project design and research. This puts forward different requirements for the planning and design of garden landscape in seeking CAD. Establishing a CAD landscape model of garden landscape requires many technologies, including digital photogrammetry, 3D landscape design, 3D modeling and database management. In order to obtain a continuous and smooth terrain model, a 3×3 grid window can be used to scan the elevation points, and the value of each elevation point is the average of the eight neighboring elevation points. The grid window moves continuously in the DEM data matrix to complete the calculation of the whole area, and the calculated elevation data is used for terrain generation.

A distributed detection model of landscape planning and layout optimization images based on visual feature space is established. The visual characteristics of images in landscape design and spatial layout optimization design are as follows:

$$G(\vec{x})=\sum_{j=1}^{p} G_j(\vec{x}) \tag{5}$$

Using the image reconstruction algorithm of landscape ecological planning based on adaptive fusion, the image reconstruction model of landscape ecological planning and spatial layout optimization of garden landscape is established, and the fuzzy closeness function of landscape spatial image is obtained:

$$fitness(\vec{x})= f(\vec{x})+(Ct)^{\alpha}\sum_{j=1}^{p} G_j^{\beta}(\vec{x}) \tag{6}$$

Assuming that the P_N coordinate of the landscape ecological construction and spatial pattern optimization design is (X_{P_N}, Y_{P_N}), then compare the edge point coordinates (x_k, y_k) and P_N of all landscape ecological construction and spatial pattern optimization design on L:

$$\begin{aligned} &When\ x_k > X_{P_N}, i_L = i_L + 1 \\ &When\ x_k < X_{P_N}, i_L = i_L - 1 \\ &When\ x_k = X_{P_N}, i_L = i_L + 0 \end{aligned} \tag{7}$$

Through CAD model, users and viewers can understand garden landscape more truly. If the model is simply made by hand, it will not only waste time, but also need a lot of manpower to support it. For the batch modeling of 3D landscape, in order to reduce the input problem of large amount of data brought by 3D batch modeling as much as possible, it is need to use the existing digital line drawing.

The 3D objects in the real world are in the real-world coordinate system, that is, the world coordinate system; The model is rotated or translated to a new position, resulting in an observation coordinate system, in which the cutting, illumination and texture mapping of the CAD model in the visual volume are realized. Then the object in the 3D observation coordinate system is projected onto the 2D plane. The convolution calculation process is shown in Figure 3.

Get the fitness function of landscape information fusion as follows:

$$fitness(\vec{x})=\begin{cases} f(\vec{x}) & If\ \ feeasible \\ 1+rG(\vec{x}) & Otherwise \end{cases} \tag{8}$$

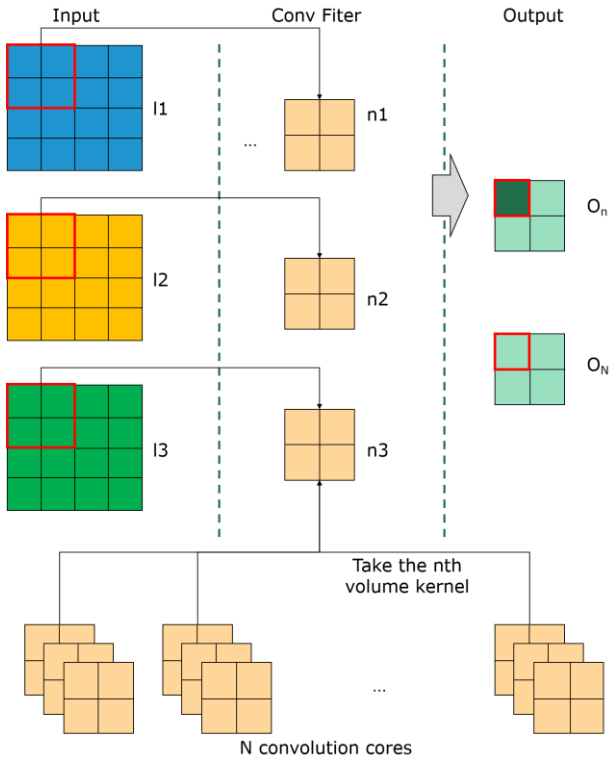


Figure 3: Convolution calculation process.

Considering the gray pixel f of garden landscape design and spatial pattern optimization design, the resolution model of landscape ecological space environmental vision is constructed by using the gray moment invariant feature decomposition method;

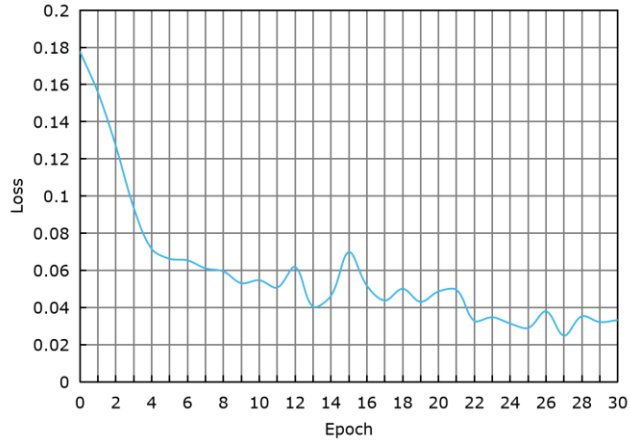
$$W_u(a,b)=e^{i2\pi k\ln a}\times\frac{K}{\sqrt{a}}\left\{\left[\frac{ae^{\frac{j2\pi f_{\min}}{a}(b-b_a)}}{f_{\min}}-\frac{e^{\frac{j2\pi f_{\max}}{a}(b-b_a)}}{f_{\max}}\right]\right. \\ \left.+j2\pi(b-b_a)\left[Ei\left(j2\pi f_{\max}(b-b_a)\right)-Ei\left(\frac{j2\pi f_{\min}}{a}(b-b_a)\right)\right]\right\} \tag{9}$$

Among them, $b_a=(1-a)\left(\frac{1}{af_{\max}}-\frac{T}{2}\right)$, $Ei(\cdot)$ represents the output of the visual information feature reorganization of the landscape ecological space environment.

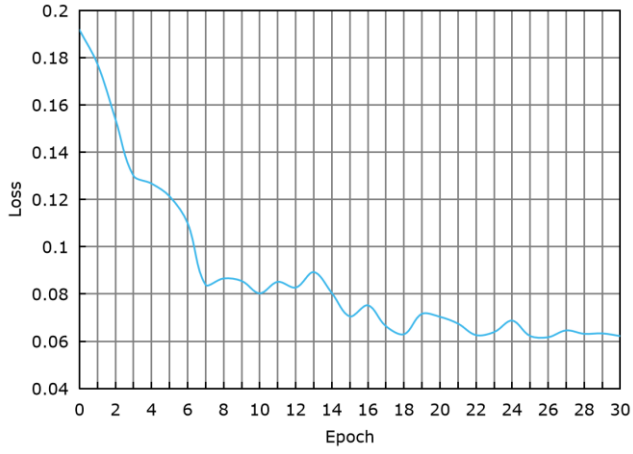
In the system, the terrain is represented by irregular triangular mesh, and plants are pre-arranged in the plane below the terrain according to a certain planting method. When the center point of plants falls in the projection plane of a triangular patch, the z value of the spatial intersection point between the center point and the triangular surface is given to the center point of plants, and the plants planted in the plane are placed on the terrain surface after a traversal.

4 EXPERIMENT AND RESULT ANALYSIS

In this article, 160 groups of pictures are collected as data sets, of which 125 groups are training sets and 35 groups are testing sets. Training is divided into two groups: (1) training with landscape pattern; (2) Without the training of landscape pattern, each group has 30,000 iterative trainings, each of which takes 1 hour. The Loss curves of these two trainings are shown in Figure 4. After training, the generator loss of the two models is 0.038 and 0.062, respectively, and the curves converge, which shows that ANN has learned the characteristics of landscape functional layout pictures and can generate a more realistic landscape functional layout CAD model.



(a) Training package



(b) Test set

Figure 4: Loss curve of two trainings.

Through the calculation of the illumination model, the light and dark values of the 2D image of the visible pixel can be obtained, so as to display the shading rendering that forms the model. The lighting model should consider the effects of floodlight caused by the synthesis of environmental distribution light sources, diffuse reflection light absorbed and re-emitted through the surface of the object, specular reflection light generated by the surface smoothness of the object, and finally express the surface lighting characteristics of different elements with different colors and different

brightness. As shown in Figure 5, the running time comparison results calculated by this algorithm and support vector machine (SVM) algorithm are given.

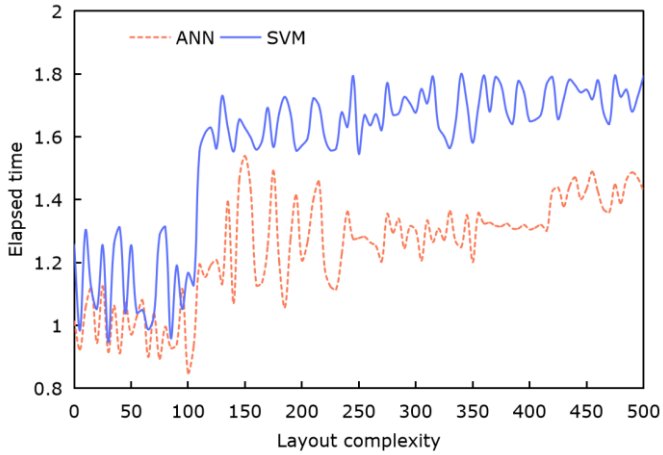


Figure 5: Calculation time comparison of algorithm.

It can be seen that although the algorithm in this article did not show significant advantages in the initial stage, with the complexity of landscape space optimization increasing, the algorithm in this article showed high operational efficiency. In the concrete data analysis, the main color of each image falls on its latitude and longitude coordinate points, and then the areas with similar color values are clustered by clustering algorithm, and then the urban color characteristic areas are classified. Combined with POI data reflecting landscape functions, the internal mechanism of landscape spatial distribution characteristics is found.

When you click on a graphic on a 2D computer screen and select a corresponding spatial entity object, you must first calculate the coordinates of the spatial point corresponding to the screen point selected by the mouse according to the original understanding of projection transformation. Its essence is the reverse process of perspective projection imaging, that is, the process of surrendering the position of the spatial point from the screen image point. Compare the recall and accuracy of the algorithm for garden landscape spatial pattern optimization, as shown in Figure 6 and Figure 7.

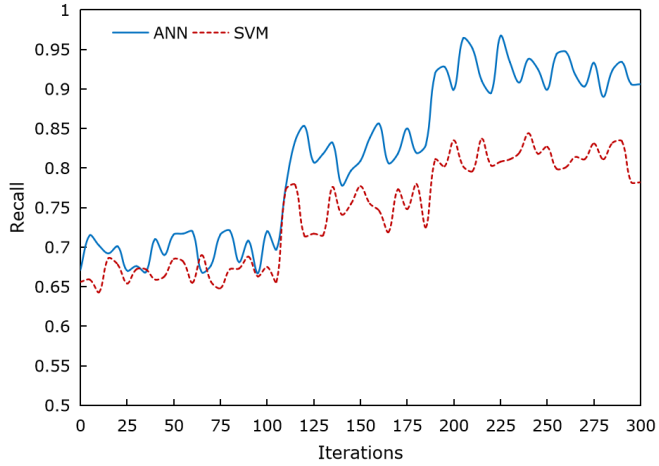


Figure 6: Comparison of recall of spatial pattern optimization.

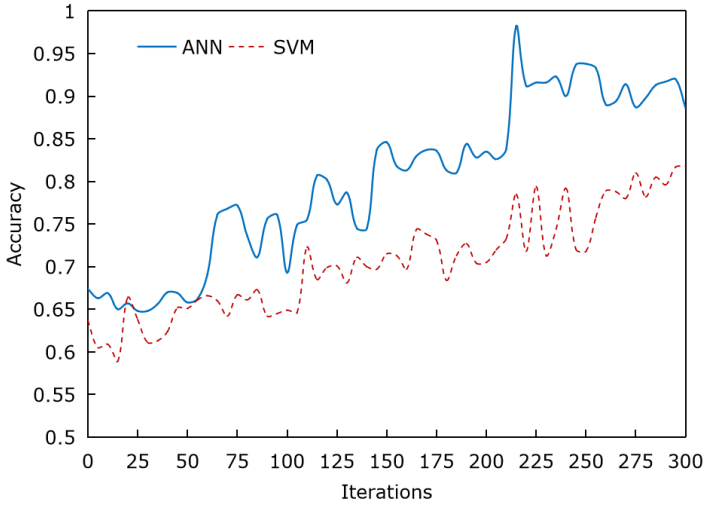


Figure 7: Comparison of spatial pattern optimization accuracy.

This algorithm has higher accuracy for optimizing the spatial pattern of garden landscape, which is more than 20% higher than the layout optimization algorithm based on SVM algorithm, and can locate the edge contour of the optimized space relatively accurately. On this basis, by constructing a regional feature fusion reconstruction algorithm based on fuzzy pixels, the pixel set of artistic characteristics of landscape environment based on spatial form is obtained, and the image information reconstruction and stereoscopic perception of landscape ecological construction and spatial pattern optimization based on spatial form are realized, thus improving the ability of environmental design. The test results show that, compared with the support vector machine method, ANN can get more reasonable, feasible and scientific spatial optimization results, and can significantly improve the operating efficiency of the system, providing scientific reference for landscape planning.

5 CONCLUSIONS

The simulation of 3D landscape has been applied to digital earth, digital city, virtual campus, military simulation and many other fields, and has become a research hotspot. The foundation and key of these applications lies in establishing realistic CAD models. 3D landscape reconstruction and 3D visualization technology is one of the important research contents of geographic information system at present. Its main significance lies in that the description of landscape gets rid of the expression of 2D map and gives people a more intuitive 3D feeling with computer-aided 3D expression. In this article, the spatial pattern optimization model of garden landscape based on AI algorithm is proposed, and the rendering process of polygon processing, coloring, blanking, lighting and projection is realized by using ANN, resulting in a realistic landscape model and realizing the visual design of 3D garden landscape. From the detection results, the algorithm has higher accuracy for optimizing the spatial pattern of garden landscape, which is more than 20% higher than the layout optimization algorithm based on SVM algorithm, and can locate the edge contour of the optimized space relatively accurately.

The modeling of large-scale garden landscape and the construction method of complex garden landscape CAD model need further study, which can enhance the fidelity and reduce the model data. 3D landscape modeling is a rapidly developing new field, which needs further research in 3D data structure, establishment of landscape spatial database, 3D modeling algorithm of spatial objects, network-oriented 3D landscape production and database system.

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