

Research on Optimization Method of Landscape Architecture Planning and Design Based on Two-Dimensional Fractal Graph Generation Algorithm

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The development of modern mathematical theory, especially two-dimensional fractal graph algorithm, provides a possibility for large-scale landscape data processing. Landscape digital identification technology is an innovative technology based on digital landscape technology and computer identification of experimental data. It is an important artificial intelligence technology, which includes three steps: landscape acquisition, landscape processing and landscape identification. The characteristics of the scene in the landscape picture can be collected by special instruments, such as cameras, etc., and then the collected data can be processed by two-dimensional fractal graph algorithm, and finally realize the automatic identification of the landscape. For images with significant boundary characteristics, we can extract the boundary of the region quickly and accurately, so as to realize the segmentation of the region. However, when the edge features of the image are not good enough, there is little color difference between the background and the region, or there is some interference, the result will be very bad. In this paper, based on the two-dimensional fractal graph generation algorithm, a series of optimization of landscape architecture planning and design. The accuracy of landscape prime number can reflect whether specific types of landscape pictures can be correctly identified and divided. 200 Pictures are divided into six categories, namely Water scene, landscape scene, living scene, sky scene, architecture and transportation then exact ratios of two-dimensional fractal graph network -8s, two-dimensional fractal graph network -16s, two-dimensional fractal graph network -32s and two-dimensional fractal graph network -32s. It reached the best level in pixel accuracy, average accuracy, average IU, etc., and the pixel accuracy has reached as high as 100%, average accuracy has reached 100%, average accuracy has reached 100%. When compared to the recommended algorithm, the 2D fractal graph generation algorithm has the highest accuracy (94.52%), precision (93.34%), and recall (94.18%) in the classification process.

Povzetek: Razvita je optimirana metoda načrtovanja krajinske arhitekture z uporabo algoritma generiranja dvodimenzionalnih fraktalnih grafov, kar je omogočilo učinkovito avtomatsko prepoznavanje in segmentacijo krajinskih elementov.

1 Introduction

The performance of landscape architecture is a comprehensive concept, which refers to the characteristics and functions of the whole life cycle of landscape architecture, including early analysis, conceptual design, construction and operation. For a long time, landscape architecture has been dependent on the designer's prediction to design it: based on the designer's prediction to complete the design. However, designers cannot predict all the factors with complete accuracy, so it is impossible to design a perfect design.

However, it is possible to maximize the perfection of design results through as much analysis and thinking as possible and considering as many factors as possible. The elements of the site environment is the material premise on which the landscape architecture depends. The design of landscape architecture is not a static way to carry out, and its form will inevitably exist in the site environment. Human perception in the space environment, sound, light, heat and other factors in the natural environment affect the form. It is significant to determine how to respond to the "unpredictable" immaterial capabilities, as well as how to respond to the force, energy and feeling in the structure, is the main task in the performance

optimization process, as shown in Figure 1 below, which is the specific landscape architecture design plan.

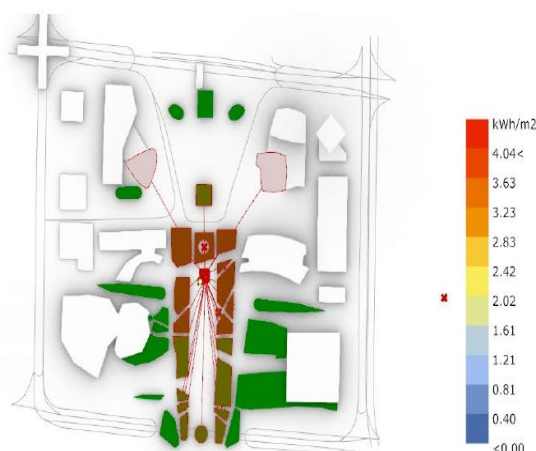


Figure 1: Planar heat planning and design in landscape architecture design

For example, in the landscape architecture design shown in the figure 1, designers can operate and optimize the form according to the perception of the natural environment of the site or the human environment of the site, to realize the transformation of the original single pure form.

The form-finding model and multi-objective optimization based on performance digital analysis make performance itself a factor and method of form creation, and help designers complete the design as an optimization technique. Landscape architecture structure optimization design process of performance, can be considered in landscape architecture designers interpretation of the space environmental conditions as the foundation, the performance optimization software as the main technical means, will be dissected into landscape architecture structures as a material system + markers, a micro three dimensions from macro a medium to form self-organizing process of structures, It is a form generation process from top to bottom and self-expression. Here, the dominant position of the designer is expressed by interpreting the site environment, predicting the function and the relationship between the construction form and the performance target. This design idea can be roughly summarized into three kinds of form generation and feedback processes: one is a dynamic interaction between the form of the structure and the human subject. The other is the environmental or other external forces acting on various forms of the structure, and the resistance of various forms to the environment or other factors. The third is the interaction between the components of the structure itself. Therefore, the performance of landscape architecture can also be summarized into three categories, which in turn is the spiritual demand (the spatial feeling brought by the space to the user).

In terms of the connotation of garden landscape, in addition to traditional garden landscape, there are also landscape preference, landscape competitiveness evaluation, etc., and the connotation of evaluation is gradually deepening. In the 20th century eighties to nineties, the landscape more beauty estimates, the environment, such as the study of different models, the visual landscape and visual effects evaluation, among them, the main methods of landscape evaluation model is divided into three categories: describe the factor method, questionnaire survey method, aesthetic attitude determination method. At present, the evaluation of landscape resources using both qualitative and quantitative way more, more is established by using AHP method of fuzzy comprehensive evaluation model, including: from the perspective of ecology, the GIS technology, the tourists demand Angle, landscape image, etc. At present, high-resolution landscape architecture can provide a large amount of landscape information with rich characteristics, so it is widely used in landscape assessment [1-3].

Two-dimensional fractal image generation algorithm is an image segmentation method based on image features. Its working principle is to select the boundary points in a region as candidate boundaries and select a method that can be spliced to obtain the boundary of the region through the inconsistency of the features of the region or region. Several edge detection operators, including first-order differential Sobel operator, Robert operator and second-order differential Laplacian operator, are usually used to extract the edge of a region.

Based on two-dimensional fractal graph. The partition technique of generating algorithm is essentially a partition based on similarity criterion, which includes some common methods. In this method, a series of basic texture pixels are used to describe each region, and an extended growth criterion is determined to expand the region. Secondly, the growth of adjacent seed pixels is calculated to determine whether the adjacent pixels have added the pixel of seed pixels. When no new pixel is found, the whole growth is carried out. The most critical step is to know the rules of seed birth and growth [4-5].

The watershed method mainly regards the pixel points of each scene in landscape architecture as the coordinates in the whole graph, and represents its location with one pixel value. Next, they used a similar in floods overflow, low-lying, pixels less place, is a piece of plain, and the high place, is a mountain, in a basin, with the change of the terrain, terrain will be more and more high, the higher the terrain, the topography is lower, the easier it is to be flooded. After enough seawater is poured into the area, a depression is formed, creating an open area. However, there is too much segmentation due to the interference of the pixels. In general, this method transforms the landscape into a grid landscape in graph theory, and treats each pixel point as a node on the landscape, and the

connection between these nodes is called the boundary. The common method to define edges is to calculate the dissimilarity of pixel points in the neighborhood according to the correlation of pixel values, and then treat them as edge weights, so as to get the graph $G = \langle V, E \rangle$. In general, G is a weighted undirected graph, and its weight is usually defined according to the actual situation. The basic principle of graph theory is to cut off several

edges on G and cross off those parts of G that are not connected together, thus realizing the partition of G . In the partitioned graph G , each independent subgraph is matched with the corresponding partition, which realizes the image segmentation [6-8].

2 Related works

Table 1: Summary on related works

Reference	Methods/Algorithm	Merits	Limitations
[9]	This work presents the multi-bit Trie-tree technique with non-collision hashing.	Test results indicate that this approach has a good success rate for data reconstruction and a high-performance efficiency.	Under this design, the necessary data reconstruction technology has not developed.
[10]	This survey updates trends in organizations, processes, and outcomes for NPD in the United States and was performed little over five years after PDMA's initial best-practices survey.	Best-practice companies have higher expectations for their NPD programs, use more versatile teams, and are more likely to monitor NPD processes and outcomes.	Businesses that do not maintain current NPD practices will find their competitive lack in growth.
[11]	This work presents an effective hybrid approach for dynamic mesh generation based on Delaunay graph mapping and Radial Basis Functions (RBFs).	The hybrid RBFs-Delaunay graph mapping approach is found to be as accurate and effective as the Delaunay technique in building dynamic meshes for various test scenarios.	Delaunay graph mapping is lacking in efficiency.
[12]	Utilizing a novel two-dimensional modification of hat functions (2D-MHFs) to solve linear Fredholm integral equations	The method is desirable from a computational standpoint, and its great accuracy is demonstrated by a few numerical examples.	Further information on the error analysis is needed
[13]	An introduction to genetic algorithm-based aeronautics is given.	The method, particularly when incorporating numerous free design factors and configurable modeling parameters, is more versatile and computationally efficient than the traditional approach.	A small number of snapshots computed via computational fluid dynamics.
[14]	This study offers a thorough approach to water and energy operation optimization.	Lastly, simulated experiments based on real network data are used to validate the viability of the suggested operation optimization strategy. The comprehensive energy-saving rate reaches 31.3%, effectively lowering the costs associated with system operation.	Lack of performance metrics with the suggested operation.

3 Research methods

3.1 Based on two-dimensional fractal graph, it is an algorithm based on conditional random point partition

According to the human landscape of the scene, make full use of the subjectivity of architectural design, carry out artistic creation of landscape architecture, and visualize its art. The design of this experimental landscape architecture structure is based on the landscape pavilion with roof and column for people to watch and chat. The reason is:

First of all, in landscape architecture works, the interaction between people and places is very critical, which requires architectural design to be comprehensively considered according to their own experience and the situation of the site. After a detailed arrangement of the area, the author divides it into two parts: natural environment and cultural environment. The experiment was conducted in a humanized manner centered on the central axis of the Guangzhou center, targeting white-collar workers, tourists and nearby residents. In view of the large urban population and various groups, the construction of landscape architecture layout should not only meet the needs of people, but also take into account the needs of history, culture and society, that is to pay full attention to the structure of landscape architecture and people's behavior.

On this basis, a concept of random spatial structure based on background, two-dimensional fractal graph, is proposed. This method uses each pixel in the background as a node, as shown in Figure 2 below, and uses the corresponding relationship between each point as the boundary. Then the minimum state random ability field is used to divide the landscape garden landscape.

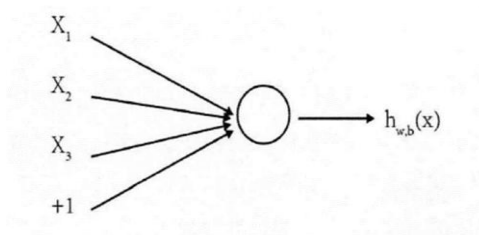


Figure 2: The most basic representation of the two-dimensional fractal graph algorithm

The energy of the conditional random field in image semantic segmentation is expressed as follows:

$$E(X) = \sum_{i \in V} \varphi_i(x_i) + \sum_{i \in V, j \in N_i} \varphi_{ij}(x_i, x_j); \forall i, x_i \in L \quad (1)$$

In the formula, represents the set composed of all landscape element pixels in the landscape image, represents the set of pixels adjacent to the landscape element pixel, and usually takes the set of pixels in four similar regions, top, bottom, left and right. VN_iL Represents the combination of categories of landscape element pixel classification. It represents the categories of all landscape element pixels and is the corresponding category of pixel points. $x_i \in \varphi$ Is the potential energy function. The general form of the unary potential energy is the logarithmic pattern of the class likelihood probability corresponding to the pixel. $\varphi_i(x_i)$ The likelihood probability can be learned according to the actual specific pixel features, and the most common pattern is directly trained according to the pixel values. However, these methods only consider the color factors of the landscape image pixels, but are not particularly comprehensive. Therefore, color and texture are generally selected :

$$\varphi_i(x_i) = \lambda_T \varphi_T(x_i) + \lambda_{col} \varphi_{col}(x_i) + \lambda_l \varphi_l(x_i) \quad (2)$$

Potential energy function trained by the value size (color) feature. φ_l Is a potential function defined according to the location characteristics of pixels. λ_T , λ_{col} And are their respective weights, which are generally obtained through training. λ_l

Binary potential energy, generally defined in the form

$$\varphi_{ij}(x_i, x_j) \quad (3)$$

$$\varphi_{ij}(x_i, x_j) = \begin{cases} 0, & x_i = x_j \\ g(i, j), & x_i \neq x_j \end{cases} \quad (4)$$

Functions are generally defined based on the relationship between pixel values between adjacent pixels. In the formula, the meaning of function is for pixel values with the same pixel class, which will make the value of function 0. Otherwise, it will be determined according to the function.

According to the human landscape of the scene, make full use of the subjectivity of architectural design, carry out artistic creation of landscape architecture, and visualize its art. The design of this experimental landscape architecture structure is based on the landscape pavilion with roof and column for people to watch and chat.

This method is based on the pixels of the pixel value, is often a function of the formula is the pixel value and pixel type are the same type of pixel values, resulting in the function value is 0, on the other hand, will be decided according to the function.

At present, by using random field model for post-processing, semantic of early model correction, one yuan a function usually to repair and add in front of the

semantic segmentation, make the original semantic segmentation more accurately.

3.2 Description of algorithm

- **Updating 2D Search Velocity:** Every search agent's velocity is updated according to its velocity, position, and the best-known positions of both itself and its neighbors in the same level.
- **Update Search 2D Position:** Next, each search agent's position is modified in accordance with its velocity.
- **Termination of Optimization:** Until a termination criterion is satisfied, the optimization process is carried out recursively.
- **Best answer Extraction:** The ideal answer to the landscape design challenge is ultimately determined to be the most well-known position among all search agents.

Effective navigation of the landscape design space is made possible by the 2D fractal graph creation technique, which takes advantage of this hierarchical classification to balance exploration and exploitation across various layers of search agents. Fractal graphs converge to ideal landscape designs through iterative refinement directed by equations guiding velocity and position updates. The hierarchical classification that the 2D fractal graph presents improves its effectiveness and efficiency in navigating the intricate landscape design space. Fundamentally, the fractal graph method is a multi-level categorization scheme that groups search agents according to how well they can explore and exploit new areas. Because of its hierarchical structure, 2D is able to strike a balance between exploitation which helps to refine promising solutions and exploration which allows for the discovery of a variety of landscape design alternatives.

Algorithm 1: Two-dimension fractal graph for the landscape architecture planning and design

Initialize:

- Define the 2D landscape planning and design problem.

- Parameters: size of the population (N), iterations in maximum (MaxIter), hierarchical levels (L), weights (w, w_local, w_global), acceleration coefficients (c1, c2), are the classifications.

Generate initial fractal graph:

- Randomly initialize N search agents with positions and velocities within the solution space.

Evaluate stability:

- Evaluate the stability of each search agent using the landscape design objective function.

Main loop:

For iter = 1 to MaxIter:

Update hierarchical classification:

- Classify search agents into hierarchical levels based on their stability and exploration-exploitation characteristics.

For each level L:

Update velocity and position:

For each search agent in level L:

Update velocity:

- Calculate cognitive and social components:

cognitive_component = $c1 * \text{rand}() * (p_local - \text{position})$

social_component = $c2 * \text{rand}() * (p_global - \text{position})$

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- Update velocity:

velocity = w * velocity + cognitive_component + social_component

Update position:

- Update position:

position = position + velocity

Evaluate fitness:

- Evaluate the stability of the new position using the landscape design objective function.

Update local best:

- Update local best position if current stability is better than previous.

Update global best:

- Identify the search agent with the best architecture stability among all levels.

Return global best as the optimal solution.

```

3.3 A Survey of the computational methods of two-dimensional fractal graphs

Due to the emergence of two-dimensional fractal graph, it has been widely paid attention to for its unique advantages, coupled with the development of technology, people's understanding of it is more and more profound, two-dimensional fractal graph performance is also getting better and better, has been widely used in many aspects. This is especially true for the identification, especially for the landscape. 2 d fractal graph has many advantages, the key point is the weighted average, and biological neural network, it can reduce weight, thus reduce the difficulties of network modeling. Compared to the conventional 2 d fractal graph, it saves a lot of tedious pretreatment process, such as refactoring related data and so on.

In numerous hierarchical networks, 2 d fractal graph is one of the most widely used. The method can in advance to BP, effectively reduce the training parameters, thus greatly improve the performance of the algorithm. With 2 d fractal graph method, can effectively shorten the preparation process of input, thus for the user to save the work time and reduce the pressure of work. Layer by layer, layer by layer, layer by layer, layer by layer with a new computation, a new way of computing, each kind of new data are added to a new system, this method can be applied to many aspects.

The formation of architectural form is mainly an innovative embodiment of the relationship between the spatial structure and the architectural structure of the building site. Landscape structure is a unique landscape architecture and its structure and has a high degree of

similarity and a high degree of convergence. This makes the landscape design of the environment and the structural form can communicate directly, not mechanically or indirectly, to adapt to the former, but will be integrated into the landscape design of the behavior of the purpose. Although the message contained in each place is different, its essence is to seek a symbiotic relationship between human and nature. Its inner essence is palpable and obvious, such as the use of local materials and traditional crafts. The internal expression is a spiritual guidance for designers to convey and express the inner meaning of the museum through accurately grasping the characteristics of the scene.

Its meaning includes two levels: first, designers use the power of nature to show a landscape structure with deep humanistic characteristics and spiritual emotions, and make its spatial connotation appear and continue according to their own experience and experience. Due to the addition of landscape architecture structure, it adds a new artistic spirit and cultural connotation, so that its symbol has a natural artistic spirit of the place. No matter what the meaning is, it shows that the landscape architecture structure is a man-made intermediary between people and places, and the essence of its design is to integrate human thought and subjective will into the information of places. Under the guidance of design, people often naturally associate or recall, and realize the meaning of the designer, thus arouse people's resonance. 2 d fractal graphic method belong to the category of deep learning, its structure characteristics are similar to deep learning, both the localization, also has a hierarchical. The method adopted a kind of monitoring method of training, make the method can more accurately extracted

from the input data contains information. This method can improve the learning efficiency of 2 d fractal graph. In actual application, because there is no information there is usually no classification marking, so you need to first according to the characteristics of the tag information itself, to unsupervised learning of these data, in order to gain rules, then marked by the monitoring data of learning, both to fully play to the role of the samples, and can deal with the issue of information is not much.

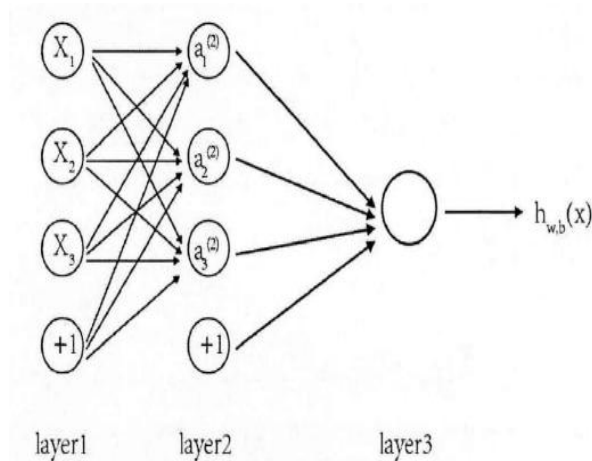


Figure 3: Computational architecture and general formula of two-dimensional fractal graphs

As we can see in Figure 3, the input level is a neural network. "+ 1" refers to a point, known as split points. The system has three types of input, output, three kinds of concealed structure, only a as output, input on the left, on the right is the output, and in the central is implied, shows the fully connected. Hidden in the shadows of data, including the data on the node, is unable to display in the training.

Among the whole network structure, said one of the layers, a total of figure 2 contains three layers. n_1 Need a tag in each layer, is in the first layer of the output layer, use said, parameters of fang, such as:

$$(W, b) = (W^1, b^1, W^2, b^2) \quad (5)$$

W_{ij} (1) arrangement of a unit of the ordinal number is 1 layer in the middle position of the first unit, and the connection between the unit operation parameters, said in the first layer of the first units to set up. $j1 + 1b_1^1 1 + 1i$ The neural network computation method is to use one of the units as outputs, and tags, and the output markup became the first layer, the value is 1, it represents in the known and the two functions, and it contains a collection of the cases, can pass for function prediction, Thus the final results and output. $a_1^2 w b h_{w,b}(x)$ The specific calculation steps are as follows:

$$\begin{aligned} a_1^2 &= f(W_{11}^1 x_1 + W_{12}^1 \times 1 + W_{13}^1 \times 1 + b_1^{(1)}) \\ a_2^2 &= f(W_{21}^1 \times 1 + W_{22}^1 \times 1 + W_{23}^1 \times 1 + b_2^{(1)}) \\ a_3^2 &= f(W_{31}^1 x_1 + W_{32}^1 \times 1 + W_{33}^1 \times 1 + b_3^{(1)}) \\ h_{w,b}(x) &= a_1^3 = f(W_{11}^2 a_1^2 + W_{12}^2 a_2^2 + W_{13}^2 a_3^2 + b_1^{(2)}) \end{aligned} \quad (6)$$

Prior to the spread of the calculation principle is shown in figure 1-3, the neural network structure and Logistic model structure are nearly the same, both calculation method and the principle of using but the biggest difference between them is the neural network Winding. Hypothesis 2 d fractal graph algorithm is able to handle the size of the data, the width of the image with said the figure like height with said, the two figures is a plane, but the dimension of the image and color channel Several are represented by $d.h * w * dwh$

Basic network formed by convolution and pooling layer, and the two basic structures are based on local entered as a unit, and 2 d fractal graph algorithm in image translation can maintain the structure of the constant, in other words Element is only related to the position of the space, if one layer of data on the coordinates of the vector is, the data vector of the next layer is, and its calculation formula is as follows:

$$Y_{ij} = f_{ks}(X_{si+\delta i, sj+\delta j}) \quad 0 \leq \delta i, \delta j \leq k \quad (7)$$

Convolution kernels in the above formula used, the size of the step length with s , said the said algorithm () function which adopted operation, general can be divided into matrix on the convolution or average pooling, a nonlinear excitation function, and calculate the maximum pool type of operation such as the maximum value.

When the parameters and satisfy, to the principle of mutual transformation between this formula can be used to represent:

$$f_{ks} \circ 'g_{ks}' = (f \circ g)_{k+(k-1)s', ss'} \quad (8)$$

General 2 d fractal graph algorithm in dealing with nonlinear equation, a very common will adopt the method for solving nonlinear filter, completely is adopted by the two-dimensional fractal graph. Full convolution net, can be used to express two-dimensional fractal graph network and because its input image in conformity with its output image, so the convolution network size is not qualified.

3.4 Based on the two-dimensional fractal figure garden jingsu level evaluation index of the algorithm

In the process of various scenarios of semantic classification, unable to differentiate each scenario, so sometimes will be a scene of scenes into other scenarios, the effect of causing some fuzzy. This paper adopts a new method, the images were compared with the real world, according to the classification results obtained will be digital processing was carried out, as a convicted landscape image of the final result. This article is currently used by common word segmentation criterion, used for statistical accuracy.

This paper used to represent the semantics and belongs to the class is judgment as the number of pixels, to represent the language righteousness, the total number of categories in this article belongs to the class represented by the number of the pixels of the total number of $n_{ij}n_{cj}n_{cj}6, t_i = \sum_i n_{ij}i$. Calculate the overall accurate rate formula such as:

$$\frac{\sum_i n_{ii}}{\sum_i t_i} \quad (9)$$

Used to define JingSu belongs to the first-class scenery and be correctly defined as the first-class scenery of Beijing plain accurate formula can be used to represent:ii

$$\frac{\frac{1}{n_{cl}} \sum_i n_{ii}}{t_i} \quad (10)$$

IU scheme (IU) on average, is expected by calculation landscape JingSu category pixels in the intersection of right then to predict the scenery line pixels and the pixels of the original category and set, the result is that the final discriminant index, can use formula to represent:

$$\frac{\frac{1}{n_{cl}} \sum_i n_{ii}}{(t_i + \sum_j n_{ji} - n_{ii})} \quad (11)$$

4 Result analysis

4.1 The practical application of two-dimensional fractal figure

2-D fractal graph network training, after a long period of time after the improvement and development, there are two main ways of training: in the presence of a monitor teaching. While this paper used a learning algorithm of monitoring, the original image and its corresponding manual segmentation image used in the network of the 2-d fractal graph modeling [14].

However, the influence ratio of each factor of the actual landscape architecture structure on the landscape architecture structure is not the same, and each aspect has

some kind of mutual coupling relationship. For example, when the landscape building structure is opened in the light environment, attention must be paid to the structural performance of the structure to ensure the stability and constructability of the structure. From this point, it can be seen that the combined effects of building characteristics and lighting conditions are very complex and some even contradict each other. For another example, the average sunshine structure is strongly related to factors such as vertical scale, but in a specific design, the coupling of sunlight with horizontal and vertical scales is difficult.

Monitored learning is machine learning, and its technical feature is the ability to recognize the functions of a map. During this period, all training samples have an alternative target and a more satisfactory output result, which is called "monitoring". The technique of monitoring refers to the comprehensive analysis of the input data at runtime, and the corresponding mapping is obtained, to obtain a new set of sampled data. If it is new data that was generated before, then he will label these new data samples as categories. In the algorithms for two-dimensional fractal graphs, guided learning algorithms are usually used for training while supervised learning is usually based on gradients (Krizhevsky et al, 2012). Batch processing stochastic gradient reduction methods are commonly used. In the learning process of two-dimensional fractal graph N, we only use one example to simplify the description process. The method is divided into two stages: forward stage and reverse stage. The first step is to carry out in turn until the final result, the second step according to the error of the value to be output weight and deviation, after the end of the operation, according to the weight and deviation of each level is adjusted accordingly. If the number of classes, we specify is for samples during classification, its error function formula is as follows:

$$J(W, b; x, y) = \frac{1}{2} \sum_{k=1}^c (t_k - y_k)^2 = \frac{1}{2} \| t - y \|_2^2 \quad (12)$$

Among them, represents the weight in the neural network, b. Represents the bias in the neural network, the training sample is represented by, and the corresponding standard of the training sample is represented by. W_{xyt_k} Denotes the KTH dimension component of the predicted value generated by the sample when predicting the sample; x However, it represents the dimensionality component of the sample label to be predicted. $y_k \times k$ When we are doing back propagation, the first thing we need to do is calculate the error terms at each level in a certain order. Suppose that the error term of the first layer is calculated according to the above formula, and the weight of this layer is expressed and the bias parameter is expressed. $\delta^{(a+1)}l + 1Wb$ If both layers are fully connected, the error term of

the first layer can be calculated using the following formula:

$$\delta^{(l)} = \left((W^{(l)})^T \delta^{(l+1)} \right) \cdot f'(z^{(l)}) \quad (13)$$

The corresponding gradient calculation formula is shown as follows:

$$\begin{aligned} \nabla_{W^{(l)}} J(W, b; x, y) &= \delta^{(l+1)} (a^{(l)})^T \\ \nabla_{b^{(l)}} J(W, b; x, y) &= \delta^{(l+1)} \end{aligned} \quad (14)$$

If the first layer is a feature extraction stage, that is, the convolution layer and the sampling layer of, then the error term of the first layer can be calculated by the formula:

$$\delta_k^{(l)} = \text{unsample} \left((W_k^{(l)})^T \delta_k^{(l+1)} \right) \cdot f'(z_k^{(l)}) \quad (15)$$

Among them, the value of represents the first convolution kernel. After a series of runs in the upper sampling layer, the error obtained later can be transmitted to the previous layer through the subsampling layer, which refers to the convolution layer of. $\delta_k^{(l+1)}$ If use method is to average sampling, sampling layer will put poor simple average assigned to run before sampling of sub zone, if use is a maximum sampling, so when the forward propagation, samples shipped to in clause, the sampling value will get all the error, the rest of the value is 0 [15]. The accuracy of landscape classification can be seen in the accuracy of landscape classification, which can see whether specific types in landscape have been correctly identified and divided. As shown in Table 4-3, the classification of landscape scenery has low accuracy, and the classification accuracy of natural landscape is higher than the 2D fractal network -8s. It can be seen that the two-dimensional fractal graph network -16s has the best overall performance in the classification of habitat landscape in landscape images. Finally, three values of average accuracy, average accuracy and average accuracy of image pixels are tested. The final value is shown in Table 2;

Table 2: Results of three kinds of upsampled semantic segmentation on landscape pixels

Scene Elements			
	Pixel accuracy(%)	Average accuracy(%)	The average IU (%)
FCN-8s	86.25	85.98	74.33
FCN-16s	88.97	88.58	75.35
FCN-32s	83.06	82.75	72.69

4.2 Optimization of landscape architecture planning and design and expansion of two-dimensional fractal graph

Through the detection and classification of 200 pictures, the correct degree of landscape element value in landscape garden landscape is obtained, as shown in Table 3 below, which can intuitively reflect the performance of three different upper sampling structures. The accuracy of landscape prime number can reflect whether specific types of landscape pictures can be correctly identified and divided. Pictures are divided into six categories, namely Water scene, landscape scene, living scene, sky scene, architecture and transportation. Water scenes include Water, river and Mountain. Scenes include: landscape, landscape, landscape, sky scene, architecture, traffic, traffic, etc. It can be seen from Table 3 that the classification accuracy of two-dimensional fractal graph network -32s is the worst among all classifications. The classification accuracy of two-dimensional fractal graph network -16s is higher than that of two-dimensional fractal graph network -8s, while the accuracy of two-dimensional fractal graph network -8s is higher than that of two-dimensional fractal graph network -8s. Therefore, two-dimensional fractal graph network -8s also has a good effect on landscape quality classification of landscape images. On the two-dimensional fractal graph network -8S, "Skyview" has the best classification rate, but in the real world, it has the lowest classification rate, only occasionally appearing something similar to the real scene.

Table 3: Three kinds of the knot JingSu landscape classification accuracy

Categories	FCN-8s (%)	FCN-16s(%)	FCN-32s (%)
The surface of the water	91.89	90.32	87.85
The mountain	87.66	86.35	82.43
Vegetation	85.94	88.28	83.12
The sky	93.56	90.65	88.45
Building	88.29	87.56	84.68
The traffic	86.12	85.08	83.28

Table 3 shows the exact ratios of two-dimensional fractal graph network -8s, two-dimensional fractal graph network -16s, two-dimensional fractal graph network -32s and two-dimensional fractal graph network -32s. From this figure, we can know the pixel accuracy, average accuracy and average value of the three kinds of

upper sampling. Through the comparison of three different upper sampling modes, it is concluded that two-dimensional fractal graph net-8S has reached the best level in pixel accuracy, average accuracy, average IU, etc., and the pixel accuracy has reached as high as 100%, average accuracy has reached 100%, average accuracy has reached 100%. The average accuracy is lower than pixel, which is calculated from the data of each classification of the image. Too much data will result in the average accuracy and the average IU.

Table 4: Classification of landscape planning and design based on two-dimensional fractal graph generation algorithm

Classification	FCN-8s	FCN-16s	FCN-32s
Ecological Sustainability (0-1)	0.86	0.79	0.72
Aesthetic Appeal (0-1)	0.92	0.88	0.81
Resource Efficiency (0-1)	0.84	0.79	0.82
Robustness	0.94	0.90	0.89

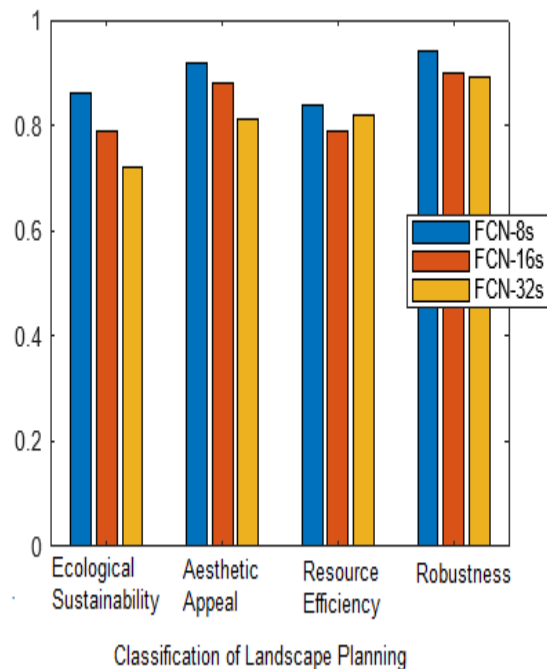
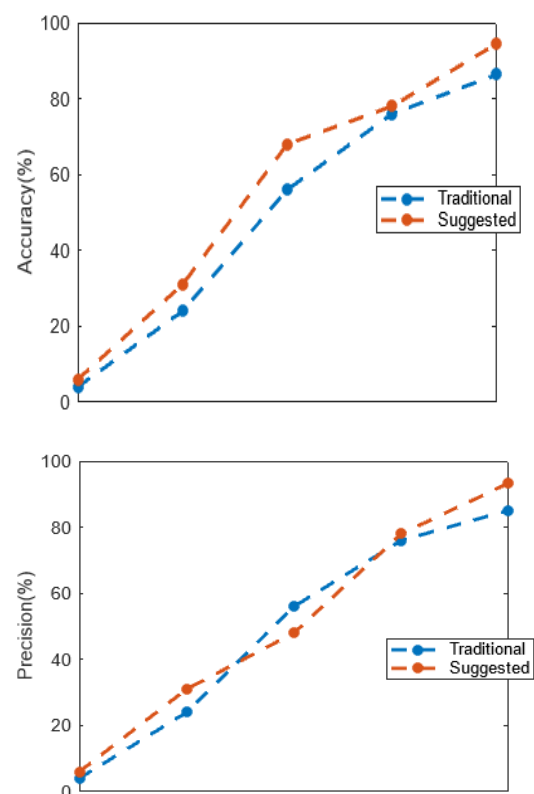


Figure 4: Outcome of landscape planning and design based on two-dimensional fractal graph generation algorithm

The landscape planning findings, which were obtained through the use of a 2D fractal network generation algorithm, are shown in Figure 4 and Table 4. The assessments are based on a number of factors, such as ecological sustainability, aesthetic appeal, resource efficiency, and robustness. Ecological sustainability, aesthetic appeal, and resource efficiency are numerical values assigned to each design solution, ranging from 0 to 1, representing the quality of the design in each respective area. The algorithm generates a wide range of solutions every time, which encourages the exploration of the solution space and makes it possible to identify several different design options. The term "robustness" describes how stable the solutions produced by the 2D fractal network generation algorithm is under different circumstances. The robustness of all trials shows that the algorithm's results are dependable and consistent in FCN-8s, FCN-16s, and FCN-32s scenarios.

Table 5: overall performance

Algorithm	Accuracy (%)	Precision (%)	Recall (%)
Traditional Optimization Algorithm	86.34	85.12	85.78
Suggested Algorithm	94.52	93.34	94.18



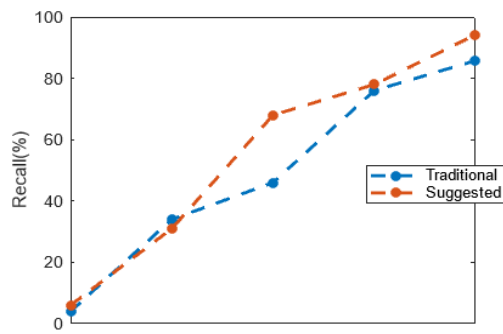


Figure 5: Overall performance of the methods

An academic discipline that focuses on the interaction between human habitation and the natural environment is landscape architecture planning and design. Table 5 and figure 5 demonstrates that the 2D fractal graph generation approach that is recommended has the best accuracy (94.52%), precision (93.34%), and recall (94.18%).

5 Discussion

A fractal graph is a complex entity that is formed using recursive iteration rules and can be found in both natural systems and man-made systems, such as cities. It displays intrinsic self-similarity on both a large and small scale. The fractal two-dimension is a scientific technique for measuring landscape architecture aspects and its evolutionary unsample in the context of network systems. Furthermore, it is an important metric to determine whether a city is experiencing self-organizational evolution. Previous research results show that self-organized architecture systems have notable fractal properties that can be measured using fractal two-dimensional graphs. Nevertheless, prior research has solely utilized these two fractal dimensions to investigate the general fractal properties of the entire city, without carrying out more accurate fractal measurements for subzones in various directions and layers.

The existence of a fractal structure, which acts as an analogy and supplement to earlier research findings on the general fractal laws discovered in other cities, is one of the study's major discoveries. Unlike earlier research, this finding supports the different 2D values that contribute to the spatial variability of separate subzone structures. The cause is the differing paths taken by various subzones in terms of planning and development, as well as the ways in which people, land, and architecture occupy and use space in distinct urban blocks. The box-counting dimension is a measure of the spatial occupancy capacity, hence urban expansion will cause it to rise. In other words, the self-organizational objective of urban development is to provide a more

balanced and effective distribution of urban space while optimizing the spatial configuration and enabling coordinated growth within its internal areas. By illustrating a progressive decrease in the fractal dimension from the city's center to its periphery, suggesting outward growth, the study contributes to the notion of fractal cities. Furthermore, it shows that pixels with mature landscape architecture have larger fractal dimensions than those that are still developing or are being quickly classified as FCN-8s, FCN-16s, or FCN-32s.

6 Conclusion

In order to solve this problem, we adopt a method based on quadratic fractal graph to solve this problem. Two-dimensional fractal graphs are mainly divided according to the pixel points in landscape architecture. Different from the method of 2D fractal graph, the final step of 2D fractal graph is to transform the whole connected level into a transition, so that the operational architecture of 2D fractal graph is preserved. The final image is the same size as the original image, and the original image of the original image can be obtained. Compared with the traditional two-dimensional fractal graph method, two-dimensional fractal graph has higher computational speed and is not constrained by the size of the input image. In this paper, a new image semantic partition method is introduced.

After establishing a virtual environment, the model is modeled by the common SifFlow on the network. The image preprocessing technology is used to enhance the data, thus effectively overcoming the problem of overfitting the model. On this basis, the second learning of the second segmentation is carried out to shorten the learning period of the model.

In the image analysis, two-dimensional fractal graph network -32s, two-dimensional fractal graph network -16s, two-dimensional fractal graph network -8s, two-dimensional fractal graph network -8s, two-dimensional fractal graph network -8s, three different upper sampling methods are adopted. In the case of pixel accuracy, average accuracy and average U value sampling, the sampling structure on 2D fractal graph net-8s is selected, and the average accuracy is 90.3%, the average accuracy is 88.91%, and the average U is 75.83%. At the same time, the pixel accuracy of the model in each scene type in the landscape image is more than 86%, it is indicating that the method is an ideal method in the landscape image, especially in the landscape image containing multiple scene types, can obtain higher pixel segmentation accuracy. In this paper, the classification experiment of landscape in landscape architecture is performance metrics in algorithm carried out with accuracy as 94.52%.

Declaration statement

Ethics approval and consent to participate

I confirm that all the research meets ethical guidelines and adheres to the legal requirements of the study country.

Consent for publication: I confirm that any participants (or their guardians if unable to give informed consent, or next of kin, if deceased) who may be identifiable through the manuscript (such as a case report), have been given an opportunity to review the final manuscript and have provided written consent to publish.

Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon request.

Competing interests

Here are no have no conflicts of interest to declare.

All authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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