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Research Article

Modularized Information Fusion Design of Urban Garden Landscape in Big Data Background

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Traditional information fusion model has the problem of low efficiency in urban landscape design. In addition, using the current method to design urban commercial landscape public facilities, there are problems of large regional space occupation and unsatisfactory design effect. This paper designs a new modular information fusion model for urban landscape design process in view of genetic back propagation. On the basis of preprocessing sensor images, a digital elevation model is created using an ordered numerical sequence. Then, the stereo orthophoto image pair is obtained through the artificial parallax assistance mechanism, and the 3D garden landscape is generated by combining with the ant colony algorithm. The positive feedback mechanism of the ant colony algorithm is used to make the processing process converge continuously, and the optimal 3D garden landscape is finally generated by obtaining stereo orthophoto pairs through the artificial parallax-assisted mechanism. At the same time, the strong robustness and fault tolerance of neural network and parallel processing mechanism are utilized for fast information fusion. The scale and resources of garden design are described by the process dimension and the context dimension, and a modular garden landscape with distinct main body is built. Finally, the initial weight is optimized in the genetic real number coding algorithm, and the appropriate learning factor is selected to train the neural network so as to make the information fusion task. Experimental results show that the above model fusion process has good stability and low energy consumption for information fusion, which can promote the efficient construction of garden landscapes.

1. Introduction

Urban commercial landscape, as well as public facilities and plant landscape design, has received extensive attention under the vigorous development of social economy [1, 2]. As a result, there are more and more studies in this area, such as low-carbon environmental protection, humanized public facilities, green economic commercial space construction, and creative plant landscapes, which have attracted people's attention and love. However, the unreasonable utilization of public facilities in commercial landscapes will result in gray space [3]. Only with the coordinated development of commercial landscapes and buildings can make the utilization of regional space be maximized. The types and elements of urban commercial space should be as diverse as possible. Plants, water bodies, and hard landscapes and public facilities in urban commercial landscapes should be efficiently utilized to integrate regional space with characteristic landscape cultural spaces. Therefore, how to form an ecological and natural urban commercial landscape public facility environment, create a green and environmentally friendly consumption concept, reflect the characteristics of the commercial landscape public facilities environment with urban characteristics, and form a natural oasis of urban commercial landscape has become the primary problem to be solved in this field. Research on the design of urban commercial landscape public facilities has become a good method to make above problems, which has important practical significance [4, 5].

The field of modern urban garden landscape design requires more and more comprehensive ability of designers, and the actual work often involves professional knowledge and skills of various disciplines such as horticulture, aesthetics, and natural biology [6]. When carrying out urban garden landscape design, designers need to make full use of innovative thinking and integrate innovative elements, so that the limited garden landscape space can exert unlimited effectiveness and present a new visual experience for urban residents. The site selection of urban garden landscape is one of the important factors in the whole design work. Incorporating the ups and downs of the terrain into the design, adding modern artistic elements to the limited garden landscape space, not only highlights the cultural heritage and humanistic characteristics of the city but also it is in line with the material life and spiritual life needs of urban residents, so that it can be cultivated spiritually and realize the coordinated development of ecological benefits, social benefits, and economic benefits [7]. Different cities should adhere to their own application principles when designing garden landscapes, give full play to the functions that garden landscape design should have in the overall urban planning, focus on the overall pattern, and take into account the overall development, elements, optimize resource allocation, so as to achieve the best combination effect. In addition, in the designing of modern urban garden landscape, it is also important to coordinate the internal layout, effectively configure each element, skillfully integrate modern art into the design scheme, and realize the innovative development of garden landscape. In the process of integrating various modern art design elements, designers need to have innovative spirit, open up thinking, break through the ideological constraints of traditional garden landscape design, continuously improve the level and diversity of design, enrich the effect of garden landscape space, and let urban residents aesthetic needs are met. Under the premise of following the local laws of nature, combined with the overall development planning of the city, according to the basic principles of modern garden landscape design, and using innovative thinking to build urban garden landscapes, can its practicability and ornamental properties be unified, thereby enhancing the city's brand image [8–10].

In order to achieve modular information fusion evaluation of urban landscape design process in the context of big data, in Chapter 3, we first obtain stereo orthophoto pairs through an artificial parallax-assisted mechanism and generate 3D landscapes by combining ant colony algorithms. The scale and resources of the landscape design are described by the process dimension and the context dimension, and thus information fusion is required. In Chapter 4, the information fusion task is accomplished by optimizing the initial weights in the genetic real number coding algorithm and selecting appropriate learning factors to train the neural network.

The main contributions of this paper are summarized as follows: 1. This paper first designs a new modular information fusion model for the urban landscape design process from the perspective of genetic back propagation. Based on the preprocessing of sensor images, a digital elevation model is built using ordered digital sequences. 2. Stereo orthophoto pairs are obtained through an artificial parallax-assisted mechanism and combined with an ant colony algorithm to generate 3D landscapes. The scale and resources of the landscape design are described by the process dimension and the context dimension, and a modular landscape with a distinct subject is established. 3. The initial weights are optimized in the genetic real number coding algorithm, and the appropriate learning factors are selected to train the neural network, so as to complete the information fusion task. The experimental results show that the above model fusion process has good stability and low energy consumption of information fusion, which can facilitate the efficient construction of the garden landscape.

2. Related Work

2.1. Urban Garden Landscape Public Facilities. Urban public facilities are dominated by commercial landscapes, supplemented by other public facilities such as vegetation, roads, and street lights. Among them, urban commercial natural landscapes and public facilities construction have an important impact on people's lives. The big data structure of urban commercial landscape model is shown in Figure 1.

In Figure 1, according to the theory of landscape ecology [11], we can get the conclusion. According to the characteristics of the urban commercial landscape, a quantifiable table is made from three ways. The three ways include landscape naturalness, vision openness, landscape diversity, landscape peculiarity, and overall coordination of public facilities.

2.1.1. Scientific Treatment of Weeds. Weeds in urban gardens should be dealt with every once in a while, and scientific treatment is the least harmful way to deal with urban landscapes [12]. And when designing garden landscapes, it is necessary to prepare enough blank areas for vegetation growth in advance, and weeds in the area need to be removed, so as to avoid competition between weeds and landscape plants for nutrients. At present, two methods of artificial and pesticide are usually used when dealing with weeds. In contrast, pesticide removal is more harmful, and pesticide spraying often has a negative impact on the soil that is not consist in the low-carbon concept [13]. The manual removal method is more like-minded with the low-carbon concept and make also effectively remove weeds and avoid soil pollution. In order to provide natural fertilizer for the growth of urban garden landscape plants after weeds are removed, the weeds can be buried in the garden, which can reduce the amount of fertilizer applied to a certain extent.

2.1.2. Greening the Walls. Greening the urban garden landscape wall can also reflect the low-carbon concept [14]. As one of the hard landscapes of the urban garden landscape, the greening of the wall can not only improve the aesthetics of the garden but also conform to the concept of low carbon. Greening the wall can effectively increase the green area. At present, many cities have gradually increased the emphasis

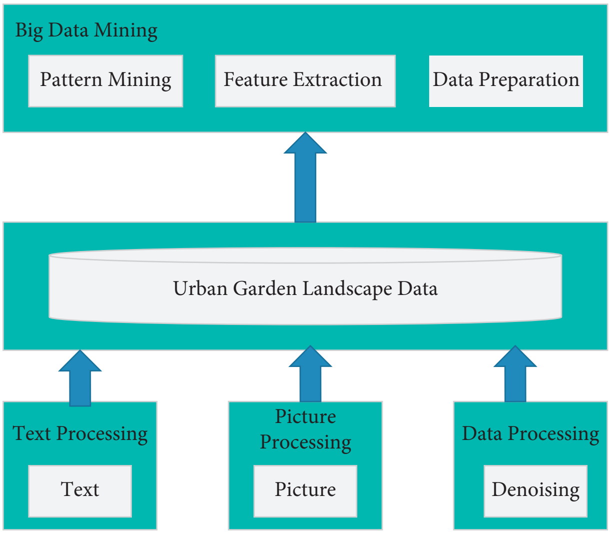

Figure 1: Urban commercial landscape model.

on the design of wall greening, in order to weaken the urban heat island effect. In the context of the accelerating urbanization process, more and more municipal public works facilities and public life service facilities are emerging, the urban green space is gradually decreasing, and the urban surface temperature reduction effect is getting worse and worse. In the long run, it will inevitably have adverse effects on human health and life safety, and greening the walls of urban gardens can also improve the urban space climate. In the specific greening design, the rationality of resource allocation should be improved to create different forms of greening effects. For example, in summer, many plants will block or cover the garden wall. Due to the high temperature in summer, the long-term direct sunlight on the wall will cause the wall to heat up rapidly. After being shielded by vegetation, the heat absorption rate can be appropriately reduced, thus playing a better protective role. After entering the winter, the plants gradually fall off, and the wall has no shelter to receive direct sunlight. In winter, the temperature is lower, and direct sunlight will not produce irritation, which can increase the temperature of the wall and reduce energy consumption.

2.1.3. Ecologically Designed Water Bodies. Water is not only an important part of urban garden landscape but also the key content of landscape design. Whether the water body design is reasonable not only affects the implementation of the low-carbon concept but also determines whether the subsequent operation of urban gardens meets the requirements of low energy consumption and low pollution. Urban garden waterscapes need to be supported by sufficient water resources. In some areas with abundant water resources, water from nearby rivers will be introduced into garden waterscapes to make rational use of existing water resources. In addition to using river water resources, sewage can also be used. The amount of sewage discharged every day in the city is large [15]. If these sewage can be recycled, the amount of water resources required for garden waterscape design can be greatly saved. However, it is worth noting that the treated sewage needs to be used in the design of water features, rather than the direct application of the discharged sewage, otherwise it will affect the normal growth of plants. In addition, attention should be paid to the use of rainwater. Rainwater is an important natural water resource, and the rational use of rainwater can effectively implement the principles of adapting to local conditions and ecological principles. In specific design, rainwater should be collected first, which can be collected on lawns, roofs, roads, etc. And then applied to waterscapes after treatment, when collecting lawn rainwater, it needs to be integrated into the wetland system [16]. Under large-scale heavy rainfall conditions, the wetland system can be used to store rainwater and then use professional facilities to transport it to the garden waterscape. When collecting roof rainwater, a larger container can be used directly for receiving it. In contrast, road rainwater collection is more difficult. In order to avoid damage to road facilities, different outflow channels can be installed on the sewers, so that after the rainwater seeps into the sewers, it can flow to the destination through the pipeline, and then the rainwater can be treated and applied into the water feature. These water body design methods are all consist in the low-carbon concept, which could create beautiful ecological garden waterscapes while saving water resources.

2.2. Information Fusion in Urban Garden Landscape. Multisource information fusion is a basic function of observation by humans and other biological systems. In nature, humans and animals perceive objective objects, which is to perceive through multiple senses, obtain heterogeneous information of objective objects through different senses, or use similar sensors. For example, the binocular obtains homogeneous but different amounts of information, and then the brain blends the information to obtain a comprehensive perception information. That is to say, human itself is an advanced information fusion system. The fusion center of the brain cooperates with many types of sensors, such as eye vision, ear hearing, taste, nose, smell, hand touch to sense the information on all sides of things, and according to human brain the relevant experience and knowledge are analyzed, and the rough is extracted, so as to make a comprehensive judgment and obtain a comprehensive understanding and study of the nature and essence of the surrounding things.

Fusion is to comprehensively process the information obtained from a single angle, usually only reflecting the side of things, because different measurement features are used to measure different indicators, so in order to obtain a unified result, the entire fusion process is quite complex and complex adaptive. In recent years, with the development of computer technology and the research on artificial intelligence, automation systems can realize many functions of human through simulation, including human information fusion function, which can be simulated through automatic information fusion system.

Aiming at the problem of information fusion, the literature [17] designed a clustered data fusion model with NARX neural network. The NARX model time series prediction model is integrated with the clustering routing protocol under the basis vector quantization to eliminate redundancy in terms of time and space correlation and transmit a small amount of data after fusion to the sink node to enhance the efficiency of data collection. However, the fusion accuracy of this model is poor and its practicability is not high. Reference [18] designed a data fusion model of adaptive fuzzy C-means clustering. Apply adaptive fuzzy C-means clustering to information fusion by introducing adaptive coefficients to discover subsets of clusters of different shapes and sizes. The principle of Mann filter and the neural network prediction method based on multilayer perceptron are applied to the error covariance estimation to improve the fusion reliability. However, the computational performance of the model is not good, and it is insurmountable to meet the computational requirements of actual scenarios.

Reference [19] proposes a design method for commercial urban public facilities. This method first takes the urban environment as the main content of the study, analyzes the characteristics and needs of people's behavior, takes the urban public service facilities and public space environment as the main factors for evaluating the livability of the urban environment, and at the same time, the characteristics of the urban living environment are analyzed, distribution is studied. Taking the city of Los Angeles as an example, this paper makes the urban living environment suitability and the needs different levels of people. Optimization measures for different public facilities are made according to different demand conditions, but this method has the problem of regional grading. Literature [20] proposes a design method based on inclusiveness theory that integrates urban natural landscape and public facilities. This method first analyzes and expounds the concepts related to the city's transportation infrastructure, and analyzes the development of the city's current infrastructure. And the problems faced are summarized. Through the above analysis, the main idea of public facilities design of urban commercial landscape is put forward, and the strategy of urban landscape public facilities is discussed and studied. This method is relatively simple, but there are some problems that cannot make regional characteristics. The problem of integration with spatial characteristics. Literature [21] proposes a design method of urban infrastructure public facilities based on landscape principles, which first studies the concept of urban public facilities and the principle of goals. Discuss the excellent design of urban public facilities abroad, put forward suggestions for improvement based on design theory on the problems existing in urban public facilities, and point out the direction of future development. At the same time, the management and maintenance of urban public facilities are strengthened to achieve the purpose of beautifying the urban environment, but this method has the problem that the design process is relatively complicated.

2.3. 3D Urban Garden Landscape Generation. In order to coordinate all the urban garden landscape layout and make for better efficiency of garden landscape design, remote sensing sensors are used to generate a three-dimensional landscape of urban garden landscape.

Since the initial city image obtained by using remote sensing technology has periodic noise, a large number of redundancies, and mountain shadows, etc. In order to complete the accurate spatial positioning of the remote sensing image, the initial remote sensing image of the city should be preprocessed, and the image to be processed should be segmented and restructured. In the process of processing more noisy images, the image is smoothed first, and the derivation is obtained while controlling the noise, and then the spatial differential operator processing is completed.

The digital elevation model uses a set of ordered numerical sequences to define the ground elevation entity model. This model includes the digitized spatial distribution values of various geomorphological factors, fluctuations, fluctuation change rates, slope aspects, and slopes, which are linear and nonlinear combinations, which is also the fundamental premise for obtaining orthophoto pairs. Therefore, in this study, considering the efficiency and smoothness of formation, the Kriging interpolation method is used to make a digital elevation method. The specific process is as follows: use the remote sensing image positioning data set to describe the remote sensing image positioning distribution scatter diagram; according to the distribution scatter diagram, distribute the sample points. The number and the level of symmetry, select the conventional kriging difference or block kriging interpolation method, and implement the appropriate difference according to the sampling point spacing and the global spatial distribution of the sampling points; according to the range of the digital elevation model, define the sample point data set external rectangular shape, get the final expression form of the data elevation model; mark the digital elevation model generated by processing, and detect whether it contains distortion phenomenon at the same time.

Digital orthophotos have accurate plane orientation and strong two-dimensional intuition. In order to develop the above advantages to 3D, the artificial parallax assistance mechanism is substituted, and the digital orthophoto image with significant advantages and the garden auxiliary image based on the digital elevation model are combined to form a stereo orthophoto image pair, thereby generating a three-dimensional image with intuitive and high precision.

Urban garden landscape, according to the above process, the orthophoto pair is used to generate a three-dimensional urban garden landscape. The basic principle is to map the three-dimensional image and the three-dimensional garden landscape within the orthophoto pair. The orthophoto pair of the orthophoto image is generated, and a 3D image is generated at the same time, and it is used as a comparison image for 3D urban garden landscape design. The factors should be completely corresponding; optimize the texture of the three-dimensional landscape buildings and color the attached plants on the ground and make appropriate adjustments to the three-dimensional landscape formed according to the urban layout.

The optimal texture path selection in the generation of 3D garden landscape plays an important role in enhancing immediacy and landscape generation texture authenticity.

The problem of texture path selection in the process of 3D garden landscape generation is disguised as the optimal path under multi-convergence conditions. For planning problems, use the ant colony algorithm with the principle of positive feedback to complete the construction of the model.

Starting from the real problem, the spatial range of the texture path selection is clarified, the complete graph weighted adjacency moment expressing the optimal problem scale is given, and the ants are imitated to complete the feature point marking in each path of the complete graph with the optimal problem scale, and the individual ants are labeled. As an agent, each ant in the ant colony algorithm is set to have the following characteristics: Each time the complete path in the complete graph is traversed, each ant has residual feature pheromone on the path passed, and the path and feature information selected by the ants subsequently element related.

In order to prevent the heuristic information from being buried due to too many characteristic pheromones, after the ant traverses a complete cycle, the pheromone should be updated, then the path (i, j) in the period $t+n$ can be adjusted as follows:

$$\tau_{ij}(t+n) = (1-\rho)\cdot\tau_{ij}(t) + \Delta\tau_{ij}(t), \tag{1}$$

where

$$\Delta\tau_{ij}(t) = \sum_{k=1}^{m}\Delta\tau_{ij}^{k}(t). \tag{2}$$

Among them, p is the set pheromone volatility factor, and m is the number of ant colonies set according to the scale of the optimization problem. Generally, a higher value of m, a better accuracy of the best solution obtained.

In order to make the authenticity of the results of the ant colony algorithm, an appropriate pheromone update method should be set. When each ant traverses a known texture path, the pheromone concentration in each edge covered by the path should be updated according to the length of the texture path. The update process is

$$\Delta\tau_{ij}^{k} = \begin{cases} \dfrac{Q}{C^{K}}, & \text{path}\,(i,j)\,\text{is traversed}, \\ 0, & \text{other}. \end{cases} \tag{3}$$

Equation (3) is the quantitative calculation formula of the pheromone update value, C^K represents the sum of the texture path lengths created by k ants, and Q has a certain uncertainty and is usually set to 1.

Since urban garden design is a complex and systematic process, a small mistake can bring inestimable losses to the subsequent design work. Therefore, after acquiring 3D landscape data, designers are required to plan a detailed and effective project plan in the initial design stage. General methods such as critical path method. Gantt charts are quite restrictive, and it is difficult to intuitively define the dependency relationship and coupling iteration relationship of design operation activities. Therefore, based on the perspective of set theory, this paper combines the landscape planning and design process through a complex set of related design processes. In this process, there are different levels of data coupling between upstream and downstream activities. Depending on the degree of information dependence, the design activities will have modular characteristics, and each area of the garden will be constructed according to the modular combination mode to create a modern urban garden landscape that expresses different living habits and has a distinct subject.

The landscape design process is analyzed from two dimensions: one is the process dimension, that is, according to the information attachment between design activities, each design activity is regarded as a fixed input and transformed into an output individual, and the exchange of information between upstream and downstream design plans; the second is the language. The environment dimension defines the design scale and resources of each design activity. The design specification can obtain the design parameters, the design object, and the convergence conditions that the design needs to meet, which is the basic content of designing a garden landscape. Design resources represent the staff, design experience, and tools needed for the design process.

3. Information Fusion Model Construction

In pattern recognition and classification, artificial neural network has inherent advantages, and the comprehensive utilization of neural network and information fusion technology has become one of the important research directions of multisensor automatic target recognition system. In the following, from the viewpoint of information theory, the mechanism of fusion recognition and classification based on neural network is discussed. The input-output mapping of neural networks for information fusion and pattern recognition is equivalent to hypersurface partitioning the input space of multi-source data patterns. The hidden layer of the neural network realizes the segmentation of various hypersurfaces in the multisource pattern space, and the output layer classifies the hypersurfaces belonging to the same class. Due to the characteristics of neural network itself, it is very difficult to make a unified quantitative analysis of the technical mechanism of data fusion based on neural network, so this paper only gives some qualitative analysis. Therefore, by generating 3D landscape generation data and integrating modular data, the overall organizational structure of urban garden landscape can be presented intuitively and clearly, and the process of landscape construction can be fully evaluated.

The genetic algorithm makes the fitness function as an evolution goal, which can only evolve in the way of a fitness function becoming larger, and a good transformation could be made between the fitness function and the objective function. The network deviation during evolution is a nonzero positive number, and then it is assumed that the population size is N, the individuals in the population are f_i, $F(f_i)$ represents the individual fitness value, and the individual f_i selection probability P_i is calculated as the following formula:

$$P_i = \frac{F(f_i)}{\sum_{i=1}^{N} F(f_i)}. \quad (4)$$

Design process is as follows.

First, P_i (cumulative probability) is calculated as the following formula:

$$P_i = \sum_{i=1}^{N} p_i \, (i = 1, 2, \ldots, N). \quad (5)$$

There are two parameters in the crossover and mutation operator: the exchange probability P_c and the mutation probability P_d. P_c and P_d change in view of the solution adaptive function. The process is as follows:

$$P_c = \begin{cases} (f_{\max} - f')(f_{\max} - f_{\text{avg}}), & f' > f_{\text{avg}}, \\ 1, & f \leq f_{\text{avg}}, \end{cases}$$
$$P_d = \begin{cases} (f_{\max} - f)(f_{\max} - f_{\text{avg}}), & f > f_{\text{avg}}, \\ 1, & f \leq f_{\text{avg}}, \end{cases} \quad (6)$$

where $f_{\max}$ is the highest fitness, f_{avg} is the average fitness, f' is the fitness of the individual with higher fitness function within the cross-individual, and f is the mutant individual fitness.

The parent chromosomes are selected in view of P_c, and new chromosomes are generated by crossover, and the search scope is continuously expanded, and finally the global target search is realized. This process, using arithmetic crossover, it is guaranteed that the resulting offspring will be made. Arithmetic intersection is to perform the following linear combination of random two points x_1 and x_2 with D in view of the important characteristics of the convex search space.

$$\alpha x_1 + (1 - \alpha) x_2, \quad \alpha \in [0, 1]. \quad (7)$$

Based on formula (7), making x_1 and x_2 represent parent chromosomes calculated by crossover, the generated offspring is

$$\begin{cases} x_1' = \alpha x_1 + (1 - \alpha) x_2, \\ x_2' = \alpha x_2 + (1 - \alpha) x_1. \end{cases} \quad (8)$$

Chromosomes mutation order is as follows.

The mutation order of chromosome X_i locus x_i is to randomly select a number x in interval $[x_1, x_2]$ to replace x_i as the following formula:

$$\begin{cases} x_1 = x^{\min} - \left| \dfrac{x^{\min} \times P_d \times f}{f_{\max}} \right|, \\ x_2 = x^{\max} - \left| \dfrac{x^{\max} \times P_d \times f}{f_{\max}} \right|. \end{cases} \quad (9)$$

Among them, $x^{\max}$ and $x^{\min}$ are the upper and lower limits of the numerical number, and P_d is probability of variation. It should be consigned that variation individual's interval with high fitness is smaller, and the variation interval of individuals with low fitness is larger, which can ensure search performance of the genetic algorithm while reducing the damage to excellent individuals caused by mutation operations.

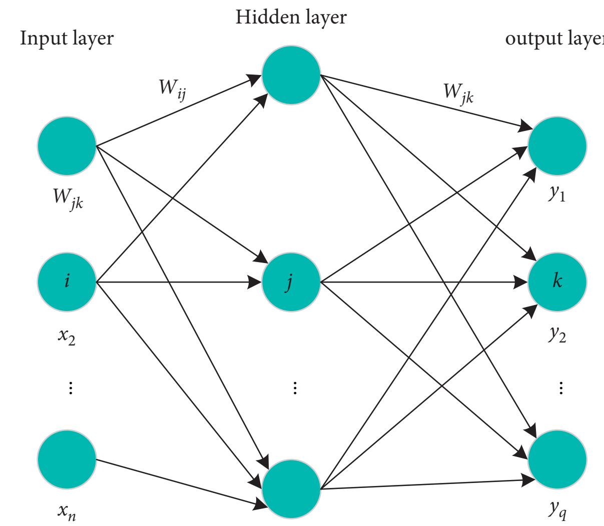

Figure 2: BP network architecture.

On this basis, a back propagation network (BP network) is trained to realize information fusion processing. The BP neural network is shown in Figure 2.

BP neural network calculation process is as follows:

Construct the BP neural network architecture and the input sample network architecture, including the number of node layers and the number of nodes in each layer. Initialize the weights and critical values in the interval [−1, 1] and specify the network learning rate in the interval. The forward calculation input is the network output of the output layer, and the input of the jth node of the hidden layer is

$$\text{net}_j = \sum_i W_{ji} o_i + \theta_j. \quad (10)$$

Among them, o_i is the node input of the input layer i, and W_{ji} is the connection weight between the hidden layer node j and the input layer node i.

The output analytical hidden layer node j formula is described as

$$a_j = \frac{1}{1 + \exp(\text{net}_j)}. \quad (11)$$

The input to the output layer node k is

$$y_k = \sum_i V_{kj} a_j. \quad (12)$$

Among them, V_{kj} is the connection weight between the output layer node k and a hidden layer node j.

The network deviation formula is defined as

$$E = \frac{1}{2} \sum_k (t_k - y_k)^2. \quad (13)$$

Among them, t_k is the expected output, y_k is the actual output, and k is the number of output layer nodes.

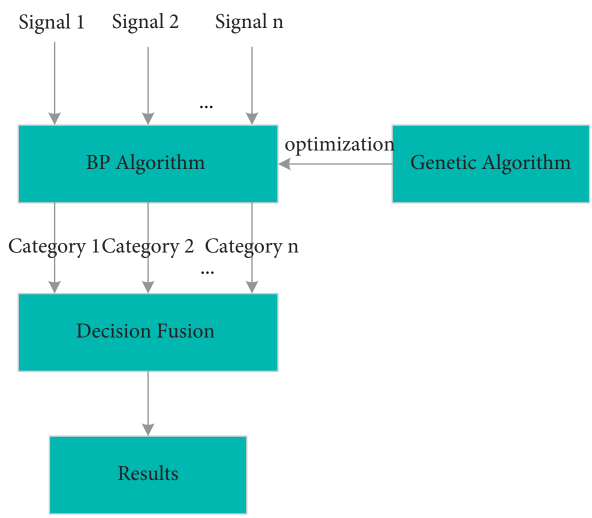

Figure 3: BP neural network architecture.

Table 1: Experimental environment.

CPU	i5-8500 CPU @ 3.00 GHz
GPU	GTX TITAN X
Graphics memory	12G
Operating system	Ubuntu 16.04 LTS
CUDA	10.0
Deep learning framework	TensorFlow

After the BP network is trained, the collected remote sensing sensor data and modularization can be processed for information fusion. The information fusion model based on the genetic neural network is shown in Figure 3.

4. Experiments and Results

In order to verify the above-mentioned urban garden landscape design process modular information fusion model. The actual application performance of the model is designed through OPNET.

The experimental environment is as follows: remote sensing sensors are randomly placed in the landscape garden, the maximum transmission distance of each node is 65m, and the original energy is 0.3 J.

The experiment uses model stability and energy consumption as indicators. In order to avoid singleness of experimental results, the literature [16] and literature [17] models are used as a comparison. The experimental data are obtained from the nonpublic data of a landscape design institute in China and contain 100 samples. In this paper, a method with 20 epochs (rounds) on the training data set is proposed. The training method is as follows: the initial vector of the model is set to 0.0001; the Adam optimizer is used; the batch size is set to 8 (the batch size is the size of the selected training samples and the limitation of the device GPU, and the best optimization and speed are selected according to the model). The software and hardware environment for this experiment is as shown in Table 1:

Table 2: Node software and hardware configuration parameters.

Node type	Hardware environment	Software environment
Master node	Dual-core 2.9Ghz, 8G RAM	Ubuntu 14.04
Slave Node1		Jdk 1.7.0
Slave Node2	Dual-core 2.4Ghz, 4G RAM	Hadoop-1.2.1
Slave Node3		

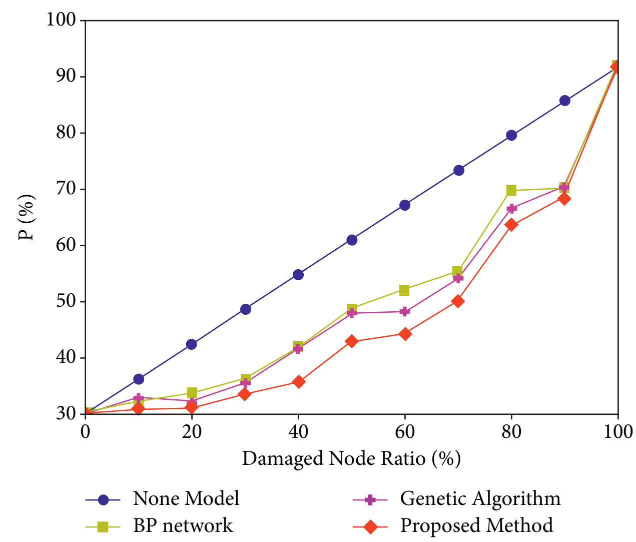

Figure 4: Probability of damaged nodes becoming cluster heads.

The hardware and software configurations of the four nodes (one master and three slaves) of the Big Data cluster in this paper are shown in Table 2 all service nodes communicate with each other over 2000M fiber. Hadoop version 1.2.1 and JDK version 1.7 are installed on all service nodes. The Ip addresses of the four nodes are 214.102.61.2, 214.102.61.3, 214.102.61.4, 214.102.61.5.

4.1. Stability Analysis. When the sensor cluster head is selected without any method, the probability of the damaged node becoming the cluster head increases linearly with the increase of the damaged node. Therefore, the probability of the damaged node becoming a cluster head is used as the verification index to verify the stability of the model in this paper, literature [16] and literature [17]. The results are shown in Figure 4.

In Figure 4, the vertical coordinate P indicates the precision of the evaluation index. The analysis of Figure 4 shows that when the ratio of damaged nodes is less than 30%, the three models have good security. When the ratio is higher than 40%, our model outperforms the two literature methods. And when the number of damaged nodes continues to increase, this model in this paper still maintains good security. At this time, when constructing the information fusion model, this paper fully considers the problem of model convergence and accurately displays the data required for garden landscape design, thereby improving the stability of the model.

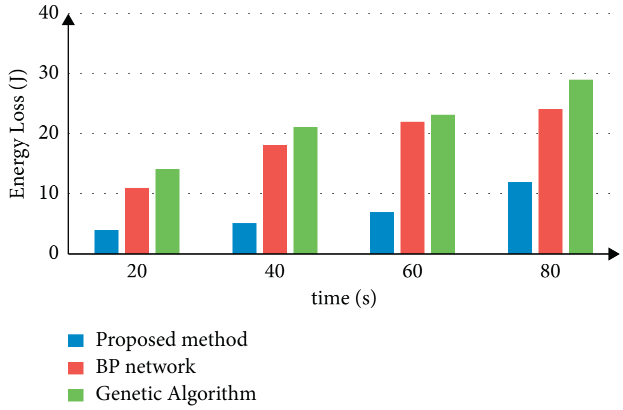

Figure 5: Comparison of energy consumption of three methods.

Table 3: Comparison of diversity of landscape public facilities.

Methods	Constituents/species	Richness of color (%)
Literature [16]	7	66
Literature [17]	8	73
Proposed method	10	88

4.2. Energy Consumption Analysis. In terms of information storage and processing, this paper uses real number coding to reduce node information storage overhead and communication overhead. Different types of data are represented by unified coding, which makes the information fusion node more efficient. In this experiment, the remote sensing sensor network in the landscape area consists of 110 nodes, and the nodes are randomly distributed in the range of 110 m × 110 m. The energy consumption comparison of information fusion of three different models is shown in Figure 5.

Analysis of Figure 5 shows that the energy consumption of the information fusion process of the models [16, 17] is higher than that of the model in this paper. This is because there are always two cluster heads in each cluster in the literature [16] and literature [17] that adopt data fusion, respectively, which increases the number of data transmissions and consumes more energy. By using the genetic algorithm, the model in this paper can not only enhance the accuracy of information fusion and computational storage but also effectively reduce the number of redundant data transmissions, reduce energy consumption, and effectively improve the efficiency of modular information fusion in the landscape design process.

In order to verify the validity of the urban commercial landscape public facilities design model based on big data, it is necessary to conduct another experiment to build an urban commercial landscape public facilities design platform in the Matlab environment. The experimental data come from a certain area of a city. Table 3 represents the diversity comparison of commercial landscape public facilities between the method in this paper and the method proposed in literature [16] and literature [17].

Figures 6 and 7 show the comparison of plant coverage and carbon dioxide absorption between the method

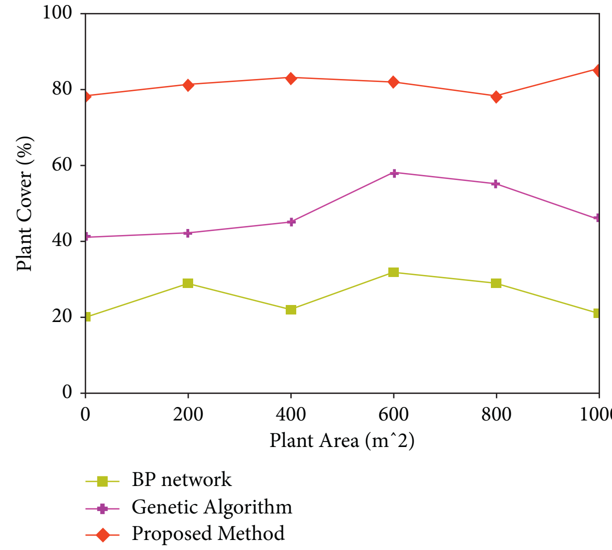

Figure 6: Comparison of plant coverage.

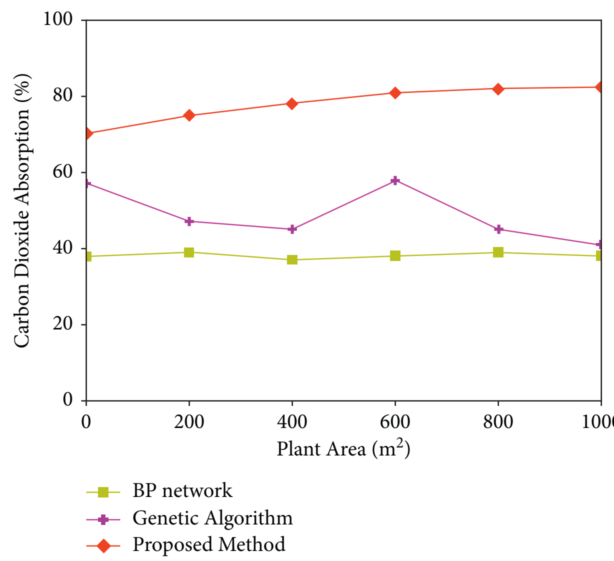

Figure 7: Comparison of carbon dioxide absorption.

proposed in this paper and the methods proposed in [16, 17]. From the comparison of the plant coverage ratio in Figure 6 and the analysis of Figure 7, it can be seen that although the vegetation coverage ratio of the method proposed in the literature [17] is not low, it can be seen from Figure 6 that the absorption of carbon dioxide is relatively low. In reference [16], although the plant coverage rate is not low, the planted vegetation has a poor ability to absorb carbon dioxide. In this paper, the use of three-dimensional simulation space analysis technology to design commercial landscape public facilities not only has a high vegetation coverage rate but also absorbs carbon dioxide and its ability is also good.

5. Conclusion

The current method cannot effectively improve people's aesthetic concept and cannot create the characteristic commercial landscape public facility design belonging to the city. Therefore, it is necessary to pay more attention to the design and use of commercial landscape public facilities to guide people's aesthetic awareness of the environment. To this end, a design model of commercial landscape public facilities based on big data is proposed. Experiments show that, through the design of commercial landscape public facilities, the concept of low-carbon environmental protection is deeply rooted in the hearts of the people, and the harmonious development of human beings and the natural environment is constructed.

Modular design in urban garden landscape is an important factor to realize diversified landscape layout. This paper designs a new information fusion model by exploring modular information fusion. Simulation proves that the model has strong temperature and low energy loss and can complete the task of precise modular information fusion, enhancing the efficiency and diversity of urban garden landscape planning. In our future research program, we plan to use recurrent neural networks and knowledge graphs for modular information fusion evaluation studies of urban landscape design processes.

Data Availability

The data set used in this paper is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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