Retraction

Retracted: Green City Landscape Design Based on GIS System

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Liang and H. Wang, "Green City Landscape Design Based on GIS System," *Security and Communication Networks*, vol. 2022, Article ID 5155677, 10 pages, 2022.

WILEY | Hindawi

Research Article

Green City Landscape Design Based on GIS System

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In order to solve the problem of green urban garden landscape design, a green urban garden landscape design method based on GIS system is proposed. This method introduces component GIS and compares three AO-based GIS secondary development modes. Based on the developed solution, comprehensively considering the index evaluation of urban landscaping and its influencing factors, the functional structure of the GIS-based landscaping management information system is designed, and the system requirements are analyzed in detail. It solves the problem that the cost of traditional green urban garden landscape design is too high, and the experiment proves that improving the landscape environment of urban public space has practical value for the research of urban landscape system. Combined with practical application, it is found that the intervention of rainwater landscape can effectively improve the aesthetics and artistry of urban rainwater public facilities. At the same time, the development of GIS and its related technologies (such as database technology and network technology) has also promoted the construction and development of urban landscaping system, which has a great effect on the beautification of the environment, which verifies the validity of the experiment.

1. Introduction

An important index to measure the level of urban greening is the urban green space rate (public green space, residential green space, unit affiliated green space, protective green space, production green space, and scenic forest land) and the green time coefficient. An important indicator for evaluating the level of urban greening is the urban green space rate. In the comprehensive aerial remote sensing survey, through the combination of remote sensing image interpretation and field measurement, the relationship between remote sensing image characteristics and plant height and DBH is found out, and the "three-dimensional greening index" or "green quantity" index is proposed to replace the original "greening coverage" index to evaluate the urban greening level [1]. The study points out that the grassland, shrub, and tree in the same area have the same green coverage, but have different green amount. Under the condition of the same area, the order of its ecological functions (oxygen production and CO_2 absorption) is:

tree > shrub > ground cover or lawn, and the ecological function of trees is ten times that of lawn or ground cover. Tall trees are the main elements for the selection of scenery in the residential area. To improve the level of urban greening, we should not only improve the greening coverage, but also improve the "three-dimensional greening index," that is, to improve the quality of greening. Geographic information system (GIS) has been widely used in agriculture, forestry, and other industries in various countries. In China's urban landscaping management, some cities have developed urban landscaping management information systems in line with their actual conditions. Using geographic information system (GIS), we can timely and accurately understand the current situation and changes of urban green space resources and establish a landscaping system with the help of GIS and its spatial analysis function, which can improve the efficiency of urban landscaping management. Therefore, combined with the actual situation, the development of a set of local urban landscaping management information system with the help of ArcGIS Engine
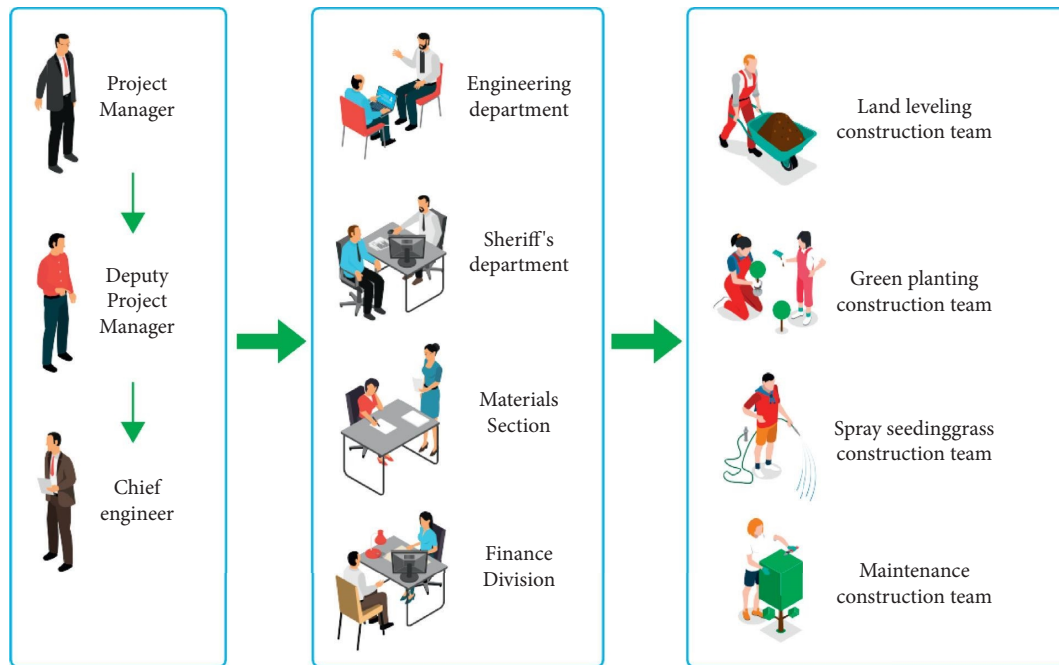
Figure 1: Block diagram of construction organization.

can not only improve the greening management efficiency and realize scientific management, but also provide data statistics and other functions for the landscaping department, so as to improve the work efficiency and data accuracy, which is of great significance to improve the management of urban ecological construction [2]. As shown in Figure 1, ArcObject component set is a series of COM component set developed by C++ and based on Microsoft COM technology. It is the development platform for the applications like ArcMap, ArcCatalog, and ArcScene in the ArcGIS family.

2. Literature Review

Gu and Wei, in the middle of the last century, began the theoretical research on the application of information management to specific work [3]. Americans first invented computer-integrated manufacturing system in the early stage, and then, further evolved into management information system, which is widely used in all walks of life. Wang believes that in the following decades, information technology has developed greatly, and in the 1990s, it has made a qualitative leap [4]. Shan et al. found that the definition of the so-called enterprise information management is to adopt digital processing for all steps in the operation of the enterprise and use the current computer information technology for integrated processing, which is conducive to improving the work efficiency of the enterprise, the development of the global economy, and the core competitiveness of the enterprise [5]. Hu and Gong found that since the twenty-first century, most of the European and American countries led by the United States and Britain have realized enterprise information management, which can increase the competitive strength of enterprises [6]. Deng et al. believe that China has experienced more than 30 years of reform,

opening up and modernization, and has made great progress in information management [7]. Not only are enterprises the first to accept information management, but most relevant parts of the government also adopt information management, which is conducive to improving the work efficiency of the government. Although China's information management is not long, it has made great achievements in the past. Nevertheless, Xu found that compared with most of the European and American countries led by the United States and Britain, China's level of government information management is still relatively low [8]. At the same time, Gao et al. found that the economic development of various parts of China is different, which leads to the unbalanced development of government and enterprise informatization. The main performance is that emerging high-efficiency enterprises, export-oriented enterprises with the ability to explore the international market and large- and medium-sized state-owned enterprises are developing rapidly, while small- and medium-sized enterprises and some old enterprises without competitive strength and poor efficiency are developing very slowly [9]. In addition, He and Zhu found that enterprises are more and more aware of the importance of informatization. They clearly know that if they want to survive and develop well, they must move towards informatization. Only in this way can they improve the competitive strength of enterprises [10]. Yonghui et al. believe that the landscaping information management system integrates modern management theory, database technology, network communication technology, and computer technology to maximize the development and sharing of landscaping information management resources [11]. Huang et al. said that at this stage, China's landscaping information management has not reached a high degree of informatization [12]. The following are examples:

(1) The overall level is not high. Compared with other industries, China's overall level of information management in the construction of landscaping is still not high, there is an imbalance in development among regions, and the investment is not high, there is no popularization, and there is a lack of corresponding standards.

(2) Management and informatization are not fully integrated, and there is a certain disconnection. When using computers to deal with work and business, it is impossible to deal with it completely according to the actual work process. There is no good cooperation and a certain disconnection. It is difficult to correctly reflect the management and service situation. At the same time, the landscaping information management system with the characteristics of informatization still has many imperfections. First, a single system function has no way to meet the current needs of landscaping information management. Second, the landscaping information management system used in other provinces and cities is lack of universality, and there is no way to use it in every region. In addition, some information of the system cannot be shared. However, at present, the landscaping information management has begun to move towards networking, integration, and intelligence, which is conducive to improve the information level of landscaping. In the research of landscaping information management system, it has achieved certain results. But there are still many problems. Therefore, we study the design of landscaping information management system, grasp the dynamics of advanced management system at any time, absorb useful experience, and apply it in landscaping information management system in time.

3. Method

3.1. ArcObject Component Set. ArcObject component set is a series of COM component sets developed by C + + and built based on Microsoft COM technology [13]. It is the development platform of ArcMap, ArcCatalog, and ArcScene in ArcGIS family. It has an independent platform, supports obese- and thin-skinned users, and supports GIS desktop applications. Developers can design powerful and flexible applications based on ArcObject devices to meet a wide range of user needs.

In ArcGIS8.3, ArcObject is not an independent application product, but a software development package bundled in ArcGIS desktop purchased by users. In ArcGIS9.0, ESRI launched ArcGIS Engine, which enables ArcObject to be published and used as a separate product [14], as shown in Table 1.

3.2. Comparison of Secondary Development Modes Based on AO. There are many secondary development modes based

on AO, and various development modes have different characteristics, as shown in Table 2.

UML (unified modeling language) is an industrial graphics standard for object-oriented analysis and design. ArcObject's object model diagram uses UML notation.

Abstract class: cannot be used to create objects. But a description of subclasses. For example, "line" can be an abstract class of "main line" and "secondary line" [15].

Class that can be created: refers to the object that can be directly created in the development environment with object definition syntax. For example, it can be written as dim as new < Object > and CreateObject < Object > in VB.

Instantiable class: new objects cannot be created directly. However, objects of this kind can be created as properties of other classes or through the use of other classes.

In these three categories, there are several possible types of class relationship.

Associations: indicates that there is some semantic connection between two classes. Diversity is defined at both ends. For example, one field can have multiple owners, and one owner can also own multiple fields, as shown in Figure 2.

Type inheritance: defines a special class, which shares attributes and methods with its parent class and has its own additional attributes and methods [16]. For example, a primary line and a secondary line (both classes can be created) are the types of a line (abstract class), as shown in Figure 3.

Instance: describes the object of a class. One of its methods can be used to create objects of other classes. For example, an "electrode" object may have a method to create a "transformer" object, as shown in Figure 4.

Aggregation: it is an asymmetric connection, in which objects from one class are considered as a whole and objects from another class are considered as local [17]. If there are three transformers in a "transformer" bank, "transformers" and "transformer bank" are related, but after the "transformer bank" is removed, "transformers" may still exist.

Composition: a stronger form of aggregation in which objects from the overall class control the lifetime of objects from some classes. If an "electrode" object contains one or more "crossbar" objects, in this design, if the "electrode" is removed, the "crossbar" can no longer be used. The "electrode" object controls the life of the "crossbar" object, as shown in Figures 5 and 6 [18].

For the tedious GIS development work, the ideal solution is the practicability of a component-based development framework, which allows solution providers or internal developers to quickly build industry-specific GIS application software. The GIS development base should provide the necessary spatial analysis work that software applications need to complete and allow software developers to focus on the specific design needs of the software. ArcGIS Engine of ESRI company is such a GIS framework. It is created in response to the request of ESRI users. It can classify rich ArcGIS technologies by products and embed its spatial analysis function into new or existing application software [19].

ArcGIS is a group of integrated family GIS software products, which can be used to publish perfect and upgradeable GIS systems in single projects, working groups,

TABLE 1: ArcGIS Engine components.

Developer components
Map presentation
Map analysis
Data access
Base services

and enterprise projects. It is based on a common library of shareable GIS component ArcObject [20]. ArcGIS includes the following main components, as shown in Figure 7.

System management is the command and control center of the whole system platform. System management is the basis for the operation of the accounting information system. It provides public account sets, annual accounts, and other related basic data for other subsystems. The operators of each subsystem also need to set and assign functional rights in the system management. Application objects are divided into system managers and application managers. The functional structure of system management is shown in Figure 8.

Greening management is divided into query of greening object information, input of new greening information, and browsing of specific information of greening object. Among them, the query of greening object information is divided into query according to greening type information, query according to the location of greening area, query of greening object creation time cycle, and query of greening object existing maintenance status [21], as shown in Figure 9.

3.3. Measure the Accessibility Index of the Whole Network. The average accessibility index represents the average value of the accessibility of each node in the network, which is usually used to evaluate the overall accessibility level of the traffic network, as shown in formula (1).

$$\overline{A} = \frac{1}{n} \sum_{i=1}^{n} Ai. \tag{1}$$

Network connectivity reflects the average number of lines connected by each node, which is the ratio of the number of lines in the network to the number of nodes in the network, as shown in formula (2).

$$\beta = \frac{\omega}{\nu}. \tag{2}$$

Network stretch is mainly reflected by network diameter and network stretch index, as shown in formulas (3) and (4).

$$D = \mathrm{MAX}\{S_{ij}\}, \tag{3}$$

$$\eta = \sum_i \sum_j S_{ij}. \tag{4}$$

Yang Tao and others defined the accessibility of transportation network as shown in formula (5). M is the network.

$$\overline{S} = \sum_i^n \sum_j^n L_{ij} \times M_{ij} \sum_i^n \sum_j^n M_{ij}. \tag{5}$$

Spatial barrier model is based on graph theory to analyze the reachability of nodes in the network. The model defines reachability as the difficulty of overcoming barriers in space. The model is shown in formula (6).

$$Ai = \sum_j L_{ij}. \tag{6}$$

The model is simple in form and takes the spatial barrier between two nodes as a numerical index to evaluate accessibility. The calculation is convenient and the results are easy to explain, the location information of the node can be well reflected. The model is widely used in traffic network research. The disadvantage is that all nodes are treated equally and lack of consideration of accessibility factors such as land use, so it cannot accurately reflect the actual accessibility of nodes [22].

The cumulative opportunity model focuses on the difficulty of nodes approaching opportunities. Accessibility refers to the number of opportunities that can be accessed from a node using a specific mode of transportation within a certain threshold. Through a given threshold, the number of all opportunities (shopping, medical treatment, school, etc.,) exposed within the threshold range is defined as the accessibility of a specific node [23]. The more the opportunities, the better the accessibility. Cumulative opportunity model is usually used to evaluate the accessibility of service facilities, as shown in formula (7).

$$Ai = \sum_j O_{jt}. \tag{7}$$

The equilibrium coefficient model is the most general spatial interaction model. Proposed the calculation method of reachability by using the direct maximum law of statistical method and gave four representative models: production constraint model, attraction constraint model, double constraint model, and unconstrained model. Among them, the most commonly used in accessibility is the double constraint model, and the formula is shown in formula (8).

$$T_{ij} = A_i B_j O_i D_j F(d_{ij}), \tag{8}$$

where, T_{ij} is the travel volume from traffic area i to j, O_i and D_j are the number of activities in traffic areas i and j, $F(d_{ij})$ is the distance attenuation function, A_i and B_j are the equilibrium coefficients, and their forms are shown in formulas (9) and (10).

$$Ai = \left(\sum_{j=1}^{n} B_j D_j F(d_{ij}) \right)^{-1}, \tag{9}$$

$$Bj = \left(\sum_{i=1}^{n} A_i O_i F(d_{ij}) \right)^{-1}. \tag{10}$$

TABLE 2: Comparison of AO secondary development modes.

| Comparison items	Customize on ArcMap	VBA development	Using VB and other development tools
Degree of difficulty	Easily	Secondary	More difficult
Code workload	Small	Secondary	Large
Flexibility	Small	Secondary	Large
Program dependency	It is inseparable from application software	It is inseparable from application software	Independent program
Code existence form	Stored in MXD	Save text in MXD	Standalone EXE file
Licensing mode	Need	Need	Need
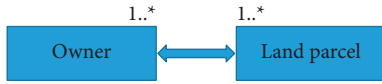
FIGURE 2: Associations.
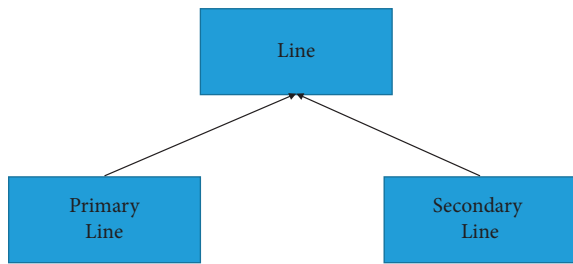
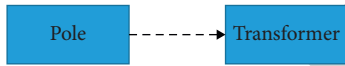

FIGURE 3: Type inheritance.

FIGURE 4: Instantiation.

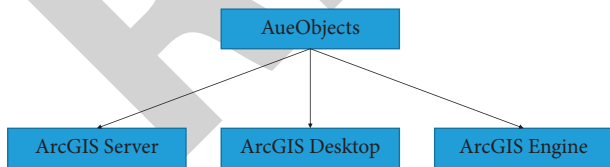
FIGURE 5: Aggregation.

FIGURE 6: Composition.

FIGURE 7: ArcObject is the basic component technology of ArcGIS products.

Potential energy model, also known as potential model and gravity model, comes from Newton's law of universal gravitation. Hansen proposed it in 1959. It mainly uses potential index to evaluate accessibility. The general expression of the model is shown in formula (11).

$$Ai = \sum_j S_j F(d_{ij}). \tag{11}$$

Ai indicates the accessibility from zone i to all opportunity points; S_j represents the attraction of opportunity point j; $F(d_{ij})$ represents the distance attenuation function, which is generally expressed by negative power function, as shown in formula (12).

$$Ai = \sum_j \frac{S_j}{d_{ij}^{\beta}}. \tag{12}$$

The potential energy model in formula (12) only considers the attraction point, but does not consider the demand point (the competition between demand points for services). By introducing the supply-demand ratio index, the different attraction points are treated in a hierarchical manner, considering the interaction between them. The improved model is shown in formula (13).

$$Ai = \sum_{j=1}^{n} \frac{S_j d_{ij}^{-\beta}}{V_j}, \tag{13}$$

where, A_i is gravitational accessibility, n is the total number of attraction points, S_j is the attraction of point j, and Vj is the competition intensity of service demand, as shown in formula (14).

$$Vj = \sum_{k=1}^{n} D_k d_{kj}^{-\beta}. \tag{14}$$

Jin Fengjun (2004) puts forward the concept of accessibility coefficient, which is defined as the total cost distance D of each node; compare the average value of the total cost distance of all nodes in the system, as shown in formula (15).

$$A_{dj} = \frac{D_i}{(\sum D_i/n)}. \tag{15}$$

Later, we uniformly expressed the accessibility coefficient, as shown in formula (16).

$$R_A = \frac{A_i}{B}. \tag{16}$$

The accessibility coefficient indicates the relative accessibility level of each node in the network. Ease of access is inversely proportional to the number of access coefficients, with the average network having the lowest coefficient.
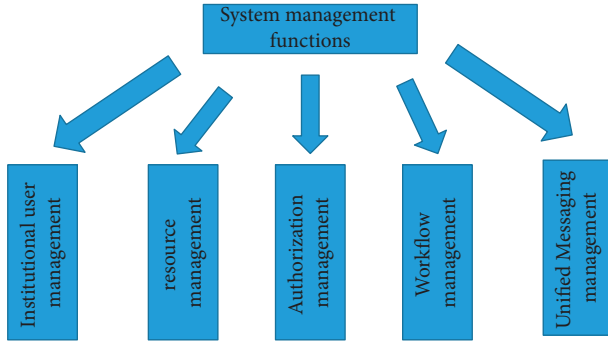
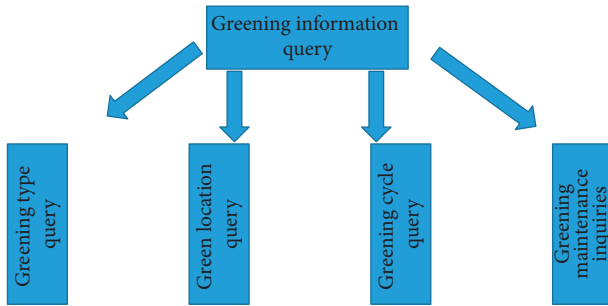Figure 8: System management function structure.

Figure 9: Greening management information diagram.

Relative accessibility can better reflect the change trend of node accessibility and the position of nodes in the network. Relative accessibility can be expressed as shown in formula (17).

$$RC_i = \left(\frac{Ai - A\min}{A\max - A\min} \right), \qquad (17)$$

where, RC_i is the relative accessibility value of node i, and the smaller the value, the easier it is for the node to contact with the other nodes, Ai is the accessibility value of node i, Amax is the maximum value of node accessibility in the network and the minimum value of node accessibility in Amin network. Accessibility coefficient and relative accessibility are usually used to standardize the calculated accessibility value, so as to eliminate the influence of dimension on accessibility evaluation.

Accessibility coefficient and relative accessibility index are mainly used to indicate the position of nodes in the whole traffic network.

Spatial accessibility measurement is carried out between the starting point and the target point. Before the measurement, the target point data should be obtained. The target point data is usually obtained by land use status map or remote sensing land use interpretation and classification. Data acquisition refers to the use of a device that automatically collects data from various data sources into one device. The collected data are various physical quantities that have been converted into electrical signals, such as temperature, water level, wind speed, pressure, etc., which can be analog or digital. The acquisition is generally a sampling method, that is, the same point data is repeatedly collected at a certain time interval (called a sampling period). Most of the collected data are instantaneous values, but also a characteristic value within a certain period of time. Accurate data measurement is the foundation of data collection, such as Baidu map point of interest (POIs) data [24]. When using the spatial interaction model to measure accessibility, we should also consider the attraction of the target point. The selection of attraction index should be defined according to the actual problems and the characteristics of supply and demand points. The common attraction points in accessibility evaluation are social service facilities, transportation stations, urban nodes, etc., according to the investigation of urban residents' daily travel behavior, residents' visit questionnaire, etc., The attraction reference indexes of common attraction points are shown in Tables 3 and 4.

After system performance inspection, when there are more than 100 users on the platform at the same time, the response time of most of the platform operations is less than 2.5 seconds, and the resource utilization rate in the platform is less than 60%. In addition, the throughput of the platform was tested, and as the number of users of the platform increased, so did the response time of the platform. All businesses of refined urban management focus on population, housing, events, and other information, so population, housing, and events are the basic information of all work. Business development is based on these basic information, and these businesses themselves are the focus of urban integrated service management [25].

Generally speaking, the organizational structure of government departments with different functions will be adjusted with the change of management system and the revolution of management mode, but their functions (business areas) in social life are relatively stable [26]. Due to such characteristics, when building data resources, from the perspective of stability and independence, the concept of a data environment called the "subject domain model" is introduced from the standpoint of stability and independence.

The subject domain model is different from the business system domain model. They are relatively stable and oriented to the business domain. The business system domain model is a data environment for business management. With the change of management mode and process system, the definition of data resources may be adjusted, and this adjustment may occur frequently.

According to the above data analysis, the data classification and relationship of the subject domain model are shown in Figure 10.

4. Results and Analysis

The rainwater in the city will eventually enter the rainwater collection "surface" of the city, that is, the final storage site of rainwater, after the retention and absorption of the source link, the dredging, purification and peak control of the process link [27]. For the design of urban rainwater collection surface, the technical measures of urban rainwater landscape include ecological wetland, multi-functional

Table 3: Common attraction point data and attraction index a.

Attraction type	Attractiveness index
School	Teachers, school area, school hardware quality, etc.,
Hospital	Strength of doctors, number of hospital beds, etc.,
Market	Mall scale, number of employees, average annual profit, etc.,
Bus station	Bus station scale, average daily passenger flow of bus station, etc.,

Table 4: Common attraction point data and attraction index b.

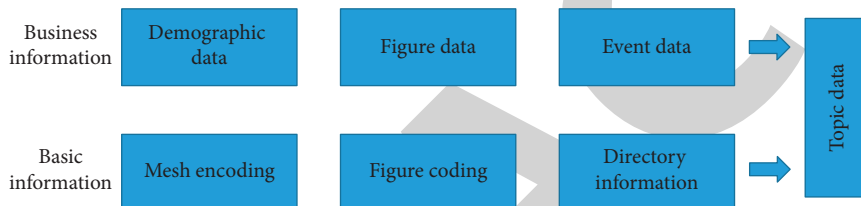| Attraction type	Attractiveness index
Park	Park area, daily average number of tourists, etc.,
Enterprise	Enterprise employees, etc.,
Train station	Station scale, daily average passenger flow of railway station, etc.,
Town node	GDP, number of registered residences, etc.,

Figure 10: Classification diagram of subject domain model.

regulation and storage tank, landscape rainwater pond, etc., As the terminal hub of urban rainwater collection, landscape design is more important. The rainwater collection surface in the city can be reasonably set according to the distribution of "rainwater community" and the rainwater runoff in the community. As the end link of rainwater runoff, the storage function of rainwater and the surrounding landscape effect have become the key of ecological landscape design.

The collection surface control of urban rainwater mainly includes the design of rainwater wetland and rainwater lake in rainwater landscape measures [28]. When the rainwater passes through the process link of rainwater dredging, it is preliminarily purified, while the storage tank in the terminal link can purify the rainwater twice. After precipitation and purification, the rainwater in the terminal link can not only be directly used for landscape greening around the urban rainwater collection surface, but also be purified by purification equipment for domestic and sanitary water in the city.

The concept of "rainwater community" is of a great significance not only in the collection and utilization of urban rainwater, but also in the design of urban public landscape. Firstly, through the application of GIS system, we can have a more detailed and in-depth understanding of the geographical and geomorphic characteristics of the city. According to the geographical characteristics of the city, scientifically divide the "rainwater community" to make the urban rainwater landscape planning and design more targeted. Secondly, the concept of "rainwater community" puts

forward a new theoretical method for urban rainwater landscape design and provides a scientific basis for the construction of sponge city in China. In addition, in terms of building an ecological city, through the exploration of "rainwater community," it can effectively control urban rain and flood disasters, reduce the waste of urban rainwater resources, improve the landscape environment of urban public space, and have practical value for the research of urban landscape system. Finally, the intervention of rainwater landscape can effectively improve the aesthetics and artistry of urban rainwater public facilities.

The overall terrain of the city is high in the southeast and low in the northwest, with an average altitude of about 410m. It faces the Weihe River and the Loess Plateau in the north and the Qinling Mountains in the south. Its unique geographical location has created a semi-humid continental monsoon climate with rich precipitation. The city is one of the earliest cities in human history. Its climate belongs to the semi-humid monsoon climate area in the warm temperate zone. It has moderate rainfall and four distinct seasons. The average frost-free period is 219–233 days per year. The temperature in January is the lowest, with an average of -0.5°C–1.3°C; the temperature is the highest in August, with an average of 26.4°C–26.9°C; the annual average temperature is 13.3°C. The average annual precipitation is 507.7 mm–719.8 mm. The annual average humidity is 69.6%. The average annual snowfall day is 13.8 days. Figure 11 shows quarterly average precipitation and percent annual precipitation.
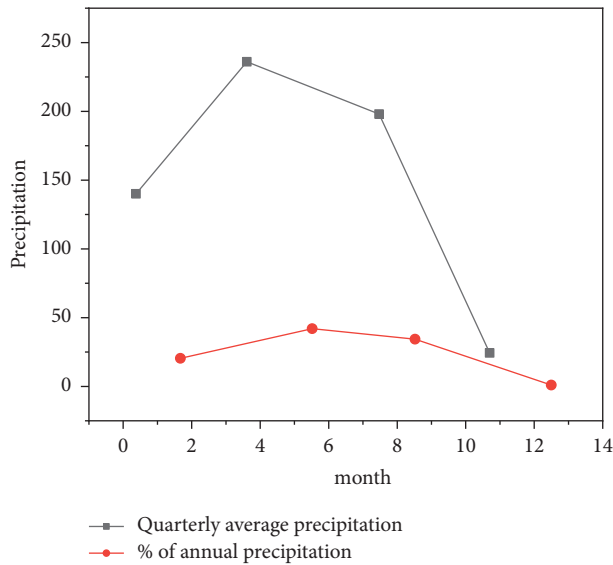
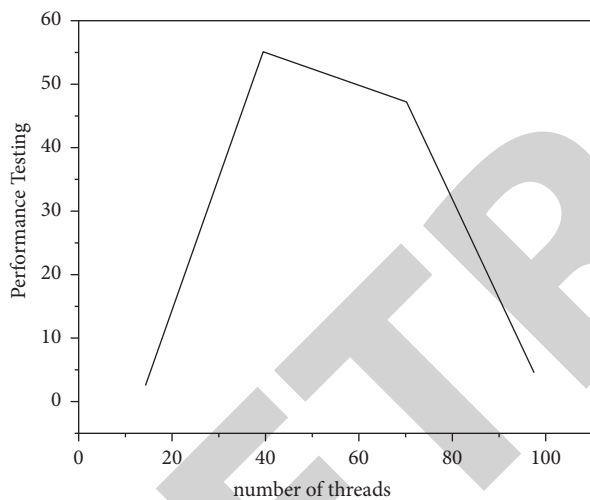Figure 11: Distribution of precipitation in the city.

Figure 12: Performance test results of the system.

The urban construction has brought serious damage to the urban green space system. The massive application of impervious pavement materials has cut off the natural circulation system of urban rainwater resources and brought a series of urban rainwater problems to the city. Many economically developed countries and regions have made a lot of efforts and contributions in the design and research of rainwater landscape, and achieved certain landscape and ecological benefits. But this is far from enough. Where cities want to retain rainwater is a key issue. In the sense of ecology, the infrastructure construction of urban rainwater management and control should be integrated with the urban landscape design. The management and control of rainwater through the way of ecological landscape can not only make effective use of rainwater resources, but also play an important role in the optimization of urban environmental landscape. Scientific and

reasonable restoration of rainwater infiltration should be based on the fine analysis and cognition of urban geographic information.

With the analysis of ArcGIS software, we can find out the main catchment routes and catchment low points with different height differences in a city. Based on the elevation data analysis of a city's road system, we can also simulate the geographical characteristics of a city's road system, analyze its hydrological characteristics and draw a conclusion. According to the analysis of road elevation data, combined with the rainwater collection area in the surrounding terrain, a triangular core area in the figure is formed. This area is the main catchment area in the road system of a city, that is, the "rainwater community" analyzed in the article. By linear representation of the data, we can clearly see the distribution of rainwater collection lines of the main road system of a city, that is, the core area of linear rainwater landscape distribution.

The performance and function test process of the platform are different. During testing, the instrument measures performance and issues data recovery requests. After doing data multiple times, you can get multiple sets of performance files, allowing you to conduct scientific analysis of the platform. Because the test performance is related to many resources in the platform, it is necessary to monitor and analyze the platform through some tools, so as to meet the needs of optimizing the platform. When testing, we should also analyze the application in detail, which can help analyze the difficult problems in the code and deal with the performance defects in the platform. At the end of the performance, write a report on the test performance. Use the analysis report to write the performance status of the platform, and use it to explain and briefly explain the performance test results.

After the pressure test, the performance test results of the system are shown in Figure 12.

Concurrent testing and stress testing are two important tests of system performance testing. The number of threads mainly used ranges from 10 to 100, and the number of request cycles is 50. After testing, it is found that the performance of the system can meet the requirements of the initial design.

After testing the system performance, when the concurrent users in the platform were more than 100, the operation response time of most of the platforms was less than 2.5 seconds, and the utilization ratio of resources in the platform was less than 60%. In addition, the throughput of the platform was also tested. When the number of users in the platform increases, the response time of the platform will also increase. The performance test scenarios and test results are shown in Table 5.

Through the above tests, the management system can basically meet the basic functions and main requirements expected by the design, and the stability of the system operation has been fully guaranteed. Each function can be realized normally, and the relevant data can reach the hands of the manager in real time. Moreover, the system is easy to operate and has little difficulty in getting started. The requirements expected in advance are basically completed, and the development of the system will be completed.

TABLE 5: Performance test scenarios and test results.

Input/action	Failed transaction	Through transaction	CPU utilization	Maximum response time (%)	Average response time (s)
Concurrent operation of 10 users	0	1680	Normal	9	1.8
Concurrent operation of 50 users	1	5954	Normal	18	4.9

5. Conclusion

It is proved that the three secondary development modes of GIS based on AO are compared, and the proposed development solution can effectively solve the problem of landscape design of green city, meet people's demand for green city, make up for the shortcomings of traditional urban landscape system, and improve people's living standards. Urban landscaping system is an important part of urban ecosystem and the main body of natural components in urban ecosystem. It has ecological benefits, social benefits, and economic benefits and has a great impact on urban living environment. Therefore, green space construction has become one of the important contents of urban construction in China. At the same time, the development of GIS and its related technologies (such as database technology and network technology) also promotes the construction and development of urban landscaping system.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

References

[1] P. Shan and W. Sun, "Research on 3d urban landscape design and evaluation based on geographic information system," *Environmental Earth Sciences*, vol. 80, no. 17, pp. 597–615, 2021.

[2] T. Jiang and Z. Li, "Study on sustainable development of environmental landscape planning based on ecological civilization theory," *Arabian Journal of Geosciences*, vol. 14, no. 22, pp. 2314–2412, 2021.

[3] H. Gu and Y. Wei, "Environmental monitoring and landscape design of green city based on remote sensing image and improved neural network," *Environmental Technology & Innovation*, vol. 23, no. 1–2, Article ID 101718, 2021.

[4] R. Wang, "Retraction note: landscape design of rainwater reuse based on ecological natural environment: hangzhou as an example," *Arabian Journal of Geosciences*, vol. 14, no. 24, pp. 2761–2811, 2021.

[5] J. Shan, Z. Huang, S. Chen, Y. Li, and W. Ji, "Green space planning and landscape sustainable design in smart cities considering public green space demands of different formats," *Complexity*, vol. 2021, no. 1, Article ID 5086636, 10 pages, 2021.

[6] T. Hu and W. Gong, "Urban landscape information atlas and model system based on remote sensing images," *Mobile Information Systems*, vol. 2021, no. 10, Article ID 9613102, 7 pages, 2021.

[7] Y. Deng, L. Xie, C. Xing, and L. Cai, "Digital city landscape planning and design based on spatial information technology," *Neural Computing & Applications*, vol. 34, no. 12, pp. 9429–9440, 2021.

[8] Y. Xu, "Application of green building design based on the internet of things in the landscape planning of characteristic towns," *Advances in Civil Engineering*, vol. 2021, no. 3, 11 pages, Article ID 6317073, 2021.

[9] Y. Gao, Y. Zhang, and H. Alsulaiman, "Spatial structure system of land use along urban rail transit based on gis spatial clustering," *European Journal of Remote Sensing*, vol. 54, no. sup2, pp. 438–445, 2020.

[10] H. He and W. Zhu, "Efficient, Customizable and Edge-Based Webgis System," *Human-driven Edge Computing (HEC)*, IEEE Access, vol. 8, no. 99, , p. 1, 2020.

[11] L. Yonghui, B. Lipeng, and C. Bo, "Analysis of enterprise site selection and r&d innovation policy based on bp neural network and gis system," *Journal of Intelligent and Fuzzy Systems*, vol. 39, no. 4, pp. 5609–5621, 2020.

[12] W. Huang, J. Ren, T. Yang, and Y. Huang, "Retraction Note: research on urban modern architectural art based on artificial intelligence and GIS image recognition system," *Arabian Journal of Geosciences*, vol. 14, no. 24, pp. 2716–2813, 2021.

[13] X. Ding and F. Li, "Retracted article: GIS-based marine atmospheric environment and fishery company governance structure," *Arabian Journal of Geosciences*, vol. 14, no. 15, pp. 1510–1515, 2021.

[14] J. Slavík, M. Dolejš, and K. Rybová, "Mixed-method approach incorporating geographic information system (gis) tools for optimizing collection costs and convenience of the biowaste separate collection," *Waste Management*, vol. 134, no. 9, pp. 177–186, 2021.

[15] J. Wells, R. Grant, J. Chang, and R. Kayyali, "Evaluating the usability and acceptability of a geographical information system (gis) prototype to visualise socio-economic and public health data," *BMC Public Health*, vol. 21, no. 1, pp. 2151–2220, 2021.

[16] N. Zainab, A. Tariq, and S. Siddiqui, "Development of web-based gis alert system for informing environmental risk of dengue infections in major cities of Pakistan," *Geosfera Indonesia*, vol. 6, no. 1, pp. 77–95, 2021.

[17] J. Zhang, "Research on classroom teaching evaluation and instruction system based on gis mobile terminal," *Mobile Information Systems*, vol. 2021, no. 11, Article ID 9790766, 11 pages, 2021.

[18] K. Datta and K. Gupta, "Morphometric analysis of pagla river basin, eastern India using geographical information system (gis)," *International Journal of Scientific Research*, vol. VI, no. IX, pp. 573–576, 2021.

[19] S. Sutariya, H. Ankur, and M. Tiwari, "Estimation of actual evapotranspiration in panam canal command using remote sensing and geographical information system (gis)," *International Journal of Electronic Governance*, vol. 8, no. 2, pp. 193–199, 2021.

[20] R. J. Nath, J. Samar, S. J. Chutia, N. Sarmah, and Y. Dutta, "A review on applications of geographic information system (gis) in fisheries and aquatic resources," *Water, Air, and Soil Pollution: Focus*, vol. 7, no. 2, pp. 97–102, 2020.

[21] P. Verma, P. K. Singh, R. R. Sinha, and A. K. Tiwari, "Assessment of groundwater quality status by using water quality index (wqi) and geographic information system (gis) approaches: a case study of the bokaro district, India," *Applied Water Science*, vol. 10, no. 1, pp. 27–16, 2020.

[22] B. O. Ugwuishiwu, O. A. Nwoke, H. Okechukwu, and E. A. Echiegu, "Gis-based system analysis for waste bin location in enugu municipality," *Agricultural Engineering International: the CIGR Ejournal*, vol. 22, no. 4, pp. 250–259, 2020.

[23] H. H. Asli, M. Arabani, and Y. Golpour, "Reclaimed asphalt pavement rap based on a geospatial information system gis," *Slovak Journal of Civil Engineering*, vol. 28, no. 2, pp. 36–42, 2020.

[24] B. Fonataba, P. J. Osly, and I. Ihsani, "Classification of land capability in manokwari area using geographic information system (gis)," *Jurnal Infrastruktur*, vol. 6, no. 2, pp. 129–139, 2020.

[25] J. Jung, "An analysis of local community youth policy infrastructure using geographic information system(gis)," *Studies on Korean Youth*, vol. 31, no. 2, pp. 235–261, 2020.

[26] C. Kahangwa, C. Nahonyo, and G. Sangu, "Monitoring land cover change using remote sensing (rs) and geographical information system (gis): a case of golden pride and geita gold mines, Tanzania," *Journal of Geographic Information System*, vol. 12, no. 05, pp. 387–410, 2020.

[27] R. Vennithasari and F. S. Papilaya, "Analysis of green land changes to building land using geographic information system (gis) in salatiga city from 2013 to 2019," *Journal of Applied Geospatial Information*, vol. 4, no. 2, pp. 350–355, 2020.

[28] A. Asadi and E. Akbari, "Spatial analysis quality of life in urban areas using geographic information system (gis) (case study: district 2 of mashhad)," *Journal of Applied researches in Geographical Sciences*, vol. 20, no. 58, pp. 35–52, 2020.