Research on The Protection System of Urban Garden Plants Based on Time-Space Analysis

Xiao Cheng*, Xiaoling Hong
Jiangxi University of Applied Science, Nanchang, China

*Corresponding author: xiao_cheng@jxcsedu.com

Abstract. The paper selects a garden as a typical object to study urban garden plants, and uses methods such as video statistics, digital camera record analysis, manual counting, and questionnaire survey statistics (CTVM) to analyse the laws of garden plants in different time periods. Based on the analysis and research, a mathematical model was established to explain the temporal and spatial behaviour of garden plants, so as to evaluate the landscape planning of urban gardens and provide a basis for studying the landscape planning of urban gardens. At the same time, the paper designs a web-based urban garden plant protection management system to improve the level of intelligent management of urban gardens.

Keywords: Spatio-temporal analysis method, urban garden, plant protection system.

1. Introduction
In order to improve the environmental pollution and damage caused by the rapidly advancing urbanization process, most cities in our country have begun to attach importance to the construction of urban gardens and listed such projects as one of the key tasks of municipal engineering projects. In order to improve the quality of urban garden construction, it is necessary to analyse many aspects of the construction process. This article uses the time-space deconstruction method to statistically analyse the changes and distribution characteristics of urban garden plants, analyses the impact of urban garden landscape settings on the presence of pedestrians from the perspective of the law of time and space activities, and evaluates the rationality of the planning of the garden pedestrian area [1]. The corresponding countermeasures and suggestions are put forward, which can be used as a reference for studying the laws and countermeasures of urban gardens.

2. Data collection and data collation of urban garden plant protection system

2.1. Data collection
The core of urban garden plant protection is to understand the relationship between population growth and the development speed of urban gardens and environmental changes, and analyse a series of issues such as changes in people's housing needs, travel needs, and consumer needs, so as to adjust and adjust in time. Optimize urban management methods. With the current rapid development of urbanization in my country, the transformation of urban villages has been intensively carried out in most cities in my country [2]. The demand for a large number of commercial buildings has been
increasing, and the residential population has also increased correspondingly. The rural population is gradually shifting to cities. Construction brought a series of problems. If a large number of new real estate's emerge, the population will increase sharply, which will require supporting municipal facilities such as medical care, schools, markets, stations, gardens and vegetation. The construction of gardens and vegetation is far from being able to meet the increasing demand for traffic and people. The pace of urban construction is often restricted by the investment of construction funds, the difficulty of land acquisition and demolition, and the occupancy rate of houses. The construction scale of municipal supporting facilities cannot be simply determined based on preliminary urban planning. A reasonable mathematical model is required. To analyse the relationship between these factors, as the basis for the final decision. The application of remote sensing technology is the key to the establishment of mathematical models, because these data are dynamically changing. Through the analysis and summary of various dynamic data, the mutual relationship can be found. Data collection can use a variety of methods, such as door-to-door surveys, monitoring systems, market research, remote sensing technology, etc. After collecting a large amount of information, it is necessary to establish an effective database for storage and aggregation, and to filter out useful data. The specific method of data collection is shown in Figure 1 below.

![Figure 1. Classification of data collection methods](image)

2.2. **Data analysis**

For the large amount of data collected, a systematic, effective and reasonable analysis is needed to draw correct conclusions. The factors affecting urban garden construction mainly include changes in the residential population, industrial development, commercial development, new or altered stations, and surrounding garden vegetation construction. The interaction of these factors will lead to changes in the flow of people and ultimately cause various garden vegetation. Service level changes. Only by establishing an effective database and analysing the mathematical model can the service level of urban gardens be analysed and provide a reliable basis for the management of urban gardens [3]. This requires the use of remote sensing technology and an automatic traffic collection system to collect traffic volume change data for each garden vegetation, analyse which garden vegetation has the most impact under the combined effect of these factors, and the services that the current cross-section of the garden vegetation can withstand. Whether the level can still meet the normal use requirements, when the model sets the limit value of the service level, a warning message will be issued to remind the manager to improve the planning and construction plan in time.
2.3. Processing and analysis of measured data

Through the analysis of measured data, the regularity of the target's movement in different time periods and various spatial positions is determined. Take several representative observation points, and plot the movement data of different objects and different conditions. The ordinate in Figure 2 is the statistical number of the measured objects, and the abscissa is from 9:00-20:00 The time period between. It can be seen from Figure 2 that the statistical value of the curve represented by Gate 3 is relatively stable, almost showing a flat horizontal linear curve. The traffic statistics of Gate 2, Gate 6, and Crystal Street show a normal distribution curve with low morning and evening and high middle. The garden also has an inverted "U"-shaped curve with morning and evening low and high in the middle, but a small peak appears in the time period around 19:00. Because the garden is the gathering place of 8 doors, it is also the main body of the urban garden, coupled with the attraction of garden landscape sketches, it brings together a large number of people [4]. On holidays, 10:00-10:30 and 19:00-19:30 are the time periods for music fountains and water curtain movie activities in urban gardens. At this time, a large number of pedestrians gather, as shown in Figure 2. The inverted "V"-shaped small peaks of the curve around 10:00 and 19:00. In this area, the function \( \int(t) \) that changes in the flow of people with time is roughly normal distribution, and its probability density graph is bell-shaped. The function expression of function \( \int(t) \) changing with variable time \( t \) should be

\[
\int(t) = \frac{1}{\sqrt{2\pi\sigma}} e^{\frac{-(t-\alpha)^2}{2\sigma^2}} \quad (1)
\]

Among them, \( \sigma (\sigma \neq 0) \) is the standard deviation of the normal distribution, which is a variable; \( t \) is the time; \( \alpha \) is the mean of the normal distribution; the normal distribution can be recorded as \( t: \mathcal{N}(\alpha, \sigma^2) \); \( e \) is the base of the natural logarithm. When \( \sigma \) is greater than 0, the smaller the value of \( \sigma \), the higher the peak of the curve, which means the higher the density of people flow, when the value of \( \sigma \) increases, the curve is smoother. The crowd density changes with the change of \( t \). When 9<\( t \) 19, the function \( \int(t) \) has a normal distribution. The larger the value of \( t \), the higher the peak of the curve, and the smaller the value of \( t \), the smoother the peak of the curve. The shape of each curve, the direction of the peak, and the shape of the curve are different. According to the direction and shape of the curve, it can provide a clear theoretical basis for the design of the walkway.

![Figure 2. The change pattern of the flow of people under different time and space conditions](image-url)
3. Release of the Urban Principles Plant Protection Web System

3.1. System function and structure

3.1.1. Network architecture. According to the functional requirements of the system, the foundation of the system construction is the construction of urban garden WAN. At present, there are two popular schemes. One is to connect each garden management point by applying for a dedicated line; the other is to connect each garden management point through PSTN (Public Telephone Network). Taking into account the low real-time nature of the information update of the management system, the amount of information is not very large, in order to achieve the maximum cost performance, we use a wide area connection based on PSTN (as shown in Figure 3).

![Network topology of urban garden management system](image)

Figure 3. Network topology of urban garden management system

3.1.2. Garden information classification and system realization. The garden management system builds a global information database by collecting information from different information points. Design information includes three aspects: basic information for garden management; multimedia information for Web publishing; auxiliary information for other aspects (such as bus status, latest activities, etc.). According to the difference of the three kinds of data, the way of processing the data is different.

The first is the basic data of garden management, these data are mainly used for management. The system adopts the traditional CS structure, the front end adopts rapid development tools, such as Power Builder, and the back end adopts large databases, such as MSSQL Server [5]. This information is specifically determined for the situation required by the management work, which is convenient for the leader to carry out the overall planning.

The second is the multimedia information used for Web publishing. It should be able to fully reflect the specific characteristics of each garden, combining graphics, images, text, sound, animation and other multimedia expressions to show the essence of the garden. Data storage includes multimedia files and related presentation materials, and all materials are managed uniformly through a database. Taking into account the specific characteristics of its implementation, the system uses Java Applet technology in the Web implementation. Client users realize the purpose of uploading multimedia files to the server through the file transfer function provided by the system. In order to simplify the implementation of the system, we only save the multimedia file name in the database, and the content of the multimedia file is stored in a dedicated directory on the server.

The third is for additional auxiliary information. Considering that the entire information changes greatly, it should also be expressed through the Web. We use Java technology combined with CGI technology to achieve dynamic extraction of the Web, and display it on the Web in the form of graphics and text.
3.2. The key technology of system realization

3.2.1. WEB service technology of weather forecast. In order to facilitate the arrangement of greening production tasks, it is very necessary to understand the weather conditions in the area, and Webservice is used to obtain paid weather information services [6]. This system calls http://www. Web service. com.cn/ Web Services/Weather Web Service. The Web Service provided by asmx weather service platform obtains dynamic weather forecast information. The format of the future weather forecast data returned is shown in Table 1.

| Array index | Meaning                                      |
|-------------|----------------------------------------------|
| weathercast [3] | Last update time                           |
| weathercast [4] | Live weather                                |
| weathercast [7] | Weather overview on the first day           |
| weathercast [8] | First day temperature                       |
| weathercast [9] | Wind/wind direction on the first day        |
| weathercast [10] | The first day weather icon 1 file name      |
| weathercast [11] | The first day weather icon 2 file name      |
| weathercast [d−4] | Weather overview on the last day           |
| weathercast [d−3] | Last day temperature                       |
| weathercast [d−2] | Last day wind/wind direction                |
| weathercast [d−1] | Last day weather icon 1 file name           |
| weathercast [d] | Last day weather icon 2 file name           |

3.2.2. Business report output technology. Business report generation and export is one of the important functions of the system. The statistical data is stored in Data Table and can be output as a report file in Word or Excel format.

3.2.3. SMS group sending technology. Due to the long distance between field workers and management personnel, the personnel are scattered, and communication is inconvenient. In order to communicate in time, SMS cats are used to send short messages in groups. In general, the use of RS-232C serial SMS modem follows the steps of initializing the device, establishing a connection, writing data to the port, and closing the connection.

3.2.4. Security access control technology. The system adopts strict precautions in terms of system security access. The data transmitted on the network is encrypted. For some sensitive information such as user accounts, special soft encryption algorithms are used. The system adopts a strict role-based authorization management mechanism. Establish a security audit and intrusion detection tracking system, and record complete security log information for core business modules. Through a series of safety protection measures, strengthen the safety education of system management and users, fundamentally block all unsafe factors, and improve the safety of the system.

4. Conclusions
The system introduced in this article adopts a hierarchical, standardized, and open design concept, with stable performance and high reliability, and it is convenient to provide services for greening maintenance managers. The powerful information processing function of this system plays an increasingly important role in the landscape management of a certain scenic spot in a city.
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References
[1] Grygorczyk, A., Jenkins, A., & Bowen, A. J. Exploring approaches for classifying ornamental garden plant purchasers. Journal of Sensory Studies, 32(3) (2017) e12268.
[2] Griffith, M. P., Clase, T., Toribio, P., Yuley Encarnación Pieyro, & Hoban, S. Can a botanic garden metacollection better conserve wild plant diversity? a case study comparing pooled collections with an ideal sampling model. International Journal of Plant Sciences, 181(5) (2020) 012-020.
[3] Heitmann, A. J., & Gardiner-Garden, R. S. A robust feature extraction and parameterized fitting algorithm for bottom-side oblique and vertical incidence ionograms. Radio Science, 54(1-2) (2019) 115-134.
[4] Lucia, M., Da Costa, M. N., Jackson, P. W., Fernandes, R. A., & Peixoto, A. L. Conservation of threatened plant species in botanic garden reserves in brazil. Oryx, 52(1) (2018) 108-115.
[5] Edwards, & Christine, E. Strengthening the link between international conservation policy and plant conservation genetics to achieve more effective plant conservation. Annals of the Missouri Botanical Garden, 102(2) (2017) 397-407.
[6] Bai, B., Suri, V. K., Kumar, A., & Choudhary, A. K. Tripartite symbiosis of pisum–glomus–rhizobium leads to enhanced productivity, nitrogen and phosphorus economy, quality, and biofortification in garden pea in a himalayan acid alfisol. Journal of Plant Nutrition, 40(4) (2017) 600-613.