



Numerical analysis and calculation of urban landscape spatial pattern

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Abstract. In order to complete the construction planning of urban landscapes in urban construction, this article conducted numerical calculations. This study focuses on the construction of ecological cities and combines the theoretical model of landscape design with the design of urban streets and squares. On the basis of understanding all the theoretical foundations of landscape architecture, we focus on the green spaces created by streets and corners in modern urban landscape art. Based on the above points, we conducted an in-depth analysis of the land distribution, layout, supporting landscape, design, and aesthetic value of green spaces. The experimental results show that the landscape aggregation index of the three urban areas basically reaches 95, reflecting the high and good connectivity between the city and the green spaces in each area. Based on the theories and models of landscape ecology and remote sensing technology, this paper investigates the current situation of urban green space, and uses mathematical knowledge to discuss the current situation of urban ecological construction and the structure and structure of urban green space structure, which provides a basis for the migration of cities to urban gardens, and provides a basis for the reasonable model of urban green space.

Keywords: urban landscape; Spatial pattern; numerical analysis

1 Introduction

The good management of street and square green space design in urban landscape architecture is a challenging task. Therefore, it is necessary to start from the design, propose the green space design at the four corners of the street and urban landscape architecture, determine the design process, and take good design measures based on the design characteristics. In order to improve the design performance of streets and squares in urban landscapes and meet the needs of urban construction [1]. A survey on the characteristics of street and square greening design in urban landscapes shows that due to the purpose of urban greening, many plants will be used for design, and the vast majority of green spaces will also be mainly made of environmentally friendly materials to avoid pollution to the surrounding areas caused by construction design. Green spaces must be integrated with the surrounding environment and reduce damage to the sur-

roundings, fully implementing the concept of green construction design. For the construction design of plants, it is necessary to ensure the survival rate to ensure the construction design effect of roads and squares in urban landscaping [2]. The design of streets and squares in urban landscapes should consider the role of street and square environmental conditions in urban landscapes, including differences in weather, climate, geology, etc., And it is necessary to design building models based on the actual situation to ensure all building models at the corners of roads and urban landscapes. In addition, the design of streets and squares in urban landscapes is difficult, so many designers will be involved in the design process, and they must do a good job in the design [3]. Road landscape environmental design refers to the construction of a safe, comfortable, and harmonious landscape that utilizes all cooperative elements between the road landscape and the surrounding area from a beauty perspective, in order to ensure the safety, comfort, and harmony of drivers and passengers. Landscape construction can beautify defense projects, make charging stations, gas stations, and gas stations unique, with green as the main measure to beautify the environment, repair the damage caused by roads to the natural environment, and increase the culture of the road environment through the dissemination of local culture and people's landscapes along the line, achieving a beautiful appearance, powerful environmental protection functions, and strong culture [4].

2 Literature review

China's landscape design has a long history and is unique in the field of urban planning and horticulture. Although the development of garden art is characterized by innovation, it cannot be cut off after all. With the increasing influence of international trade, the urbanization of China is also deepening. How to inherit and carry forward the design concept of "the relationship between man and nature" in China's urban landscape architecture design while shaping urban functions [5-6]. Achieving a win-win situation between urban work and landscape beauty is not only a theoretical issue that we must consider when discussing urban landscape construction today. This is also the main problem of "homogenization" of urban landscape layer in China, which has been questioned for a long time. As the main combination of urban work and landscape construction, the green space design of landscape streets and squares is the most important of the above problems [7]. XiaoNing et al. said that Yanchi County is located in the ecotone between agriculture and animal husbandry and belongs to the fragile ecological area in the northwest. It is of great significance to study the change of landscape structure to limit its environmental damage. In order to prove the change of landscape structure in the study area with time, the data of Landsat Thematic Mapper (TM) and Landsat Operational Land Imager (OLI) in 1991, 2000, 2010 and 2017 were used. This study attempts to apply the niche theory and method to landscape ecology, and build the niche model of landscape components by using "N-dimensional super-volume niche theory" and landscape pattern index. Evaluating the spatio-temporal evolution of niche from the perspective of two-dimensional space reflects the changes of landscape pattern in

the study area in the past 26 years, and introduces a new theory and method for landscape pattern representation [8]. How to realize the "two-way truth" of urban work and the beautiful landscape of streets and squares in theory and practice is the starting point and goal of learning this method.

3 Methods

Object-oriented geographic mapping is a special application of object-oriented relation in the field of historical data science. In a narrow sense, it is the conceptual model and concrete application model of geospatial objects. Broadly speaking, it is the expression of people's understanding of geographical areas. Spatial representation must be able to solve problems related to space. According to the decision level, it can usually be divided into three levels, as shown in Figure 1.

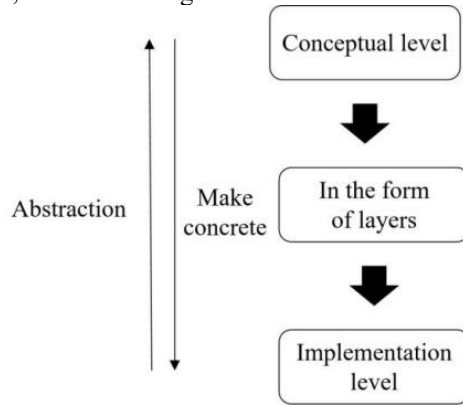


Fig. 1. Hierarchy of object-oriented geospatial representation

This paper will start from these three levels, involving the research concept and framework at the conceptual level, the methods and procedures at the legal level, and the model and application at the implementation level.

The third-level evaluation value Q_i is the basis of eco-city evaluation, and its calculation formula is as follows: When the measured value is as large as possible:

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$$Q_i = \frac{C_i}{S_i} \quad (1)$$

When the actual value of an index in that year is greater than the target value, no matter how much the index is greater than 1, the index of the index will be calculated.

When the measured value is as small as possible:

$$Q_i = \frac{S_i}{C_i} \quad (2)$$

When the actual value of an index in the current year is less than the target value, the value of the index will be calculated no matter how much the value of the index is less than 1.

Where: S_i is the standard measure of the third evaluation level; C_i is the current value of the third-level index selected as the city index. The second-level parameter value V_i is calculated as the arithmetic average of its third-level parameter values, The formula is as follows:

$$V_i = \frac{\sum_{i=1}^m Q_i}{m} \quad (3)$$

Where: Q_i is the value of the third measurement level; M is the number of items from the second measurement level on the third measurement level. The first level index is a general index for numerical reference of urban landscape. The general definition of correlation statistical analysis (ECI) is the sum of secondary values of its weights. Calculators are as follows:

$$ECI = \sum_{i=1}^n V_i W_i \quad (4)$$

Where: V_i is the value of a secondary index; W_i is the weight of a secondary index; N is the number of items of secondary indicators.

3.1 Exploratory spatial data analysis

The main methods used in exploratory spatial data analysis (ESDA) include histograms, frequency distribution tables, summary statistics (mean, maximum/minimum, variance, standard deviation, skewness, kurtosis, etc.), variance maps (variance cloud maps and heteroscedasticity maps), spatial autocorrelation statistics (Moran's I, Geary's C, LISA, G, etc.) A series of techniques and methods specialized in handling the dependency and heterogeneity characteristics of spatial data, such as Moran scatter plots and their derived graphs. In addition to traditional graphs and charts, ESDA can also be combined with GIS to express relevant results on basic or thematic map by using GIS visualization technology to enhance intuitive effect.

4 Results and analysis

Landscape classification is one of the most difficult problems in landscape ecology. The reason is that different studies use different classification models, because different situations make different classification assumptions. According to the guidelines, it is necessary to determine the special distribution of urban green space to monitor remote

control transmission. According to the actual situation of the study area, taking China city as an example, this study divides green space into green park, production green space, protection green space, green space and other green spaces. See Table 1 for details of various green spaces.

Table 1. Classification of urban green space

kind	meaning
Park green land	Cities, university areas, park areas, small amusement parks, street squares, botanical gardens, zoos, special parks open to the public, and surrounding green spaces.
Affiliated green land	It is about green service land in different types of land, not green space in urban land development. Including land, public land, commercial land, reserve land, external land, road and square land, green space in urban areas and special land.
Protective green space	It refers to the green space with urban cleaning, extraction and protection. It includes clean energy belt, green belt protection, urban roads, green belts, storms, urban isolation, etc.
green land for production	It mentions nurseries, flower beds, meadows and other nurseries that provide seedlings, flowers and seeds for green cities.
Other green spaces	Refers to the green space that directly affects the urban environment, people's leisure, urban environment and biodiversity protection. It includes beautiful areas, protected areas, national parks, forest parks, El nature reserves, beautiful forests, urban green spaces, wildlife parks, wetlands, garbage green spaces, etc.

(2) Landscape richness index (PR)

PR is equal to the total number of all patch types in the landscape. It is one of the key indicators reflecting the landscape components and spatial heterogeneity, and has an impact on many ecological processes. The study found that there was a good positive correlation between landscape abundance and species abundance, especially for those organisms that needed multiple habitat conditions for survival, PR was particularly important. Taking a city as an example, the total landscape area of the three districts of the city is 3405.921 hectares. The city and each district contain five types of green space, including park green space, production green space, protective green space, auxiliary green space and other green space. It can be seen from Table 2 that the landscape aggregation index of the three districts in the city has basically reached 95, which reflects the high degree of landscape connectivity and good connectivity of the green space in the city and each district[9-10].

Table 2. Landscape level analysis of urban green space system

area	Landscape area	The landscape richness index	The Shannon diversity index	The Shannon evenness index	Cluster index
Zone 1	3405.821	5	0.9026	0.5566	95.705
Zone 2	1117.442	5	0.8408	0.5176	95.881
Zone 3	776.534	5	0.7775	0.48	95.5822

5 Conclusion

Landscape design is a unique feature of urban environment. This paper combines and summarizes the theoretical basis and principles of urban landscape construction, and takes part in the research of urban landscape and people's life in combination with special cases in urban landscape construction. With the green space of streets and squares in urban landscape as the medium, the influence on theory and practice is based on the green landscape expanded by design.

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