

# 3D Urban Landscape Network Publishing Technology Based on Remote Sensing and GIS

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**Abstract**—With the development of digital technology, remote sensing technology is more and more widely used in urban landscape. Based on remote sensing and GIS technology, this study takes urban plant landscape as the research object, discusses the application technology measures and implementation path of GIS technology in urban landscape, and takes a site design in Chongqing as an example.

**Keywords**—remotesensing and GIS, three-dimensional urban landscape, plant landscape, internet technology

## I. INTRODUCTION

With the development of remote sensing technology, high resolution remote sensing image has been widely used in urban research. High resolution remote sensing image provides an important source of information for the study of urban environment due to its own advantages. The use of high-resolution remote sensing images to obtain the types, distribution and structure of urban vegetation can provide an objective basis for improving urban environmental quality, optimizing vegetation layout and improving urban green space system planning, which is of great significance for urban greening construction and overall planning in the future.

## II. BASIC OVERVIEW OF REMOTE SENSING AND GI

GIS is a program used in the input, storage, display and analysis of geographic data. Now GIS has been widely used and is a relatively comprehensive subject. GIS has now penetrated the landscape architecture planning and design field, and its extension tools can be used to design different spatial, road network, hydrological analysis and so on. At the same time, it can obtain the site height, slope aspect, undulation [1], surface runoff and solar radiation value according to the digital elevation model tool, and use the ability of GIS processing and analyzing data to cooperate with the professional knowledge of other disciplines to assist the planning and design of landscape architecture.

The corresponding basic texture is generated on the 3D surface: the cultural feature number (GIS) is some vector data obtained by mapping, which has accurate geographical coordinates and various feature codes, and is used to describe various human landscape images and natural landscapes. Such as buildings, roads, power telephone lines and poles, towers and Bridges and other forests, rivers and so on. In the 3D terrain database, these feature data are expressed with the help of specific 3D models and specific texture patterns. When the data is collated, edited, calibrated and organized, it is integrated through specific software powerful tools. You can then make small adjustments with a few preview tools, and finally you can build and generate the

desired 3D real-time visualization of the terrain. In the study of urban landscape ecology, it is pointed out that the characteristics of urban landscape pattern are closely related to urban functions. With its powerful radiation and penetration ability, urban landscape not only determines its own structure and pattern characteristics, but also plays a significant role in improving and restricting the structure of other landscape types around it. According to the two-dimensional spatial form, the traditional urban landscape features are mainly manifested as two types of traffic corridors and geometric blocks. But with the urban space resources

With the increasing shortage of urban landscape, urban elements begin to overlap and Mosaic in space, which is specifically manifested as the superposition of elevated roads and other buildings. The overlap of underground space and ground buildings, the Mosaic distribution of urban green space, square and buildings, etc. At this time, the traditional two-dimensional plane structure analysis will not reflect the spatial distribution characteristics of urban landscape elements.

The function of the traditional city depends on the two-dimensional plane transportation network. The material, energy flow and information exchange ability in the urban landscape all depend on the spatial density and mutual connection of the transportation network. At the same time, large-scale traffic and urban construction also lead to the isolation of natural habitats, resulting in the fragmentation of natural habitats, the decline of urban environmental quality, and the degradation of open space. The three-dimensional network of urban functional connection refers to the network connection between urban functional elements, which is manifested as the interspersed, overlapping and even interwoven channels of logistics, energy flow and information flow, forming a three-dimensional urban functional network. The network node is the city function center, and the network corridor is the landscape function flow path based on the landscape elements. And together constitute the internal, inter-urban and regional links.

## III. THE DEVELOPMENT OF THREE-DIMENSIONAL URBAN LANDSCAPE

Thanks to the progress of data acquisition and technology, the study of 3D urban landscape pattern has attracted more and more attention from researchers. Data sources such as ground data survey and 3D cadastral data, aerial photogrammetry, high-resolution satellite remote sensing images and airborne laser scanning are widely used in 3D landscape pattern modeling and change analysis [2]. Data sources have an impact on the analysis of 3D landscape

pattern. Ground survey and 3D cadastral data acquisition, and aerial photogrammetry will have the problem of missing 3D information in built-up dense areas. High-resolution satellite remote sensing image data can provide dynamic and real-time features for 3D surface information. However, large-scale processing of high-resolution remote sensing data is still needed to obtain the most advanced three-dimensional information, but the data in the changing period is not easy to obtain. Therefore, it is feasible to obtain 3D information of urban landscape by integrating multi-source data.

#### *A. Visualization Analysis of 3D Urban Landscape*

The corresponding basic texture is generated on the 3D surface: the cultural feature number (GIS) is some vector data obtained by mapping, which has accurate geographical coordinates and various feature codes, and is used to describe various human landscape images and natural landscapes. Such as buildings, roads, power telephone lines and poles [3], towers and Bridges and other forests, rivers and so on. In the 3D terrain database, these feature data are expressed with the help of specific 3D models and specific texture patterns. When the data is collated, edited, calibrated and organized, it is integrated through specific software powerful tools. You can then make small adjustments with a few preview tools, and finally you can build and generate the desired 3D real-time visualization of the terrain. In the study of urban landscape ecology [4], it is pointed out that the characteristics of urban landscape pattern are closely related to urban functions. With its powerful radiation and penetration ability, urban landscape not only determines its own structure and pattern characteristics, but also plays a significant role in improving and restricting the structure of other landscape types around it. According to the two-dimensional spatial form, the traditional urban landscape features are mainly manifested as two types of traffic corridors and geometric blocks. But with the urban space resources

With the increasing shortage of urban landscape, urban elements begin to overlap and Mosaic in space, which is specifically manifested as the superposition of elevated roads and other buildings. The overlap of underground space and ground buildings [3], the Mosaic distribution of urban green space, square and buildings, etc. At this time, the traditional two-dimensional plane structure analysis will not reflect the spatial distribution characteristics of urban landscape elements.

#### *B. 3D Networked Landscape Function*

The function of the traditional city depends on the two-dimensional plane transportation network. The material, energy flow and information exchange ability in the urban landscape all depend on the spatial density and mutual connection of the transportation network. At the same time, large-scale traffic and urban construction also lead to the isolation of natural habitats, resulting in the fragmentation of natural habitats [5], the decline of urban environmental quality, and the degradation of open space. The three-dimensional network of urban functional connection refers to the network connection between urban functional elements, which is manifested as the interspersed, overlapping and even interwoven channels of logistics, energy flow and information flow [4], forming a three-dimensional urban functional network. The network node is the city function center, and the network corridor is the

landscape function flow path based on the landscape elements. And together constitute the internal, inter-urban and regional links [6].

## IV. RESEARCH ON THE APPLICATION OF REMOTE SENSING AND GIS TECHNOLOGY IN 3D URBAN LANDSCAPE

#### *A. Project Overview*

##### **(1) Location analysis**

The base is located in the northwest of Nanshan Botanical Garden in Nanan District of Chongqing, facing the downtown of Chongqing across the river, with convenient transportation, and is the green barrier of Chongqing. It is adjacent to Orchid Garden in the southeast and Great Golden Eagle Garden in the northwest, which is the connecting plot of all parks. The base covers an area of 1.6 hectares.

##### **(2) Current situation analysis**

The base as a whole is a mountain landform with large terrain fluctuations and less flat land, and the terrain is relatively complex, which indirectly affects the landscape effect of the medicinal botanical garden. The original site is rich in vegetation and has a high coverage rate of green space, but most of the growth is chaotic. The roads are mainly self-stepped paths [7], and there is no complete road planning. Retain the original teahouse, herbarium and other buildings.

The original tree plants in the site include Masson pine, camphor, eucalyptus, Magnolia magnolia, Chinese toon tree, osmanthus, bamboo, etc. Shrubs include coral tree, rhododendron, African asparagus, camellia, clove leaf, etc. The ground is mostly fern, big leaf fairy hair, spider orchid, ophiopogon and so on. Although there are many kinds of plants, there are no specific health-preserving medicinal plants, which can not complete the characteristics of the whole health-preserving theme.

##### **(3) Base topography analysis**

According to the GIS slope analysis (FIG. 1), the slope of the whole site is not large, which is suitable for landscape planning. The small area in the eastern region has a large slope. Can do plant landscape, the southern area only small area slope is larger, suitable for slope landscape. The overall slope of the whole site is relatively slow, and the red line area is the design site [8]. The slope of the site is large in the north and south, the middle part is in the form of whirlpool, and the slope of both sides is relatively gentle. Therefore, the gentle slope area can be used for plazas and rest, and the north and south area can be used for dense forest landscape and quiet rest area. In a word, the whole site can be planned, and the gentle slope area can be used for buildings, landscape pieces and other facilities.

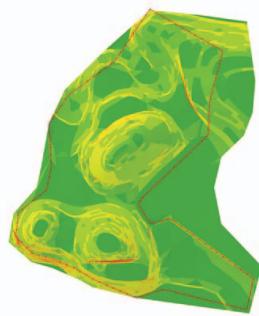


Fig. 1. Slope analysis

According to the GIS elevation analysis (FIG. 2), the site is high in the south and low in the north, relatively flat in the west, relatively undulating in the east, and diverse in the southwest. The terrain of the whole park is not undulating. The highest elevation in the region is 594.1 meters, located in the east of the park, while the lowest elevation is 566.04 meters, located in the northwest edge of the park, with a maximum elevation difference of 27.96 meters. The high points are few and distributed in the central and southern parts. The whole site presents a high terrain in the middle and low on both sides. Therefore, the whole central area can be built with ornamental landscape buildings such as pavilions and other buildings, creating the landscape effect of height and distance. The northern area has a low elevation and can be built as water landscape, while the southern area can be built as a leisure and entertainment area, satisfying the basic entertainment functions.

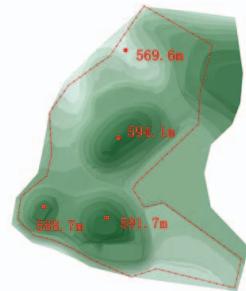


Fig. 2. Elevation analysis

According to the GIS slope direction analysis (FIG. 3), the site is high in the south and low in the north, and there are few sites on the south, southeast and southwest slopes. Under the same geographical conditions, the south slope, southeast slope and southwest slope received longer light time, sufficient sunshine, higher temperature and greater water evaporation, which were conducive to plant growth.

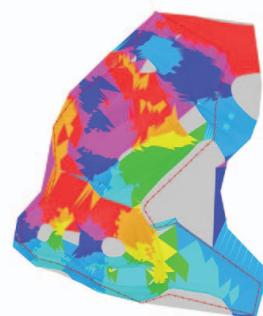


Fig. 3. Slope aspect analysis

## B. Overall Planning

### (1) Planning Idea

The project mainly takes traditional Chinese medicine plants as the carrier, with the promotion of traditional Chinese medicine culture and modern health culture as the theme, and establishes a medicinal botanical garden integrating traditional Chinese medicine culture display, popular science education, health and recreation. Rich medicinal plants integrate science popularization, ecology, ornamental and health preservation, constituting the main body of medicinal botanical garden. With the development of The Times, the concept of health has been deeply rooted in people's hearts, and has been integrated into people's lives, and the basic theory of health is also from traditional Chinese medicine.

### (2) Planning the Layout

The whole site is divided into two large areas, health and health area and traditional Chinese medicine culture area, health and health area to health care and popular science display as the theme, the planned content of herbal tea garden, health exhibition garden, colorful medicine garden. The culture of traditional Chinese medicine mainly takes the development of traditional medicine culture as the theme, and its main function is cultural display and sightseeing. There are Daguan Herb Garden and Pulse Garden planned.

## C. GIS technology Urban Landscape Path

### (1) Expression of health preservation theme in traditional Chinese medicine cultural area

The traditional Chinese MEDICINE culture area is mainly based on the history of traditional Chinese medicine culture, and the traditional Chinese medicine culture is the auxiliary design main line. The area is designed with Mai Yuan and Grand View Garden. Mai Garden is designed with scenic spots such as Shennong Herbal Garden, Shizhen Square and Wenya Hall. Shennong Herbal Garden cultivates different kinds of medicinal and health plants to show visitors the cultural history of traditional Chinese medicine. Shizhen Square, Li Shizhen of Ming Dynasty is the master of the development history of traditional Chinese medicine, so the square uses Shizhen sculpture, planting pool of traditional Chinese medicine, characteristic signs and so on to show visitors the great pharmacists. It is built in the form of architecture, mainly imitating the process of seeking medical treatment in ancient times, so that visitors can experience the extensive and profound culture of traditional Chinese medicine.

### (2) Expression of health theme in health area

The health and fitness area is the core of the whole park, and the planning content of the park is rich, mainly centering on the theme of health and health. GIS technology analysis shows that this area is suitable for planting rich plant landscape. The whole elevation of this area is relatively high, and the ornamental value is high, because it can be used as an ornamental health area mainly based on plants.

This AREA TAKES HEALTH AS THE THEME, PLANNING medicine TEA HALL, medicine garden, health and medicine garden, science museum, winter garden, Long SUMMER garden, golden Autumn Garden, Spring garden, summer garden. It is mainly a popular science education, health leisure and sightseeing that combines health plant cultivation and health experience activities. At the same time, you can also experience the beauty of plant configuration in the four seasons health regimen, enjoy the health experience activities such as medical tea health, aroma physiotherapy and so on.

The herbal tea garden is planned to have a herb garden and a herb tea hall. The herb garden is planted with aromatic and medicinal plants, mainly jasmine, lavender and marigold, which have three kinds of ornamental aromatic plants, and can closely follow the theme of health preservation. The medicinal tea hall mainly changes the original tea room into a pavilion based on medicinal tea, and there is a medicinal tea hall inside the tube for people to taste medicinal tea. The medicinal food hall mainly uses some medicinal plants to make health food for people to lose weight and keep in good health. Horticultural therapy provides visitors with some aromatic SPAR and fumigation therapy using medicinal plants [9].

The colorful medicine garden uses the five elements, five Zang organs and five hours of traditional Chinese medicine theory to plan the scenic spot, and uses different kinds of health plants to match. Gold (lung), the area is mainly planted in autumn lung plants, such as Buddhist hand, non-

thorn citrate, Cellophus, white Du, pear tree, pipa, pomegranate and other plants. Wood (liver), the main planting spring liver plants, Magnolia magnolia, Magnolia magnolia, Magnolia magnolia, Magnolia magnolia, safflower loropetalum, Rhododendron, citrus, jasmine, calendula, Cassia, rose, four. Water (kidney), the area is mainly planted in winter kidney plants, Lamei, mountain Lamei, Sichuan big head tea, walnut, fairy lance, ophiopogon, Phnom Penh broad-leaved mountain ophiopogon, silver grain along the steps of grass. Fire (heart), the area is mainly planted in summer heart-nourishing plants, mountain plum, Taiping, rose, pink spiraea, gingko, ginger, heart-nourishing grass, geranium, carnation. Soil (spleen), the main cultivation of spleen plants, banana, Xia Ju, persimmon, lemon, fire thorn, peach, jujube, hawthorn.

The Health and Sports Medicine Garden is planned to have a health and Sports Medicine garden and a science museum. The Science Museum mainly displays the knowledge of traditional Chinese medicine and integrates some health experience activities. For example, in combination with the history of traditional Chinese medicine culture, the museum also displays medicinal plant specimens, ancient medical books, modern health rules and so on. The health herb garden uses health plants for landscaping, mainly planting some plants for weight loss and blood pressure reduction, such as Eucommia ulmoides, forsythia, honeysuckle, Cassia, hawthorn, Ningxia wolfberry, salvia miltiorrhiza, safflower and so on.

## V. CONCLUSION

With the development of artificial intelligence, the digital development of landscape pattern is more and more favored by researchers. In future landscape research, more high-tech visual data analysis will be integrated, such as GIS analysis in landscape pattern and research on 3D visualization technology of urban landscape [10].

TABLE I. CLASSIFICATION OF HEALTHY PLANTS

The serial number	The name of the	Family species	flowering
1	Safflower Lou	Witch hazel family, Lou <sup>2</sup>	3-4 months
2	Salvia miltiorrhiza	Family labiate, genus Salvia	4months
3	hawthorn	Hawthorn in the rose family	5-6months
4	Red flowers	Compositae, safflower genus	5-8months
5	Honeysuckle flower	Honeysuckle, genus Lonicera	4-5months
6	firethorn	Family rosaceae, genus Pyrrhus	3-5months
7	Magnolia bark	Magnoliaceae, genus Magnolia	4-5months
8	Jasmine flower	The family Melilotaceae, the genus Xanthaceae	5-8months
9	The cuckoo	Rhododendrons, genus Rhododendron	4-5months
10	St John's wort	Family mignonaceae, genus forsythia	4-5months

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