

## Application of GIS Technology in Urban Planning Informatization

Zhong Zhaodong

School of Planning and Design, Xinyang agricultural and Forestry College, Henan Xinyang 454000, China

**Keywords:** Urban Planning; Informatization; GIS Technology

**Abstract:** As a new information technology science in recent years, GIS plays an important role in urban planning industry, and its application is becoming more and more extensive and in-depth. At present, the application of GIS technology in urban planning informatization mainly embodies in the aspects of database platform construction, information comprehensive service, three-dimensional assistant decision-making and dynamic monitoring of planning, etc. The main shortcomings and application prospects of GIS technology are studied and analyzed, and the urban digital planning system based on GIS technology is preliminarily established. The establishment of GIS-based urban planning platform is inseparable from the modeling of known geographical phenomena, that is, the completion of the establishment of geographic data model, which also involves the object-oriented method. The application of GIS technology has helped solve many problems encountered in urban planning and design, changed the situation that planners relied excessively on subjective experience to guide and guide the planning work, and made planning and design have more scientific and quantitative analysis methods for urban planning and construction. Have important reference value.

### 1. Introduction

At present, GIS technology has been widely used in engineering design, urban planning, land management and many other industries, but because of their different origins and histories, two distinct but closely related application fields have been formed [1]. With the transition of social and economic system in China, the process of urbanization is obviously accelerated, and the construction of cities has reached an unprecedented scale. The tide of informatization has brought great impact on urban planning, and the traditional means of planning and management can no longer meet the development process of the city [2]. The introduction of GIS technology can greatly expand the information technology content of urban planning, and the urban planning information system with good GIS technology application will save a lot of funds for urban planning, construction and management. Geographic Information System (GIS) is a computer technology system for storing, referencing and managing geographic information [3]. Its emergence brings opportunities for the renewal of urban planning and design technology. The use of GIS technology in urban planning and design is of great significance for improving urban planning and design techniques.

The construction of digital urban planning platform by GIS mainly includes three aspects: transforming topographic map from 2D CAD to 3D model; establishing digital urban planning information system; using GIS to complete the construction of urban traffic information system [4-5]. In the daily planning business, a large number of planning drawings, status maps and other professional graphic data are needed, and various forms and additional materials need to be processed, which greatly increases the workload and complexity of the Planning Bureau [6]. At present, urban planning information management still adopts the traditional manual mode, which is inefficient, lack of information and slow update speed. All these urgently need to improve the level of urban planning management to meet the requirements of urban informatization. In this context, the Ministry of Housing and Construction actively responded to the call of the Central Committee of the Party to reform the urban and rural planning system, fundamentally changing the traditional planning system of "emphasizing cities and towns, despising rural areas", "rebuilding construction, despising ecological protection" [7]. With the continuous renewal of modern urban planning

concepts and the deepening of urban planning informatization, new technologies and concepts represented by GIS technology have been integrated into the process of urban planning and design.

## 2. Advantages of GIS in Urban Planning

GIS has the ability of unified management and analysis of spatial data and attribute data, which greatly enriches the means and results of planning and design. Visual and rational spatial analysis module can assist planners to simulate the planning plan. On the one hand, the database of urban planning results has been established. Through the integration and classification management of planning results resources, the efficient application of planning data has been realized, and the integrity, standardization and timeliness of data have been guaranteed. On the other hand, an assistant decision-making system supporting the technical review of urban and rural planning has been established to meet the needs of urban and rural planning supervision and management. Using GIS technology to analyze the filling and excavation of terrain can help to solve the problem of terrain leveling. In addition, the project is a conceptual plan [8]. After several rounds of expert review, it is necessary to jointly discuss the concept of the plan. The urban planning management information system is a comprehensive information system integrating urban planning, construction, management and service. The system is supported by the urban geographic information database, which realizes urban basic terrain data and various planning data, and provides acquaintance geographic information data services for the government, enterprises and the public [9]. The government's management and social services are based on advanced technical support and reliable data to achieve a qualitative and quantitative transformation. The implementation of urban planning management informationization will provide a solid technical foundation for the development of China's "digital city".

As an information technology, the advantages are positioning accuracy, powerful data management capabilities and spatial analysis capabilities, which make it have broad application prospects in urban road planning. At the same time, through the extensive application of technology in the urban and rural planning work, it can also promote the informatization construction process of urban and rural planning industry, and promote the planning industry to make benefits and achievements through technological innovation [10]. The spatial analysis of spatial data and the spatial analysis of attribute data have been greatly improved, providing an intuitive and rational tool for urban planning. By integrating all kinds of planning information with GIS technology, the technical services of planning can be gradually realized, such as research and analysis of planning, standardization of electronic data, and provision of planning thematic maps, so as to liberate the planners from the daily repetitive and complicated work and better concentrate on the rational and scientific planning preparation and planning approval. At present, this phenomenon often occurs. Planning designers are not familiar with the analysis function of GIS technology, while GIS professionals are not familiar with planning related business. Thus, there is still a gap between the application of GIS technology in planning and design and the planning needs.

Using the DEM model generated by GIS and the new district scheme to establish a three-dimensional model, as shown in Figure 1, provides the designer with a dynamic virtual urban space environment, which is conducive to the relationship between the analysis scheme and the mountain within the planning scope.

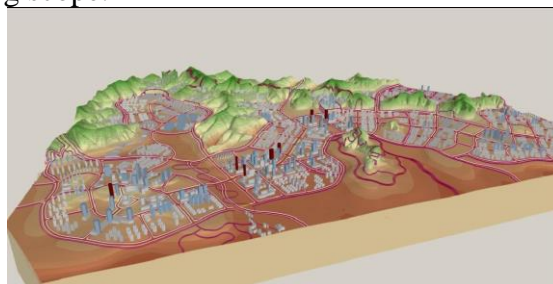


Fig.1. 3D visualization of GIS (animation screenshot)

In urban planning management, it has become a consensus in the field of urban planning to regard it as the core technology. In recent years, the application of urban planning management industry in China has developed rapidly. The application of technology provides a fast and effective means of information acquisition and analysis for urban planning and management. It is a global long-term strategic thinking, the core of which is to use digital means to deal with the earth's problems and maximize the use of information resources. Specifically, at the global, national and regional levels, long-term planning of the acquisition, processing and application of digital information on the earth's surface and shallow surface. When planning urban and rural planning, it is necessary to determine the scope of planning and research through urban master planning, urban near-term construction planning, and urban system planning. Quantitative analysis of regional development through land-use master planning, and development of regional development through social and economic development planning Qualitative analysis. Process innovation and improve the traditional production operation management mode. Today, information technology and related high technologies are developing rapidly. Using databases and computer networks to help public managers access information in a timely manner; so that information does not need to be passed up one level at a time through management hierarchy, saving time; enabling control and coordination of public management business activities at a level closer to actual activities.

### **3. Application of GIS in Urban Planning**

Urban planning is based on geospatial data and urban development status as a basis for its design and management. As far as the city itself is concerned, it is a complex system engineering. By using the functions of GIS software, the computer-aided decision support system and the 3D landscape system are integrated to construct a three-dimensional auxiliary decision support system, which helps to improve the correctness and scientificity of the planning decision. The 3D assisted decision support system can provide multi-view positioning. The application of GIS technology in urban planning and design is relatively simple and the application depth is not enough. Currently, it is only used when certain problems arise. Therefore, the application in urban planning is hindered. How to reduce the threshold of application of GIS technology in planning and design. The establishment of such an open, fair and efficient system has resulted in innovation and improvement of technology and system. Technological innovation only refers to the use of urban grid management system, that is, 10,000 meters grid information management system. It not only has the ability of routine work flow transaction processing, but also highlights the huge amount of data, on-line spatial transaction processing and analysis, multi-user concurrent operation, complex processing methods and spatial distribution. Digital City provides people with a new concept and control means of urban planning, construction and management. It can adapt to and predict the changes of the city, and then achieve sustainable urban development.

Urban-rural integrated planning is a typical spatial planning, focusing on solving the problem of coordinated urban-rural spatial development. Spatial information runs through the whole process of current situation investigation, data integration, planning decision analysis, scheme design and planning implementation. By classifying and calculating the area in GIS software, we can have a certain understanding of the current situation of urban land use. On the basis of the present situation, we should have a better grasp of the future development of urban land. Through the processing of remote sensing images and the comparison of GIS software, we can find out the differences and help the relevant departments to check the actual situation of the differences. Including compliance with the planning situation, changes in the nature of land use, land area, and implementation of relevant planning and management, etc., and found violations of urban planning violations in a timely manner. The application of GIS technology is relatively early and mature, but it is applied comprehensively and systematically in urban planning and design. It is only used to solve a certain problem in urban planning, and the application is not systematic. Generally based on GIS, the database can be linked by digital maps and geographic coordinates. Based on this, GIS performs, queries, modifies and analyzes the data, laying the foundation for data information.

On the whole, the application of China's urban planning management information system has

developed rapidly, and a number of operational operating systems have been built, but some systems still remain at a relatively junior level of application, and even difficult to actually operate, with user expectations. A considerable gap. Optimizing decision support and realizing visual performance is conducive to improving the scientific, normative and democratized levels of government decision-making, making urban planning more efficient, richer expression techniques, more information, higher analytical capabilities and Accuracy, more forward-looking, scientific and timely. The system uses the system to query, count and analyze the spatial database to discover the planning problem, and on this basis, carry out spatial analysis, assist decision-making, and propose a planning plan to solve the real problem. Because it combines the latest technology of integration of GIS and CAD, and is based on the characteristics and requirements of the planning industry, it avoids tedious data conversion or complex program development. However, in the construction of urban planning information system, the effective association between document information and "mass" graphic data has always been a bottleneck in the system construction. Therefore, it is necessary to continuously improve the planning data to meet the needs of storage and application. In the future, the data of urban planning results can be sorted out, checked, stored and managed, and the data of urban planning results can be accessed, queried, counted, analyzed, output and dynamically updated quickly and accurately.

#### **4. Conclusion**

With the acceleration of informationization, the rapid development of cities, and the further improvement and popularization of GIS and related technologies, the application of GIS technology in urban planning has made significant progress and fruitful results. With the rapid development of urbanization, urban development is faced with many uncertainties, which increases the difficulty of urban planning and design, and also raises the scientific requirements for design results. Data is the blood of GIS. The establishment of urban planning platform based on GIS can not be separated from the modeling of known geographical phenomena, that is, the establishment of geographic data model, which also involves object-oriented methods. The advantages of modern business type in urban planning management work, we have reason to believe that modern business type will become the technical support for the current information construction of urban planning management business in China. Establish a planning information management system to realize networked and automated planning information management methods, effectively maintain the accuracy and current situation of planning information, and enable other departments and fields to share information. From this perspective, it is of great significance to study the relevant application technologies of urban planning management systems.

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