Prospect of Frontier Technology of Urban and Rural Planning Supervision and Management

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Abstract

The 21st century is a crucial period for China's all-round economic and social development and modernization, and urban construction has entered a stage of rapid development. However, in the process of planning and implementation, there are frequently uncoordinated "notes" and illegal construction behaviors emerge one after another. With the progress of science and technology, a new generation of high-tech has been widely studied and applied, and many high-tech technologies have been introduced into the supervision and management of urban and rural planning, such as GIS technology, three-dimensional GIS technology, mobile GIS technology and GIS-based graphic integration technology, have been introduced into the supervision and management of urban and rural planning, greatly improving efficiency. In view of the problems existing in the informatization construction of dynamic supervision and management of urban and rural planning at present, this paper probes into the application of cutting-edge technology in urban and rural management planning at present, to provide reference for improving the informatization level of dynamic supervision.

Keywords

Urban and rural planning, GIS technology, Mobile GIS, Graphic integration

Introduction

In recent years, with the rapid development of urban economy and society and the accelerating process of industrialization and urbanization, the behavior of not building according to the permitted content in the construction process after the construction project has obtained the planning permission has occurred frequently. Due to the lack of perfect urban and rural planning supervision and management mechanism and professional and technical urban and rural planning supervision and management team, the behavior of not carrying out construction according to the license is often discovered only after it has caused a fait accompli, which not only causes adverse social impact, but also brings great pressure to the post-treatment of illegal construction [1].

At present, the law enforcement and supervision detachment only carry out law enforcement and supervision. They do so according to the planning supervision and inspection results provided by the Municipal. Institute of Surveying and Mapping after the inspection, and the data acquisition means is single. With the increase of the number of construction projects, the disadvantages of single data acquisition means will become increasingly obvious, the workload of the Municipal Surveying and Mapping Institute will increase greatly, the input cost of planning supervision and management will increase significantly, and the efficiency of planning supervision will also be greatly reduced. The mobile monitoring ability of dynamic monitoring of urban and rural planning is insufficient. On the one hand, when conducting on-site supervision and inspection, it is difficult to save time and upload on-site planning inspection records, on-site photos and other materials to the law enforcement and supervision system. On the other hand, it is difficult to download construction project planning supervision information to the client (PAD or mobile phone) and conduct real-time and dynamic supervision and management of construction projects through the mobile client [2,3].

As an important means of urban and rural planning supervision, public supervision has an important impact on the implementation of urban and rural planning supervision and management. At present, the public

participation in the supervision and management of urban and rural planning in Zhuhai is insufficient, the degree of informatization is low, and the participation effect is not good, which affects the implementation effect of urban and rural planning supervision and management in Zhuhai to some extent [4].

Application of GIS technology

Geographic Information System (GIS) originated in the 1960s, which is an information technology integrating computer technology, surveying and mapping science, applied data, information science and earth science. This technology can conveniently and quickly realize the collection, storage, management and analysis of geospatial information [5]. With the development of social economy and the rapid advancement of urbanization, the scope of urban and rural planning supervision and management is getting wider, and the amount of information involved is getting bigger. Traditional manual work and analysis methods can no longer meet the business needs of urban and rural planning supervision and management. More than 80% of the business information of urban and rural planning supervision and management belongs to spatial information [6]. With the special spatial analysis and visual expression function of GIS technology, the analysis results can be generated quickly and displayed clearly [7]. Therefore, GIS technology has been widely used in urban and rural planning supervision and management, land and resources supervision and management and other fields.

The application of GIS technology in urban and rural planning supervision and management is mainly reflected in the analysis of illegal cases, including the following specific applications.

(1) Analysis of illegal cases. Using the overlay analysis function of GIS, the spatial coordinates of nonconforming parts in urban and rural planning supervision results are overlaid with layers such as approval planning map, land use planning map, land use status map, cadastral map, land use red line map and basic farmland protection map, and the distribution of nonconforming parts is analyzed.

(2) Analyze the temporal and spatial correlation of nonconforming parts, predict the possible construction stages and spatial areas of nonconforming parts, and assist the regular monthly planning and inspection. Using scanning statistics, density clustering, mixed distance and other spatio-temporal clustering methods, the data of nonconforming parts are deeply mined, the spatio-temporal correlation of nonconforming parts is analyzed, the possible construction stage and spatial area of nonconforming parts are predicted, and then the monthly regular planning inspection is assisted.

(3) Analyze the causes of nonconforming parts. Based on experts' experience, a set of nonconforming factors is initially constructed, and the causes of illegal cases are analyzed by means of correlation analysis and regression analysis.

Application of 3D GIS technology

Three-dimensional GIS technology is a new technology developed based on two-dimensional GIS technology, which uses three-dimensional simulation technology to collect three-dimensional data, make model textures and establish three-dimensional visual models. Its core lies in the construction of three-dimensional spatial database. 3-D GIS must be able to support 3-D vector and raster data models and 3-D spatial databases are based on them and can solve the problem of spatial operation and analysis of 3-D data models [8].

Three-dimensional GIS technology not only has the spatial display and analysis function of two-dimensional GIS technology but also can greatly improve the performance effect of data, so that data information can be displayed to analysts simply and intuitively. At present, it has been widely used in urban and rural planning, mapping, resource management, macro-decision support and other fields.

The application of 3D GIS technology in the supervision and management of urban and rural planning is mainly reflected in the verification of planning conditions. Firstly, the planning approval scheme of the construction unit is made into a three-dimensional planning model by using three-dimensional GIS technology. Then, the supervised surveying and mapping results provided by the Municipal Surveying and Mapping Institute are made into a three-dimensional status model by using three-dimensional GIS technology [9]. After the three-dimensional planning model and the three-dimensional status model are made, law enforcement supervisors can

clearly compare the two three-dimensional models from any angle and height, such as the location, length and elevation of a single building, and finally judge whether the construction project has strictly implemented the project planning.

Application of mobile GIS technology

Mobile GIS is a set of software and hardware systems that simulate, express, process, query, retrieve and analyze mobile entities and background reference entities (relatively static or moving) when one or more mobile entities are in relatively static or moving entity groups in electronic maps and GIS. With the development of GIS technology and the increase of social demand, mobile GIS technology has been widely used in the fields of urban and rural planning supervision and management and administrative office. For example, Chongqing urban planning bureau has developed a set of urban and rural planning supervision and law enforcement information system based on mobile GIS; Baiyun District Branch of Guangzhou Municipal Bureau of Land Resources and Housing Management plans to establish an office platform based on mobile GIS in 2015-2019. After the introduction of mobile GIS into the office system, the office location will no longer be limited to the fixed office, the office forms will be flexible and diverse, and the office efficiency will be greatly improved. After the introduction of mobile GIS into the dynamic supervision and management system of urban and rural planning, a mobile supervision system can be established. The system can realize the process and informatization of post-approval management and violation investigation of engineering construction projects, and can effectively monitor the whole process of engineering construction projects from the approval of engineering planning permits to the completion acceptance of projects, grasp the law enforcement supervision and management of projects in the city, and effectively ensure the consistency between the approval, implementation and completion of engineering construction projects. The specific application is mainly reflected in the following three aspects:

(1) When carrying out regular monthly supervision and inspection, the supervision and law enforcement officers can report and renew the collected field information data, such as field surveying and mapping data and field photos, in time through the mobile client installed on the Android phone or iPad tablet computer.

(2) When carrying out regular monthly supervision and inspection, you can use Android mobile phone or iPad tablet computer to quickly locate and navigate the map of the construction project to be inspected.

(3) Law enforcement officers can use Android phones or iPad tablets to quickly browse and query the monitoring items. The establishment of mobile monitoring system needs to design a scientific and reasonable technical framework. Because the mobile client of the mobile monitoring system adopts intelligent terminal equipment, which is light, flexible, easy to carry and elegant in appearance design, the portability is greatly improved, but its storage and calculation ability is greatly weakened. Therefore, it is unrealistic to store all static spatial data on the mobile client. It is necessary to establish a server for data storage and calculation and establish the connection between the server and the solid terminal and the mobile client through wired or wireless communication technology, the technical architecture of the whole system and the functions of the mobile client.

The application of graphic integration technology based on GIS

With the development of computer technology, the concepts and technical means of GIS have gradually penetrated all aspects of management. Based on map data and other management data, it has become a new technology of modern management to develop an integrated system of graphics and text. In recent years, GIS-based graphic integration technology has been widely used in urban cadastral management, urban planning, land and resources management and other fields.

The integration of graphics and text based on GIS refers to the seamless integration of graphic data and structured data through certain technical means, and based on data integration, information extraction and mining are carried out to realize the mutual search, display and output of graphics and text. The introduction of GIS-based graphic integration technology into the urban and rural planning supervision and management system can realize the rapid interactive operation of “looking up the text from the map” and “looking up the map from the text” and carry out the rapid map positioning of the

supervision project [10]. The core of realizing integrated management of graphics and text is data integration, that is, the design of integrated database of graphics and text. To design an integrated database of graphics and text, we must first know what data needs to be stored and displayed. The data on urban and rural planning supervision and management mainly include:

(1) Documents, such as planning inspection results report, construction project planning implementation management manual, etc.

(2) Raster data, such as high spatial resolution remote sensing images, planning and inspection site photos, etc.

(3) Vector data, such as administrative division boundaries, topographic maps of different scales, survey control points, etc. These data can be divided into two categories, namely spatial data and non- spatial data. Then we need to consider how to display spatial data and non-spatial data in an associated way. Because spatial data and non-spatial data are heterogeneous, they are often stored in different databases. To reduce the workload of database construction and save costs, two databases are usually connected by using attribute information to realize the interactive query and display of spatial data and non-spatial data, and finally the logical structure of the database is designed.

Conclusion

The application of remote sensing technology in the dynamic supervision and management of urban and rural planning is mainly reflected in the following three aspects: (1) Auxiliary planning supervision and measurement. As a cutting-edge data acquisition method, remote sensing technology can assist the field data acquisition of planning and supervision surveying and mapping. (2) Auxiliary construction progress monitoring. Through the comparative analysis of remote sensing images in different phases, monitor the construction progress of each monomer of the construction project. (3) To assist the regular monthly planning inspection. Through the interpretation and analysis of remote sensing images, we can master the construction situation of construction projects within the city and conduct key spot checks on suspected illegal construction projects.

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Conflicts of Interest

The authors declare no conflict of interest.

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