Investigation and application of urban background resources based on multi technology integration

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Abstract. With the development of natural resources management from extensive management to refined management, the traditional survey methods had problems such as single survey methods and data sources, and less detailed data of urban land space. It was difficult to meet the needs of urban land space monitoring and refined management of natural resources. Therefore, more detailed urban background resource data was urgently needed to support the needs of land space planning and refined management of natural resources. Through the research of multi technology integrated urban background resource investigation method, this paper conducts detailed investigation and integrated application on the production, life, ecology, history and humanities of urban land space, so as to provide better data and technical support for the fine management of natural resources.

Keywords: refined management; background resource survey; big data

1. Introduction

At present, Chinese urban economic development is transforming from high-speed development to high-quality development and from incremental development to stock development. As a typical mountain city in China, Chongqing's physical space development is increasingly restricted, and the high-quality development potential of urban land space has not been fully released. After the establishment of the Ministry of natural resources, natural resources investigation and monitoring has provided good basic data for the implementation of "two unified responsibilities". However, with the development of natural resource management from extensive management to refined management of natural resources [1], traditional survey methods have problems such as single survey methods and data sources, and less detailed data of urban land space. It is difficult to meet the needs of urban land space planning monitoring and refined management of natural resources. More detailed background resource data is urgently needed to support the needs of land space planning and refined management of natural resources.

Through the investigation and research of urban back-ground resources with multi-technology integration, the detailed investigation of urban production, life, ecology and history and humanities[2], such as public facilities, infrastructure, land use, building use efficiency, historical humanities and urban land residual development space, will be carried out to form a basic database of urban background information with multi-source data supporting, complementing and checking each other, Find out the background resource data of urban space on every inch of land, provide better data and technical support for fully tapping the development potential of urban land and space, urban renewal and other land and space planning and fine management of natural resources, to achieve the application goal of "speaking with data, making decisions with data, managing with data and innovating with data", and promote the construction of natural resources investigation and monitoring technology system.

2. General idea

The investigation methods of intelligent remote sensing interpretation [3], "Internet +" land survey, multi-source data spatialization and big data, cloud computing and other technologies are

comprehensively used to obtain the information of urban background resources. Big data and cloud computing are used to solve the problem of big data storage and calculation of urban background resources. Meanwhile, connecting all workflow technologies and methods in series and integrating the results of urban background resource survey to build a map system of urban background resource survey to realize the rapid statistics of multiple types of background resource information within any land parcel, and master the endowment of urban space background resources on every inch of land by one click query, in order to provide technical and data support for urban national space planning and monitoring and fine management of natural resources.
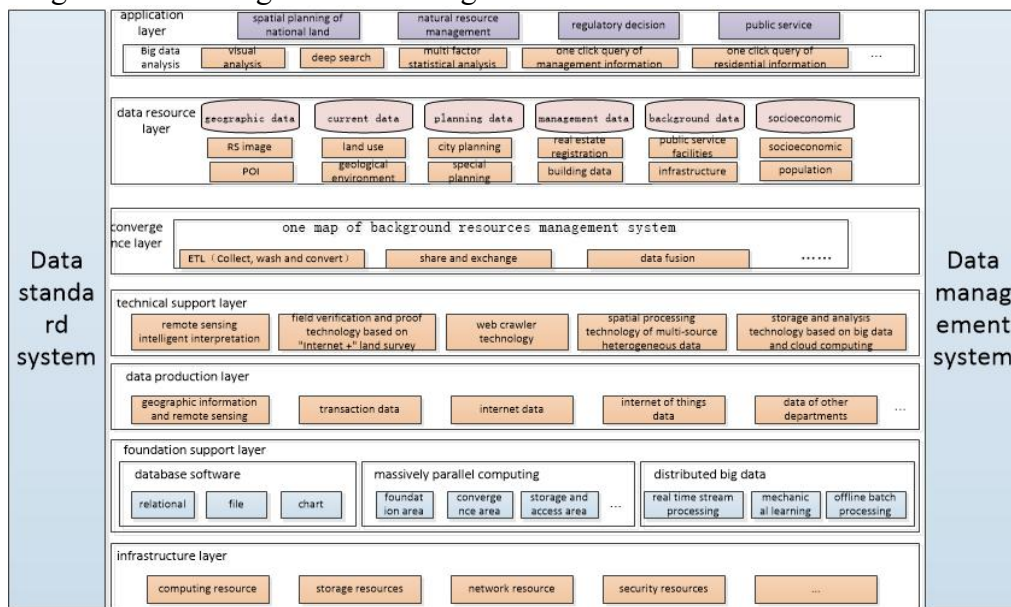

Figure 1. Overall architecture design.

3. Key technologies

3.1 Intelligent extraction technology of remote sensing on specific elements of natural resources

It is mainly based on long-term quantitative multi-source remote sensing data, combined with the current land use data of the third national land survey and change survey data, and through the establishment of remote sensing sample databases of urban green space, squares, parks, buildings and so on, which are oriented to the investigation and monitoring of urban background resources, it builds a deep learning model for automatic extraction of specific elements of background resources and their change information, so as to realize the automatic extraction of new urban construction land, building space, urban green space. The overall accuracy of remote sensing quantification and intelligent extraction of natural resource elements such as water area can reach more than 85%, which can effectively improve the efficiency of remote sensing information extraction of natural resources and background resources.

3.2 Field verification and proof technology based on "Internet +" land survey

"Land survey cloud" is a survey monitoring and field verification system which used by the ministry of natural resources in the field of township grass-roots planning of natural resources commonly. It provides real-time query of land status, land planning, remote sensing images, basic farmland and other information, as well as functional services such as photographing and evidencing of land types. Its objective and real characteristics are very consistent with the basic requirements of the current national natural resources survey and monitoring work. Based on new technologies such as "Internet +", mobile GIS and UAV interconnection, and based on the Chongqing Branch of the land survey cloud, the mobile app for urban background resource survey

is developed. The mobile background resource survey software and the high-precision GNSS mobile application are used to enhance the positioning system, accurately draw background resource maps and fill in relevant attribute information through field surveys, and use mobile random photos and UAVs to conduct on-the-spot investigations and provide evidence, The relevant information was uploaded to the one map system of background resource survey, which comprehensively investigated the current situation of land use and actual users of urban space inefficient land, slope land, urban surplus state-owned vacant land, etc., and provided strong support for comprehensively and clearly mastering the current situation of natural resource assets.

3.3 Spatial governance technology of multi-source data

Firstly, the background resource data crawler tool is compiled based on the network data crawler technology, which can capture the location service data, POI data, enterprise information data and other information of medical facilities, educational facilities, social welfare facilities, administrative offices and other municipal infrastructure and public service facilities in the website address and Internet map information automatically and quickly, and convert the location service data coordinates into CGCS 2000 coordinates by compiling a coordinate conversion program, the web data crawler program is encapsulated into a tool and integrated into the one map system of urban background resources to realize the automatic update of background resource information. Secondly, through special data collection, relevant background resource data and relevant materials, including spatial data, attribute data and unstructured data, provided by the development of NDRC, Housing and Urban Rural Development Commission, Municipal Bureau of Civil Affairs, Bureau of Public Security and other relevant departments, FME was used to build tools for spatial data and attribute data fusion and unstructured data spatialization (XLS / txt to SHP), which realized the governance of unstructured data standardization spatialization quickly.

3.4 Storage and analysis technology based on big data and cloud computing

Considering the large amount of data obtained from the urban background resource survey, the project adopts the mixed mode of "relational database + distributed file database" to build the urban background resource database. On the one hand, the basic data of urban background resources is stored in a relational database, which is coordinated with HA mode and load balancing technology to ensure the smooth operation of the database. On the other hand, the full coverage patch data that needs to be subjected to large-scale data overlay analysis is stored in the HDFS storage system. At the same time, based on the "Hadoop + spark" big data technology framework, the big data engine software is used to realize the rapid overlay analysis and statistics of large-scale vector data spatial data in the background resource database, and the rapid overlay analysis and statistics of multiple types of background resource information in any range, It improves the statistical analysis efficiency of urban background resource information effectively, and provides technical and data support for urban renewal planning, fine management of natural resources and background resources.

3.5 Integrated R & D of a map management system for background resources

Through the integration of remote sensing intelligent extraction, "Internet +" land survey, multi-source data standard governance, big data storage and analysis and other background resource survey workflow methods, the urban background resource database was obtained, and the survey results were integrated to build a one map management system of urban background resources. The system provides functions such as comprehensive query of background resource information, comprehensive statistical analysis, and comprehensive data management, warehousing and updating tools, and big data analysis model construction, which realizes rapid statistics of multiple types of background resource information in any range. In addition, by constructing the land life atlas model and the background information atlas model, the life-lines of land resources such as "regulation, planning, approval, requisition, supply, storage and registration" are connected in series, and the

background resource information of the plot is related at the same time. The background resource endowment of urban space on every inch of land can be inquired and mastered at one click, providing technical and data support for urban land space planning and monitoring and fine management of natural resources.

4. Pilot application effect

The relevant research results of the project have been applied to the construction of the natural resources (background resources) investigation project in Yuzhong District successfully. There is no precedent for other provinces and cities in China to carry out urban background resources investigation. Through the multi technology integrated urban background resource survey method, the project has obtained and built the background resource database of Yuzhong District in detail and comprehensively, which basically covers all the data contents of production, life, ecology and cultural space in Yuzhong District. There are about 180 background data resource layers and the data volume is about 20TB. In combination with the large amount of data obtained from the survey of ur-ban background resources, the project adopts the mixed mode of "relational database + distributed file database" to build the urban background resource database. At the same time, based on the "Hadoop + spark" big data technology framework, the big data engine software is used to realize the rapid superposition analysis and statistics of large-scale vector data and spatial data in the construction of the background resource database, It can easily and quickly grasp the endowment of urban spatial background resources per inch of land. Such statistical analysis results cannot be completed quickly by using conventional statistical methods. However, in the one map system of background resources in Yuzhong District, it only takes half a minute to count a variety of background resource information in any area, which can effectively improve the efficiency of land spatial planning and design and urban renewal design, At the same time, it provides technical support for the fine management of natural resources.
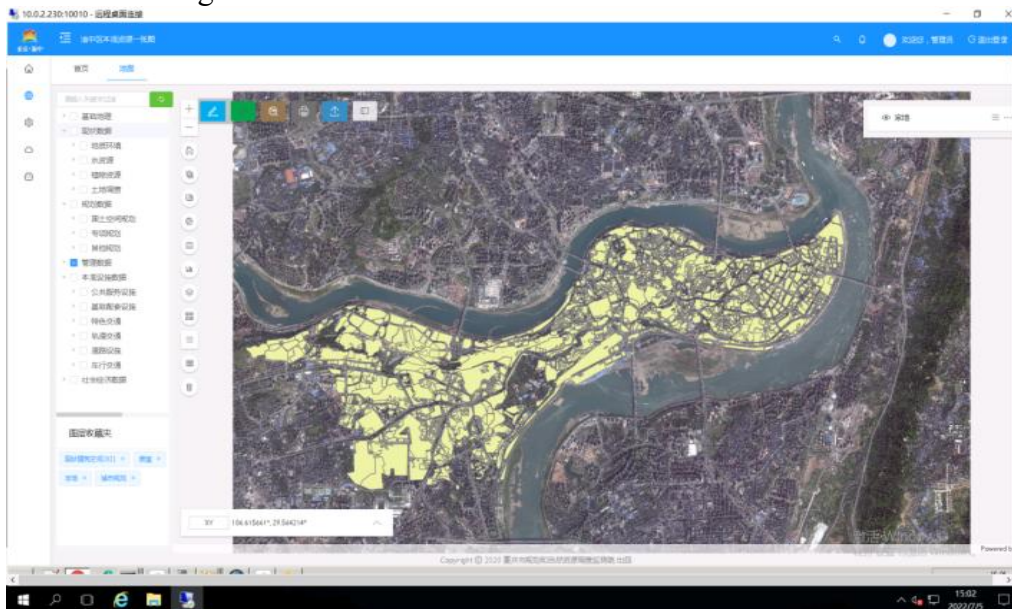

Figure 2. One map of background resources management system.
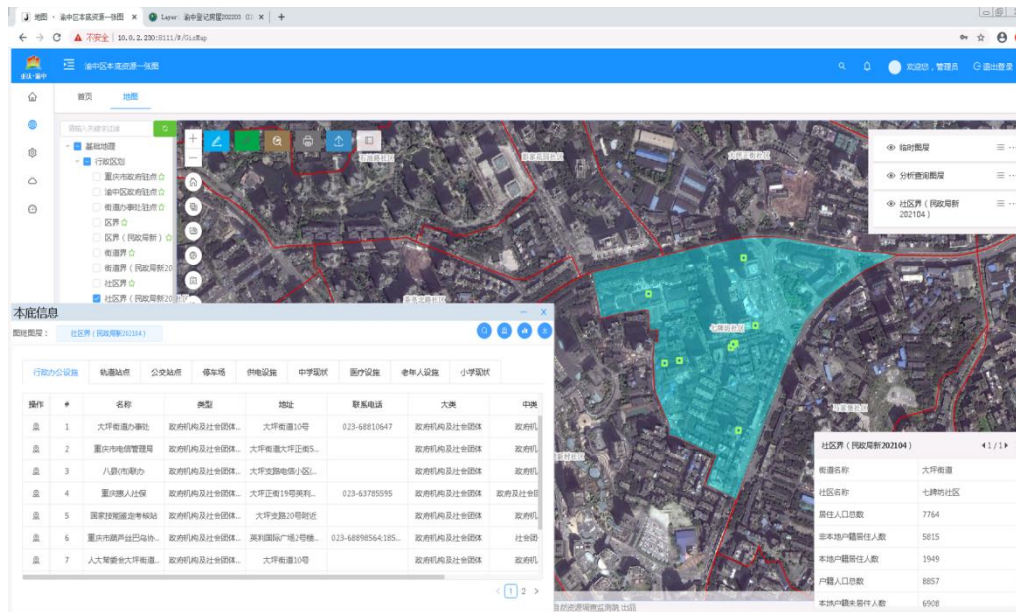
Figure 3. Statistical analysis of multi factor comprehensive query.

5. Conclusion

In the context of land and space planning, urban land and space monitoring, urban physical examination and refined natural resource management are extremely important for timely mastering the requirements of urban background resource information. Rapid and timely mastering of urban space background resource information on every inch of land plays an important role in service support planning, natural resource management, administrative service decision-making and public service management of district level departments. At the same time, this study has formed a working mode and technical method that is in line with the local reality and can be popularized, which can provide a reference for the promotion and application of background resource investigation in the whole city or other provinces and cities in China.

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