# The Construction and Practice of Big Data Mapping GIS under Low Altitude Remote Sensing

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**Abstract.** This paper introduces the construction and practice of big data mapping geographic information system under low-altitude remote sensing. The combination of low-altitude remote sensing technology, which obtains high-resolution remote sensing data through unmanned aerial vehicles and satellites, and big data technology, which can process and analyze huge geographic information data, provides new ideas and methods for the development of geographic information systems. Starting from an overview of low-altitude remote sensing technology and the advantages of its application, the article discusses the process of building a big data mapping GIS and introduces a practical case based on the system. At the same time, the current challenges and future development trends are also put forward.

**Keywords:** Low-altitude remote sensing; big data, mapping; geographic information system, construction practice.

## 1. Introduction

With the rapid development of technology and the continuous progress of society, geographical information systems (GIS) are increasingly used in various fields. The rapid development of low-altitude remote sensing and big data technology has brought new opportunities and challenges for the construction and practice of GIS. The fusion of low-altitude remote sensing technology, which obtains high-resolution remote sensing data through the use of drones, satellites and other vehicles, and big data technology, which can process and analyses huge geographic information data, provides more accurate, efficient and comprehensive support for the construction and practice of GIS. This paper will discuss the process of building and practising big data mapping GIS under low-altitude remote sensing, and demonstrate its application in different fields through practical cases. It will also discuss the current challenges and future development trends, with a view to providing useful references and insights for research and practice in related fields. By making full use of the advantages of low-altitude remote sensing technology and big data technology, we can build a more powerful and intelligent GIS to provide more accurate and comprehensive support for social development and decision-making.

## 2. Application of low-altitude remote sensing technology in big data mapping

With the rapid development of low-altitude remote sensing technology and big data technology, their combination in the field of geographic information system (GIS) provides a new opportunity and method for big data mapping. Low-altitude remote sensing technology acquires high-resolution remote sensing data through drones, satellites and other vehicles, while big data technology is able to process and analyses huge amounts of geographic information data. The following will introduce the application of low-altitude remote sensing technology in big data mapping and discuss its advantages.

Low-altitude remote sensing technology can provide high-resolution geographic data. Through imaging equipment carried by vehicles such as drones, finer, real-time remote sensing images can be acquired. These high-resolution data can be used for operations such as feature classification, feature extraction and 3D reconstruction, resulting in more accurate extraction and representation of

geographic information. The application of big data technology, on the other hand, can process and manage this huge amount of geographic data, ensuring its accuracy and integrity.

Low-altitude remote sensing technology can carry out multi-angle and multi-temporal observation. Compared to traditional satellite remote sensing, low-altitude remote sensing technology can be more flexible in adjusting the observation angle and time to obtain multi-angle and multi-temporal data. These data can be used for applications such as feature change monitoring and environmental evolution analysis, providing more comprehensive geographic information support for decision-making. At the same time, the application of big data technology can realise the storage, processing and analysis of these multi-dimensional data, helping users to better understand and utilise geographic information.

Low-altitude remote sensing technology also enables access to richer geographic information. In addition to high-resolution remote sensing images, low-altitude remote sensing can also acquire other sensor data, such as LiDAR data and thermal infrared data. These data can provide additional geographical attributes and features for use in areas such as terrain modelling and subsurface resource detection. The application of big data technology can integrate and analyse these multi-source data to achieve a more comprehensive and in-depth geographic information processing.

## 3. The construction of big data mapping GIS

Data acquisition is the key link in the construction of the system. Low-altitude remote sensing technology provides the means to acquire high-resolution geographic data, and can be used to acquire surface images, LiDAR data, etc. through unmanned aerial vehicles, satellites and other carriers. In addition, richer geographic information can be acquired in combination with other sensors. The acquired data needs to be pre-processed, including geometric correction, radiation correction and noise removal, to improve data quality and accuracy.

Data storage and management is an important part of building a big data mapping GIS. Huge geographic information data needs to be stored and managed effectively to ensure data security and accessibility. Traditional relational databases can no longer meet the needs of big data storage and query, so distributed storage and processing technologies, such as Hadoop and Spark, need to be adopted. At the same time, a metadata management system is needed to facilitate data retrieval and utilization.

Data analysis and modelling are the core aspects of system construction. Using big data technologies, huge amounts of geographical data can be processed and analyzed efficiently. For example, operations such as feature classification, feature extraction and change detection can be carried out to extract the intrinsic laws of geographical information. In addition, methods such as machine learning and deep learning can be applied to build predictive models and decision support models to achieve intelligent analysis and application of geographic information.

Data visualization and application is an important part of building a big data mapping GIS. Through data visualization techniques, huge geographic information data can be presented to users in an intuitive and easy-to-understand manner. Visualization methods such as maps, charts and dynamic displays can help users better understand geographical phenomena and trends. At the same time, corresponding application interfaces and tools need to be developed to support the user's query, analysis and application of geographic information data.

## 4. Practice of big data mapping GIS

In the field of urban planning and land management, big data mapping GIS can be used for land use analysis and urban construction planning. High-resolution remote sensing image data obtained through low-altitude remote sensing technology can be used for land classification and change monitoring to help decision-makers understand the status and trend of land use. Spatial analysis and

modelling using big data technology can predict urban expansion trends and provide a scientific basis for urban planning.

In the field of resource and environment management, big data mapping GIS can be used for natural resource monitoring and environmental protection. LiDAR data acquired through low-altitude remote sensing technology can realise terrain modelling and groundwater resources investigation, helping to understand geological formations and water resources distribution. Remote sensing image analysis and geographic data mining using big data technology can monitor changes in forest cover and land degradation, providing support for environmental protection decisions.

In the field of transport planning and management, big data mapping GIS can be used for transport network optimization and traffic flow prediction. Road network data and traffic flow data obtained through low-altitude remote sensing technology can be used for traffic simulation and route planning, helping to optimize the layout of traffic networks and traffic congestion. Traffic data analysis and prediction model construction using big data technology can predict traffic congestion points and optimize traffic signal control to improve transport efficiency.

In the field of disaster risk management and emergency response, big data mapping GIS can be used for disaster monitoring and risk assessment. Remote sensing images and thermal infrared data obtained through low-altitude remote sensing technology can enable disaster damage assessment and post-disaster reconstruction planning. Spatial analysis and model building using big data technology can predict the probability of disaster occurrence and the scope of disaster impact, and make emergency preparations in advance.

## 5. Conclusion

The construction and practice of big data mapping GIS has important significance and application value in today's society. The development of low-altitude remote sensing technology provides strong support for acquiring high-resolution and multi-angle geographic data, while the application of big data technology enables huge geographic information data to be stored, managed and analysed in an efficient manner. Through the integrated use of these two technologies, a powerful and intelligent GIS can be constructed to provide accurate and comprehensive support for decision-making and development in various industries. The construction and practice of big data mapping GIS faces a number of challenges, such as data quality assurance, data privacy protection and technology integration. However, these challenges will be gradually overcome with the continuous advancement of technology and the accumulation of application experience. In the future, we can foresee that big data mapping GIS will be applied in a wider range of fields, providing more accurate and efficient solutions for urban planning, resource and environmental management, transportation and disaster risk management. In short, the construction and practice of big data mapping GIS is a field full of opportunities and challenges. By making full use of the advantages of low-altitude remote sensing technology and big data technology, we can build a more powerful and intelligent GIS, provide accurate and comprehensive support for social development and decision-making, and promote the further development of geographic information science.

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