Solid Mineral Geological Exploration Technology Based on Geological Information Theory

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Abstract: China's mineral resources are rich in variety and widely used, among which solid minerals account for a relatively high proportion. China's development and utilization of solid minerals is relatively early and experienced. In recent years, with the advancement of science and technology, China's corresponding technical methods in the exploration of solid minerals have been further developed, and engineering technology has also changed accordingly. In particular, the development and application of information technology has enabled the level of prospecting technology to be continuously improved, which has largely guaranteed the efficiency and quality of prospecting work. The analysis and discussion of the prospecting technology in the solid mineral area, summarizing the relevant recommendations, is of great significance for the subsequent mineral development.

1. Introduction

With the development of science and technology, cloud computing technology has begun to penetrate into various fields of people's lives. It is necessary to continuously improve the understanding of geological information management, analysis, storage and actual surveying and mapping work, and ensure effective management of geological information data. Optimize informational data analysis. Promote the application level of cloud computing and Internet of Things technology in the context of big data era, and promote the rationalization of geological information analysis [1].

China's mineral exploration work has a relatively early history, and has accumulated rich experience over the years, and related technologies have become increasingly mature. However, there is still a gap compared with foreign technology, which is not conducive to the future development of mining and scientific and technological requirements. This paper mainly analyzes the application of regional prospecting technology in solid mineral exploration, summarizes the characteristics of domestic minerals, and expounds the basic ideas of prospecting. It aims to adopt different exploration methods according to local conditions and improve the development efficiency of minerals.

Due to the complexity of engineering geological survey content, traditional survey techniques have been unable to meet the data collection and analysis work by combining attribute data and graphic image data. The application of GIS technology can better compensate for the defects of traditional exploration methods, and can process complex data and describe complex spatial entities [2]. Using visualization technology and graphical interaction technology to establish a database, store and manage experimental data of engineering geological exploration, establish a three-dimensional model of engineering geological body, update and update the information of the research area in real time and automatically display the distribution of data in the study area, using model feedback to find out [3]. There are deficiencies in the survey work, and the survey plan is revised to guide the implementation of the next step [4].

Under the guidance of the scientific development concept and sustainable development, the geological and mineral exploration work has received extensive attention and attention from all levels of the state and society. How to improve the efficiency and technical level of geological mineral exploration has become a key issue for the state and survey enterprises [5]. GIS technology is produced and developed in this context. It can exert very good effects and generate economic

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benefits in practical applications, but there are also some problems that require us to conduct more in-depth research. Through the author's many years of work experience in geological mineral exploration, this paper analyzes the application of GIS technology in geology and mineral exploration based on the theoretical background of geological informationization.

2. Construction of geological information platform

The geological information platform is an integrated solution based on GIS system, supplemented by satellite navigation and positioning data to realize geological survey data management, analysis application and sharing. The goal of the platform is to digitize various geological survey results, to model three-dimensional models and to express results, and to provide a multi-source heterogeneous underground spatial data management platform and a three-dimensional visual decision support platform for government and professional researchers. Considering the security of system data, the system development adopts C/S architecture and 3D GIS technology [6]. Based on Microsoft. net's network service platform, the spatial layer data of GIS is combined with the corresponding geological attribute data to generate 3D visualization. GIS geological information platform [7].

2.1 System structure and function of geological information platform

According to the system construction goal, the structure and function of the system will be considered from the two aspects of overall structure design and function allocation, ensuring that the database and software modules of the system can be easily updated and expanded in future applications to reduce the total work of system development work. Volume, the overall structure is shown in Figure 1.

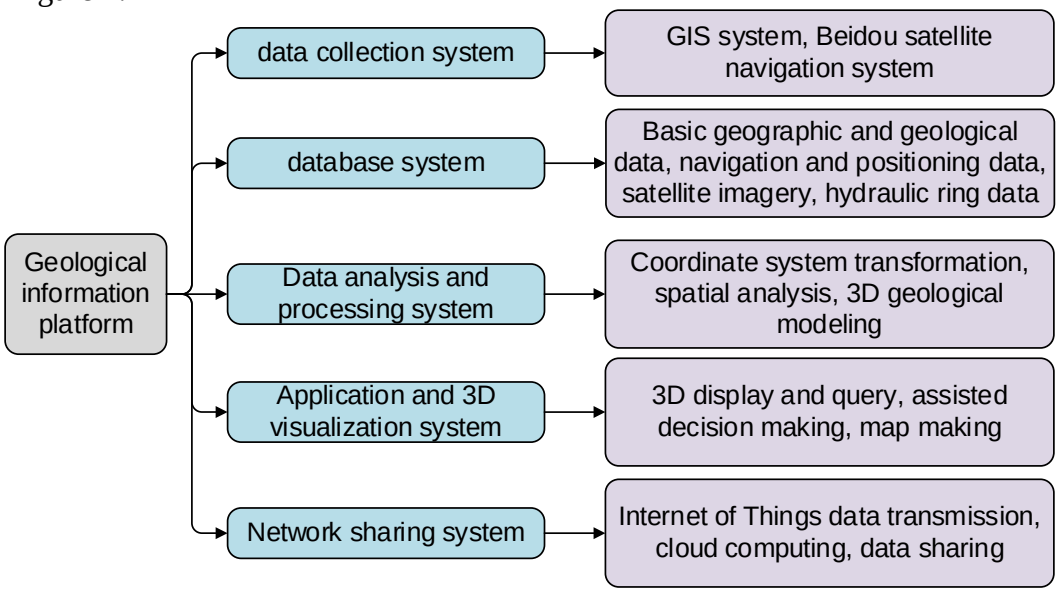

Fig.1. System architecture of the information platform

Data collection is the process of collecting data information of various geological entities, and analyzing the process of filtering and storing data through a processing mechanism. The data acquisition system realizes the connection between the computer system and the geological entity, collects various kinds of data information of the real target object, and stores it on the computer system, and performs data analysis and processing through a unified mathematical model [8]. With the development of intelligent acquisition systems, faster data acquisition speeds are possible. At present, the use of more intelligent data acquisition devices, such as drones, exploration robots, etc., can upload remote data to the cloud, perform statistical analysis after reading data statistics in the cloud, and gradually use remote measurement data collection using manual measurement survey mode. Replaced by the pattern.

The database is a collection of data formed by storing geological maps and related data in a

computer based on a unified data format standard based on geographic information systems and database technologies.

Spatial analysis and processing is based on the spatial analysis of basic geographic elements of points, lines and planes. New information is extracted through spatial analysis methods such as spatial information query and measurement, buffer analysis, overlay analysis, network analysis and geostatistical analysis. This solves the need for spatial data processing and output in different application areas, and simplifies geographic entities and spatial relationships.

The geological informatization platform can display the analyzed and processed data through symbolic classification, and can quickly construct points, lines and surface objects with common features through three-dimensional symbols.

2.2 Geological information platform design

In the overall structure of the system, a three-layer model structure is usually adopted, and the system is constructed according to the data service layer, the application logic layer, and the presentation layer. In the software design and implementation, the object-oriented method is adopted. Based on the application components composed of software objects and logic-related software objects, the system analysis and design structure view are used for programming and organization.

The presentation layer is the outermost layer of the system platform. It is mainly used to display data and receive user input data. It can provide users with an interactive operation interface to display data through a visual user interface. In this information system, the presentation layer serves as the user's map representation interface, and text, images, and the like are provided through the browser, and the server side of the system is responsible for processing various data requests sent by the user through the client.

The application logic layer is the core part of the system architecture. The key technologies are the formulation of rules, the implementation of processes and the system design in terms of business requirements. The application logic layer implements the client's request through the presentation layer by applying relevant data through specific procedures and rules. The logic layer is in the middle of the data access layer and the presentation layer, which plays a role in the data exchange. Through such processing, the GIS system achieves maximum flexibility and stability in function performance.

The data layer is also called the persistence layer. Its function is mainly responsible for accessing the database. It can access database systems, binary files, and text documents. The data layer uses the spatial data engine to manipulate components and metadata components to achieve centralized management of spatial data, while using a relational database, which can also serve as a host database for the spatial data engine to store data and centrally manage the data. Ensure the integrity of the public base space database attribute data.

The server is the center of application data organization management and distribution sharing. According to the data delivery mode in the specific application environment, it can be provided by distributed file server, spatial database, database server, geographic information system server, internet server, streaming media forwarding server, etc. Based on the data type and the amount of data, the server side displays the effect from the geospatial browser to achieve data sharing and publishing.

3. Solid mineral exploration technology under the background of information

The geological exploration work serves the national economy. It is the guarantee of important mineral resources. Under the new situation, the mineral geological exploration technology should also be adjusted and innovated. This is the main driving force for development. The introduction and promotion of advanced mineral geological exploration technology is to cultivate internal strength. It has important decisive significance for the geological exploration activities of minerals. Find a balance point and achieve “protection in development and development in protection”. Continue to update exploration instruments and equipment in a timely manner. At the same time,

the state and industry departments should provide strong assistance, pay attention to the education and training of internal personnel, strengthen their ability to operate equipment and equipment, build a modern geological and mineral exploration team, and realize the dual promotion of technology and talent.

3.1 Prediction and analysis of metallogenic model

Using GIS technology combined with massive amounts of comprehensive information, the spatial sampling task can be done well. The structural evolution, igneous activity and sedimentary equivalent characteristics are analyzed from the perspectives of time and space and multivariate statistics. It can predict mineralization, and thus rationally guide a series of related work such as mineral exploration, and can also simulate the geological evolution of the local area.

3.2 GIS mineralization prediction anomaly application

GIS is useful in mineralization prediction because GIS technology has the function of analyzing geological anomalies; it can delineate areas that may be mineralized, can be used for prospecting and areas where prospecting is more favorable; Analyze (faults, strata, magma layers, geophysical and geochemical anomalies, etc.), analyze whether it has a certain relationship with the known deposits, and then calculate the relationship between the anomalies and the ore points by processing the statistical data. The radius and other data, which has an important research role in spatial correlation. According to the favorable degree of prospecting, a new data layer can be generated. By using the spatial analysis superposition function of GIS technology, the prediction area of mineralization can be delineated accordingly. Furthermore, the prediction model of the ore-forming space of GIS can be constructed, the specific sections of the prospecting can be delineated, and different geological information and prospecting information can be integrated, integrated, screened, matched and superimposed. After the above operation is completed, the data of the ore-finding evidence layer can be superimposed to generate a completely new data layer, and the prediction area of the mineralization is delineated.

3.3 Exploration technology integration development trend

With the development of science and technology in China, China's mineral resources exploration and mining technology is more and more mature, and different survey techniques have different characteristics, and each survey technology has its own scope of application. Therefore, in the development process of China's solid mineral resources, it is necessary to select appropriate exploration techniques based on survey objects and survey conditions, so that the exploration effect of solid mineral resources can be more obvious. However, in the past mineral exploration work in China, the lack of careful analysis of the characteristics of minerals and the on-site exploration of mineral resources on-site mining, coupled with the old-fashioned thinking of mineral surveyors, led to the inability of many mineral exploration techniques to be fully utilized. This has brought great inconvenience and impact to the mineral survey work. However, with the emergence and application of new GIS mineral exploration technology in recent years, many mineral resources exploration technologies have been continuously improved and developed, from the development of mineral resources to the application of exploration technology, and then applied exploration technology to the field development of minerals. Among them, a set of development trends of exploration technology integration has gradually formed. From the development to the end of mineral resources, it is reflected in every link and stage, so that in the exploration process of mineral resources, various exploration techniques can exert their unique characteristics. Advantages, improve the quality and effectiveness of its mineral resources exploration work.

3.4 Mineral resources exploration potential evaluation

Through GIS technology, it is possible to effectively combine various types of geographic information with modern geological theories and conduct effective analysis to summarize the mineral resources information of the research area, and finally evaluate the mineral resources potential of the area through mineral resources information. The main process of GIS technology

for mineral resources exploration is shown in Figure 2.

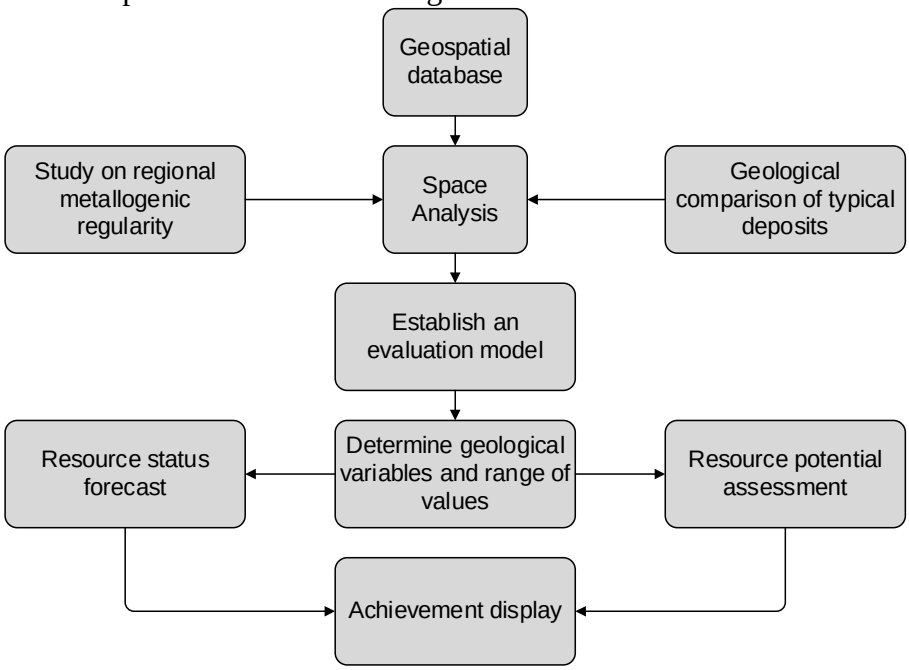

Fig.2. Survey process

With the improvement and development of science and technology, in the exploration of mineral resources, computer technology has gradually been applied to the exploration of minerals, and GIS technology has become the preferred technology in the exploration of mineral resources. China's application to this technology. It is relatively late, but it is also actively exploring and improving. The Australian survey team began to use computer notes to automatically record the geological data of the collected mineral resources, and to build a powerful database to record the various mineral deposit data, which can provide reference for future mineral resources exploration work. . When this database is combined with other deposit resources for analysis, GIS is used for ore analysis to predict and locate areas of exploitable mineral resources. In addition, some countries use GIS computer technology to compare mineral resources and established multi-source information systems, and then find the stage characteristics of mineral resources. In order to make GIS computer technology fully applicable in the exploration of mineral resources, the Chinese government and the survey team have developed relevant system work rules and documents and data content standards for GIS computer technology. GIS computer technology can spatially sample, conduct multi-dimensional analysis of mineral resources, and then conduct mineralization prediction and guide mineral exploration for survey personnel. It has a strong positioning system, which can give dynamic monitoring effect in real time and form a four-dimensional space. The model helps to give a more objective understanding when the surveyor conducts the analysis. The most important thing is that this computer technology can combine the original data with the existing situation on the ground to form a new analysis result. For reference, it has a high timeliness. Therefore, the development prospect of GIS technology in China's geological mineral exploration work is very good.

4. Conclusion

Due to the diversification of geological information and the geological data of various types, the use of modern information technology to establish a geological information platform is of positive significance. At present, new generation information technologies such as cloud computing, big data, and Internet of Things have become the leading forces leading social and economic development. Geological informatization is entering a new era of comprehensive integration, cross-border merger, and accelerated innovation. At the same time, these technologies have also had an important impact on geological survey informationization and solid mineral exploration. In

addition to emphasizing data sharing, under the support of these emerging technologies, the sharing of information resources such as geological information platforms has become the trend of the times.

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