RESEARCH ON MINERAL RESOURCES PLANNING AND MANAGEMENT INFORMATION SYSTEM BASED-ON GIS TECHNOLOGY

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ABSTRACT:

Mineral resources are important non-renewable resource, its reserves are limited. However, with the social development and population growth, the depletion of mineral resources is increasing rapidly, how to use this valuable resource reasonable will have a bearing on the sustainable development of the national economy. This shows that it is very essential to develop a powerful mineral resources planning and management information system to manage programming and exploitation. This paper takes mineral resources planning and management information system for An County of Mianyang City as an example to explain the process of building the system, including system architecture, development platform as well as the selection of development tools, design the main functions of system and operating environment, the feasibility of the program and the broad application prospects of GIS technology in the area are all proved by operation of the system.

1. INTRODUCE

Mineral resources are valuable asset of the country, it is the material basis for the national economic and social development, and it is also an important basis of the production development and the protection for people's living standard. The using quality of mineral resource will directly relate to the sustainable development of human society. With the development of society, progress of science and technology as well as the world's population growth, the consumption speed of mineral resources has become faster and faster, while mineral resources prospecting has become increasingly difficult because of the improvement of the degree of geological work. In order to protect mineral resources and environment, we must be to maximize the protection and comprehensive utilize of mineral resources, to strengthen the management of mineral resources.

However, the current grass-roots mine authorities are widespread some shortage such as: the lag business office methods, the low level of information, the existing data can not be effective use, even if some areas achieve the information management but the resource sharing are at low degree, the existing software is only based on the document management, most of the maps which are managed mostly based on paper, there is no realization of the management of the digital map. With the development of the GIS technology, we can use mineral resources information management system to manage them. We need to innovate the traditional process technology by strengthening the integrated management of mineral resources, this can enhance the speed and quality of data processing, reduce the burden on staff and improve the level of office automation [1] [2]. How to make use of the advanced GIS technology and the computer language to establish mineral resources management system has become one of the urgent problems for some of the mine authorities.

2. SYSTEM BUILDING OBJECTIVES AND ARCHITECTURE

2.1 System building objectives

The "planning" is the purpose of mineral resources planning and management information system based-on GIS technology, we take more consideration to the requirements in the actual embodiment of business and the <<mineral resources planning>> in the design, to promote the smooth implementation of the planning in technology. If we build up this system, day-to-day office management will become easy, deviations between operations and <<mineral resources planning>> will be reduced, it also can provide potential information of mineral resources utilization at any time for the ministry of land and resources, this reflects the management of mineral resources information dynamic and real-time[3] , there is an important practical significance in the current trend information and the realization of mineral resources management information technology and automation.

2.2 System architecture

There are three main popular types of software network architecture: C / S (Client / Server), B / S (Browser / Server) as well as the C / S and B / S hybrid method. Taking into account the use rang of the mineral resources planning and management information system software, the needs of GIS data processing as well as the graphics platform of security, flexibility, stability considerations, the system uses the C / S structure. fig.1 structure of system and fig.2 the main interface of system.

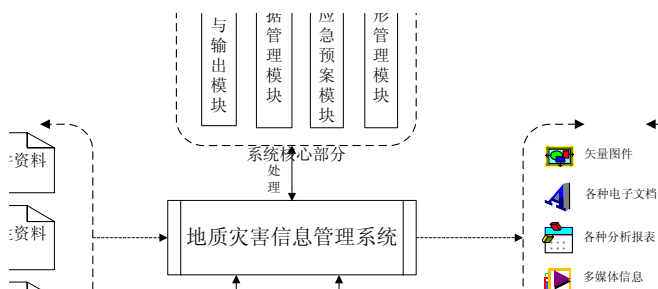* Corresponding author.   Li_hf.student@sina.com

与输出模块　　筹管理模块　　应急预案模块　　形管理模块

系统核心部分处理

资料　　资料

地质灾害信息管理系统

矢量图件
各种电子文档
各种分析报表
多媒体信息

Fig.1 Structure of system

Fig.2 The main interface of system

S Y S T E M　F U N C T I O N

system settings subsystem

graphics editor subsystem

minerals planning subsystem

business office subsystem

query and statistics subsystem

resource evaluation subsystem

Fig.3 Function structure of system

3. CHOOSING DEVELOPMENT TOOLS FOR SYSTEM

There are multiple types of data involved in this system: vector graphics, raster graphics, graphics with CAD style, photo with JPG style, multimedia data. This requires a powerful database to manage the data files. We integrate a wide range of comparison and select SQL Server2000 as the background database in this subject, it also has the ability to transform with other formats of data.

The system software development uses VB+MapX pattern and C/S structure. Combination of GIS tool and visualization development language for the secondary development is today's mainstream of GIS application development. The advantage is that it not only can take full advantage of GIS tools for spatial database management and analysis functions, but also can use other languages' advantages such as highly efficient and convenient programming, set both the directors not only can greatly increase the efficiency of application systems development and the system will have better appearance, more powerful database function, reliability, easy to transplant and easy to maintain because of using the visualization software development tools.

4. FUNCTION AND STRUCTURE SYSTEM [4-6]

According to the target of system design, this system mainly consists of the following subsystems: system settings subsystem, graphics editor subsystem, minerals planning subsystem, business office subsystem, query and statistics subsystem, resource evaluation subsystem
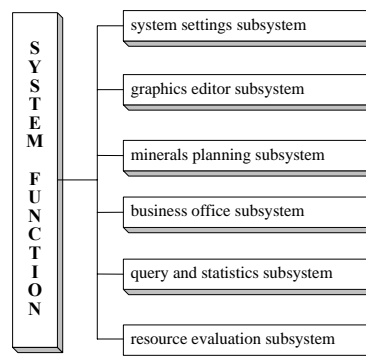
4.1 System settings subsystem

This subsystem includes setting classification color, setting the option, setting permissions, modifying the user's password, setting the scope of the system coordinates, setting the map projection conversion functions, etc.

4.2 Graphics editor subsystem

This subsystem is mainly marking the properties for graphics and pixel tagging, basic editing and adjusting the graphics can be carried out too, which including the basic editor operation such as revocation, copy, paste, delete, add symbols, add text, pictures, painting point, painting line, painted rectangular, circular painting, etc, adjusting graphics including drag-and-drop map-assisted, split, merge, erase.

4.3 Minerals planning subsystem

Mine administrations are in accordance with the development and utilization of mineral distribution and structure, combine with the mineral resources of the region's economic and social development situation as well as objectives and requirements, they can do the region's mineral resources planning on the thematic map, including the mineral status maps, planning areas of mineral exploration, mineral resources protection areas, planning of project which mine ecological problems is serious, and it can also achieve a variety of mineral maps and schedule by the automatic. All various types of mine approved by the government is the legal basis for mineral development and utilization in the future, hence the local government authorizes mineral prospecting or mineral exploration must be based on this.

4.4 Business office subsystem

Business office subsystem functions include two aspects: approval of exploration and mining rights as well as management mineral reserves.

Mining rights management includes many different categories of application and approval of mining and exploration rights, involving management and gathering a variety of information and maps, fill out the application to register the book, delineation the mining area as well as release the final permit. Reserves management is mainly to complete the resources quantity registration, summary, statistics, it contains some specific identification such as mineral resources business registration, registration the occupied mineral resources,

registration the closed (off) residual mine reserves, registration pressure review of mineral resources as well as registration geothermal and mineral water reserves.

4.5 Query and statistics subsystem

This subsystem includes both query function and statistics function. Query function can find the existing data in the database based on the query conditions which are input, the query conditions including mineral name, mine name, legal representative, permit number, etc, it can also be combined inquiry. statistics function includes aggregation all types of mineral, classification by reserves summary by mining, it can summary the information of similar body for the scope of the provisions, such as statistics the similar ore reserves.

4.6 Resource evaluation subsystem

The subsystem is to meet the needs of professional and technical staff, it applies the geology science professional models and combines with computer knowledge to simulate of resources quickly and assess reserves, they can be shown directly by an intuitive graphics.

5. SYSTEM DATABASE DESIGN

Any operation of a GIS system is to have professional, localization data support, as this system we also target to build the database to ensure system operation [7][8]. System database consists of two parts: the spatial database and attribute database.

5.1 Spatial database

The aim of construction spatial database is to achieve management the data and sharing the data by information method, spatial database accommodates a lot of spatial data such as point layer, line layer, polygon layers note layers, raster layers, composed of a lot of space, This data is an important aspect of spatial database, the purpose of designing spatial database is to achieve access of graphical information, it can provide data for the system needs to run. Accordance to the scope of application graphical information can be divided into basic geographic information data, the basis of geological spatial data and mineral resources thematic information data.

5.2 Attribute database

Aiming to the mineral resources planning and management system we design attribute database, it stores plug-in information related to the spatial data, it describes mineral resources and the utilization information the resources are the main mining areas, the main mine resources reserves, the main mineral resources development and utilization of the status quo, Planning for all types of mineral resources, mining economic indicators more detailed, comprehensive and precise, it includes planning text such as some forms, text planning, establishment of description, research report, as well as the various types of registration form for day-to-day office operations.

6. SYSTEM ENVIRONMENT OF DEVELOPING

6.1 Hardware environment

1. Server: server must be Pentium IV more than 1G, recommended brands server such as HP，IBM，COMPAQ, basic configuration: hardware more than 40G, memory more than 1G, UPS an hour online.
2. Client: server must be Pentium IV, hard disk more than 40G, memory more than256M.
3. Basic external equipment: printers, scanners, plotters.
4. Network: ADSL broadband network (bandwidth of 10M or more) network cards and other related equipment.

6.2 Software environment

1. Server: operating system platform Windows 2000/XP, database platform: SQL Server 2000 version.
2. Client: operating system platform Windows 2000/XP, GIS platform MapInfo Professional 6.5 or later; day-to-day office software Office 2000 and later; application software: planning and management of mineral resources information system.

7. CONCLUSION

With the development of the computer technology and the industry survey and mapping, GIS technology has been applied in many industries, but the examples for the management of mineral resources in China are rare, development this system is commissioned by the land bureau of Mianyang AnXian County, it is the basic information systems of application, according to the needs of the system achieves the functions of graphics editor, mineral planning, business office, query and statistics, as well as resource evaluation. After the system operation, we find that he system simplifies the operation processes of staff, achieves the sharing of mineral resource information and services, promotes the integrated, scientific, standardized and open of mining affairs management, at the same time the system has some advantages such as simple operation, easy to learn, ease to use. Of course, the system must has some insufficient, in order to make the system closer to its day-to-day work, more user-friendly, automated, the system will be continuously improved, while using of B / S structure to develop will be the next phase of our research.

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