

Spatial Graphical Data Organization in Polar Region

Database of China

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Abstract: Polar Region Database of China (CN-PRD) is a relational database management system (RDBMS) integrating very large data about a lot of subjects gotten in the Arctic and the Antarctica scientific investigation. Spatial graphical data is one of the main kinds. Realization method of operations of storage, special query and arithmetic for spatial graphical data in RDBMS based on ORACLE 8i is presented in this paper. Building geographical information system of the spatial graphical data based on MapInfo Professional and joining the spatial graphical database to the RDBMS by MapInfo Spatialware for ORACLE that is a good spatial database engine.

Key words: Polar Region, relational database, spatial graphical database, data organization

1 Summarize

Building Polar Region Database of China (CN-PRD) is to administer data of the Antarctica and Arctic the scientific investigation in standardization. It promotes a scientific use of data resource. CN-PRD is an integrate database about many subjects. It is designed as a relational database management system based on ORACLE 8i with Client/Server structure. RDBMS is a main framework in business database system because it is opened, accessibility, integrity, reliability and security and manages very large data.

Spatial graphical data in RDBMS must be organized as in GIS in order to realize the operation of spatial statistic, arithmetic analysis and location queries that is bi-directional between graphical data and traditional data. In the system maps can be united, divided up and output. At present, there are many good software, such as SED (Spatial Database Engine) of ESRI (Environmental System Research Institute Inc.); MapInfo Spatialware; MapInfo Oracle 8i Spatial and Spatialware for Oracle of Oracle Co. in the world. In china this software has existed such as Spatial Database Guide.

In this paper Polar Region GIS of China will be built based on the software of MapInfo. Spatial graphical database will be joined with the relational database by Spatialware.

2 Organization and management of data

In RDBMS spatial data must be stored in a consecutive frame so that the operation of spatial statistic, arithmetic, analysis, location queries and map editing may be realized.

Adding spatial data to RDBMS, we can operate spatial data, but the inner structure of spatial data is not changed. So we add a data item of spatial graphic index to relational data tables and establish spatial data tables to apply and access correlative data for the system.

MapInfo SpatialWare is a kind of data management software enables businesses to store, manage, and manipulate location-based, or spatial data and process spatial query and analysis based on SQL within an RDBMS of Oracle. This data includes a variety of non-traditional data types, such as digital representations of highways, fiber-optic lines, sales territories or land parcels - each with a physical component. SpatialWare allows spatial data to be stored in the same place as traditional data, ensuring data accessibility, integrity, reliability and security. It offers more than 150 spatial functions such as large-scale deployment of powerful GIS functions and mapping applications - aligns with SQL, interactive operation in Client/Server system and data exchange between user and system,

CN-PRD is a relational database management system based on ORACLE 8i. The data will be organized into relational tables based on oracle. The spatial data have been organized into MapInfo tables. Every table includes one layer of spatial data. It means the data with the same character must be in a same layer. Building the layer directory tables is for handling data flexibly and efficiently. These tables register the basic character of spatial data. The relational tables with graphical data items are called spatial stamping tables in which every record marks an object. But the spatial stamping tables don't include real spatial data and the spatial data are stored in metadata tables (Feature Table). Every Feature is endowed with ID and the spatial stamping tables are associated with the metadata tables by ID.



Fig. Data organization and processing

3 Expression and handling of spatial features

The spatial data may be put in different layers according to their attributes. The layer directory tables note the basic attributes of the layers. These layers can be edited, zoomed, displayed, united and divided up. The graphical data can be jointed without slots because of its consecutive frame. Many small sheets can be jointed into a whole.

- 1 Expression of the point features, such as settled station, observation station, floating ice station and navigating station tables.

Field No. 10

Field Name

Field Type

Chinese name

Char (15) Index 1

English name	Char (15)
Country	Char (15)
Function Type	Char (15)
Object Type	Char (15)
Time	Integer
.....	

2 Expression of the line features, such as the scientific investigation routes, navigation routes tables.

Field No. 9	
Field Name	Field Type
Name	Char (15) Index 1
First place	Char (15)
Last place	Char (15)
Country	Char (15)
Time	Integer
From left	Smallint
To left	Smallint
From right	Smallint
To right	Smallint

3 Expression of the area features, such as perennial icecap tables.

Field No. 4	
Field Name	Field Type
Name	Char (15) Index 1
Type	Char (15)
Area	Integer
Thickness	Integer
Center location	Integer

4 The system structure of data model

Rationality of building data model and organizing data ensure to realize spatial query and analysis .The spatial data are stored in Oracle relational database in a measurable frame. The relational tables are linked with the spatial coordinate tables by the bi-directional index table. The integrality of the spatial data ensure processing the data model. Users handle the data congruously in order to prevent destroying data each other in Client/Server. The users need not rework application and special safeguard before storing spatial data into relational tables so that we manage their using purview expediently. Optimizing the query method of the databases is necessary.

API function bases are used to re-exploit for consumers in client port. Building

incorporate relation between spatial data tables and traditional data tables is to support handling the spatial data tables. Users access the traditional database based on ORACLE and the spatial database based on API functions. MapBasic supports many functions including BASIC functions, MapInfo functions. MapBasic own functions and define functions.

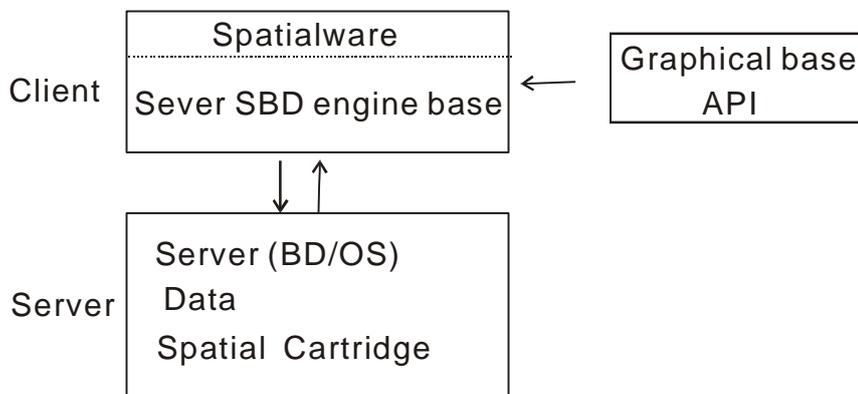


Fig. 2 The system structure of data model

The system is a Client/Server network with two classes. The data model can operate spatial graphic data in client or server port. Users apply API by MapBasic or re-exploit directly. In Server port the spatial graphical data in Oracle relational databases can be accessed by Spatialware.

5 Reference

- 1 Cheng Shaohua, Researching and Designing of China Antarctic Directory System, Science Publishing House, 2000.
- 2 Liu Renyi, etc. Manipulation of Spatial Graphical Data in RDBMS and Its Implementation in Application of GIS, ACTA GEODAETICA et CARTOGRAPHICA SINICA, Nov. 2000.
- 3 Zhang Jianping etc. GIS and Application of MapInfo, Science Publishing House, 1999.
- 4 Gong Jianya, Some of Theories and Technology about GIS in the Contemporary Era. Publishing House of WTUSM, 1999.
- 5 Spatialware, <http://www.mapinfo.com.cn/digpro>, 01-4-20.
- 6 Oracle8i Spatial, <http://www.mapinfo.com.cn/digpro>, 03-4-20.
- 7 Oracle 8i, <http://www.oracle.com/ip/deploy>, 28-3-20.