THE DESIGN AND IMPLEMENTATION OF SPATIAL DATA EXPLORER BASED ON SHELL

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ABSTRACT:

Spatial data is core of the Geographic Information System (Shorter form the GIS). Spatial data management is an important part of the GIS, many present spatial data management systems are usually only attached importance to storing and managing graphical data and attribute data of GIS in RDBMS. Making use of a spatial database technology to realize the integrated management, but this is not satisfied to quick access and management for many users. However, considering one way of the visual management, using the shell namespace extension framework and a registered mode integrated with the windows explorer, this paper has designed and developed a visual management component of data explorer about the spatial data in GIS so as to convenient to manager the distribution、multi-source、heterogeneous data. In addition, according to the requirements, users could organize the spatial data and access and manage quickly huge amounts of spatial data.

1. INTRODUCTION

The core content of the spatial data management is spatial data. Spatial data is the sum of the geographical spatial data associated with the application, in which the geographical information system be stored on the physical storage medium. In general, spatial data is a kind of data related to the spatial location and spatial relationship which is organized as a series of special file structure in a storage medium. With the rapid development of science and technology, spatial data management technology has been out of the traditional file management mode (Su et al., 2003). In the western country, spatial data management application has continuous deepening in many aspects. The demand of spatial data of GIS is increasingly growth and in my country the development of spatial data management has also entered a rapid development stage. At present, many spatial data management systems are accomplished and used to city planning, basic surveying and mapping, land management, traffic management, environment monitoring and real estate management and so on in my country. Meanwhile, these systems have achieved remarkable economic and social benefits (Huang, 2010 and Meng, 2011).

The method for spatial data management by GIS has closely interconnected with the development of database technology, for the moment, some systems adopt the mode of combining file and relation database, others use full relational spatial database management mode. Along with the combination of object oriented technology and database technology, object oriented spatial data model and its implementation system have been proposed, but it is not used widely in the GIS because of the immature technology (Tong, 2006).

In this paper, combined with the existing spatial data management technology and the help of shell namespace extension programming (Zhou, 2002), integrating with the vector data, attribute data and raster data and so on, has realized the integration display of multi-source data. These are better for the development, utilization and integration of the spatial data, which provide a feasible technical scheme for the development and application of spatial data management system. Finally, combining windows explorer, a component of spatial data explorer is designed and realized in order to be more convenient and fast use and manage spatial data.

2. INTRODUCTION OF NAMESPACE EXTENSION

Namespace extension (Armstrong et al., 2001 and Shell Programming Manual) is simply defined as a method allowing the extension and customization are integrated into windows detector. Namespace extension presents a custom folder in the detector. It is a shell perceptive COM object in the process. If correctly registered, then namespace extension realizes a bundle of interface and the detector calls back these interface to get all the information needed to set the folder view. The system structure of the detector is below:

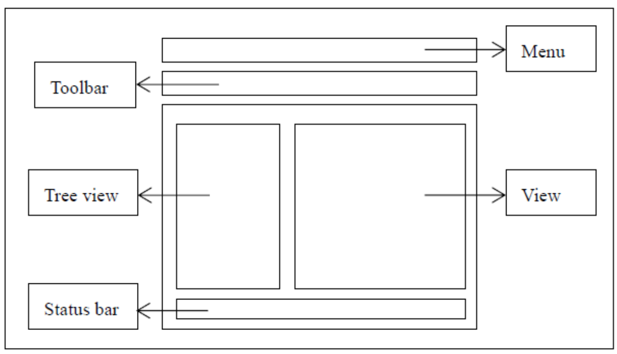

Figure 1. System structure of detector

The detector is only empty frame, for example, tree view, list view and the common program of several other controls, which totally depends on shell and namespace extension as its basic frame for adding real something. When the detector feels that if one namespace extension exists, it will enter into COM server and query folder management (IShellFolder) interface. IShellFolder interface is a work interface and provides all the things by the detector required. In other words, namespace extension is agent between the detector and other extension. When needs to display the content of view, it requires IShellFolder interface to give the view object. Similarly, when to display the tree view node, it requires namespace extension to enumerate the content and find the properties about folder and subfolder. All these things are underdoing by IShellFolder interface. After namespace extension being loaded, the detector lets it refresh user interface. All possible events of interest notice the extension by calling proper function of special interface.

On the contrary, writing namespace extension actually is going to ready to accomplish all input request, that is to say, realizes certain functions on the special COM interface. As this system, it can be well integrated by using the smallest interface and function of one extension supported.

3. FUNCTION DESIGN OF SYSTEM

Based on the syntactic model of the shell namespace extension, main function of this system includes two parts: spatial data source management and spatial data management (GeoBeans SDK Manual). Specific functions such as shown:

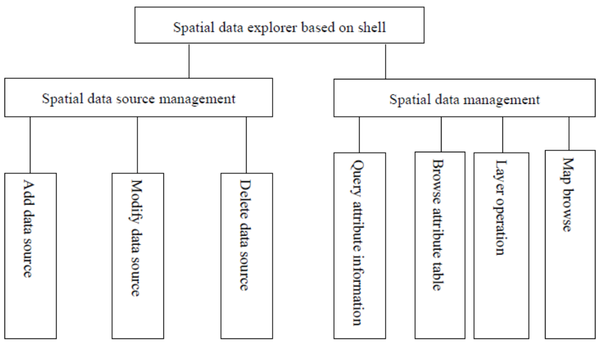

Figure 2. Function structure of system

3.1 Spatial Data Source Management Module

Spatial data source management module mainly manages kinds of spatial data engine for adding, modifying, and deleting and so on. Using "New Link" dialog to realize adding operation of kinds of spatial data engine such as Oracle Spatial, Shape, ArcSDE and so on. If successfully connected, spatial data will display in "the folder list directory" of the system by tree directory. So, this way is not only convenient to manage all sorts of data source and make modify, delete and check on spatial data, but integrated display of all kinds of data source.

3.2 Spatial Data Management Module

Spatial data management module is able to query the attribute information of layer, display the attribute table of layer, operate layer and browse map and so on. Users could choose the data source connection object in the tree view to display and check on all spatial data object. Certainly, they also can choose special spatial data object and browse its attribute data table information in the shell view. The function uses simulated table to accelerate the speed of displaying about large data table and improve work efficiency. In addition, users are able to make add and delete of the layer and can also make some operation such as zoom in and zoom out. So as to be convenient to check on attribute information of one layer, this paper has also realized to display attribute information of a special layer.

4. THE STRUCTURE DESIGN OF SPATIAL DATA EXPLORER

4.1 The Structure Design of System

Based on the introduction of the two part in the third section, we know that this explorer main be divided into two parts: folder directory tree in the left being similar to the tree view in the detector, which is presented by tree structure of data source object in the namespace extension; the detail information of object who has been selected in the right view. The system although is not the shell object of namespace, in a broader sense, it could be considered as the namespace. The structure design of spatial data explorer shown in here:

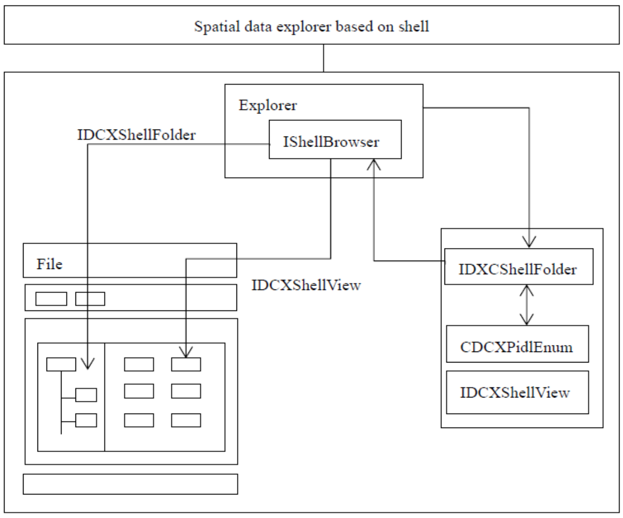

Figure 3. Structure design of system

In order to quickly integrate into the windows explorer, the system uses the frame structure of shell namespace extension to realize management for spatial data(Windows Shell Interfaces Manual). To achieve the namespace extension, we must realize several main interfaces such as IShellFolder, IPersistFolder, IEnumIDList and IShellView. IShellFolder interface and IPersistFolder interface are considered the "folder manager". IEnumIDList interface is called "enumerator", IShellView interface main gives view dialog in the right view. In Figure 3, IDCXShellFolder interface inherits from IShellFolder, IPersistFolder interface realizes the management for spatial data and spatial data source. CDCPidlEnum interface inherits from IEnumIDList interface to realize traversal of folder directory tree. IDCXShellView interface inherits from IShellView interface to achieve the display of spatial data object in the right view.

4.2 The Class Design of System

Based on the structure design of system, we main give the detail design diagram of some major classes, as shown in figure 4:

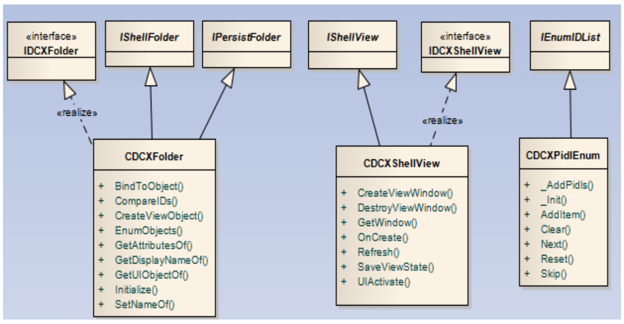

Figure 4. The design diagram of major classes

4.3 The Sequence Diagram Design of System

Based on the description of the part 4.1 and the part 4.2, when the mouse clicks triangular symbol of one node on the left most or a node on the left in the directory tree, message transfer process among objects are below:

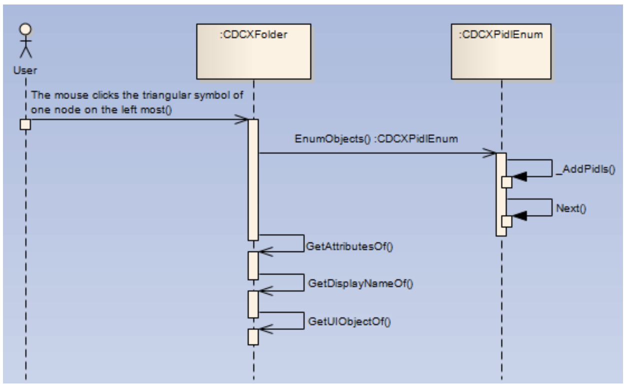

Figure 5. Sequence diagram when mouse clicks the triangular symbol of one node on the left most

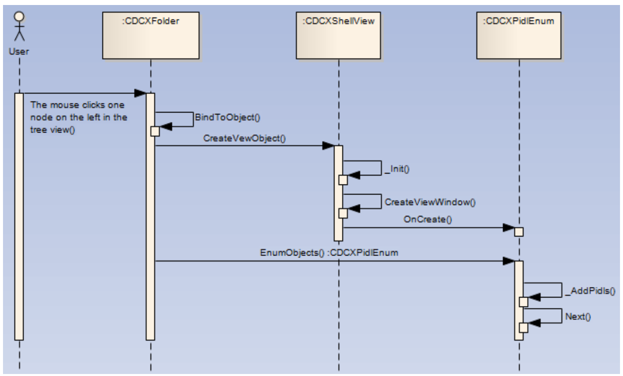

Figure 6. Sequence diagram when mouse clicks one node on the left in the tree view

5. IMPLEMENTATION OF SPATIAL DATA EXPLORER

Spatial data explorer based on shell has implemented development and application for spatial data management. Aiming to all kinds of spatial data engine, spatial data source management module provides to add and delete and modify capabilities. This part has achieved integrated display capability of spatial data source by integrating local data engine and database engine together. Spatial data management module has implemented layer operation, attribute information display and attribute information table display and so on. When users need to check on spatial data in a spatial data engine, they can click the data engine name added in tree view and then spatial data will present in sorter view on the right dialog. If want to see a layer, you can click the layer object on the left in the tree view, attribute table of the layer will display in the right view. Effect charts about some functions of spatial data explorer are shown in here:

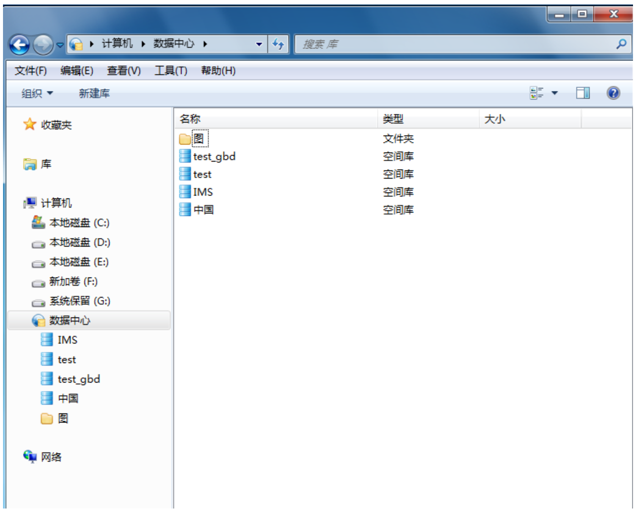

Figure 7. Data engine interface in the tree view

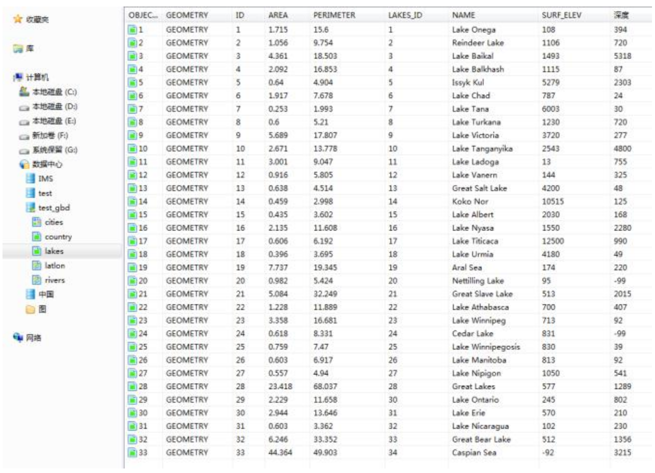

Figure 8. Attribute table of layer display interface when clicks the “lakes” layer in the tree view

6. CONCLUSIONS

Spatial data explorer based on shell has changed implementation way of the traditional spatial data management system. Using to namespace extension programing and spatial data explorer and windows explorer integration, this paper realized integrated display for kinds of spatial data source and integrated management of spatial data, which is convenient and quick to users for applying and managing spatial data as well as improve system work efficiency. This paper elementarily fulfills the basic operation and function of spatial data management, we also need to successively improve and modify in the future in order to provide more powerful the spatial data explorer.

7. ACKNOWLEDGEMENTS

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