The Design of Statistic System in the Country Enterprise based on SAS and GIS

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Abstract

Statistics plays an important role in social and economic development. Traditional data collection is too laborious, time-consuming and ineffective. Its statistic is not correct and can't share the data. Aiming at the requirement for regional economy statistics of Pan Zhihua, this paper designed an analytical system based on regional economy statistic and achieved the analytical function of regional economic statistics. Spatial analysis method was used to integrate the special visual effect of GIS and geographic analysis function into the general statistical database, and the distributed GIS was utilized to release the data, provide browsing, searching and analytical function of the space data for the users. This analytical system accomplishes data share through internet and has the advantages of intuition, convenience and lower management cost. Most of all, it reduces the loss of the tax source after putting into operation and supplies the government's decision with the reasonable evidence.

Keywords: SAS, GIS, Statistics, Enterprise,Database.

1. Introduction

This document is set in 10-point Times New Roman. If absolutely necessary, we suggest the use of condensed line spacing rather than smaller point sizes. Some technical formatting software print mathematical formulas in italic type, with subscripts and superscripts in a slightly smaller font size. This is acceptable. At the moment, governments at all levels strengthen the statistic of regional economy data. For example, the statistic of regional enterprises and their production can analyze the energy consumption and unit energy of the enterprises. The GDP statistic of the enterprises is the proof of paying taxes. In the face of various statistic data, data collection has a tremendous workload, a bad function for the common use, the lower utilization ratio and inconspicuous decision of the government management. Traditional statistic method hardly gets timely, accurate and reliable data.

The SAS System provides a powerful programming language and components called procedures that allow us to perform many different kinds of analysis and data management functions, as well as produce many different types of text-based and graphical presentation output. Combined with other features of the SAS System, the SAS language and its procedures make possible an unlimited variety of applications from general-purpose data processing to highly specialized analyses in diverse application areas[1,2]。SAS/GIS software provides an interactive geographic information system within the SAS System. A geographic information system (GIS) is a tool for organizing and analyzing data that can be referenced spatially; that is, it is data that can be tied to physical locations. Many types of data have a spatial aspect, including demographics, marketing surveys, customer addresses, and epidemiological studies[3-5]. A GIS helps to analyze the data in the context of their location. For example, if we need to evaluate population data for census tracts, we could view the information in tabular format. However, consider how much easier and more effective it would be to view the demographic information in the context of the geography of the tracts. When viewing information that has a spatial component, we may find it easier to recognize relationships and trends in these data if we view the information in a spatial context. As the further application of GIS and the fast development of object-oriented programming and the component

technology[4-6], the synthesis method of spatial analysis in many economic activities has no difficulty to realize the technology. The spatial management function easily achieves the analysis and application of the regional economy. Therefore, based on the background of the whole country's enhancing the statistic, the paper uses secondary development module and visual programming language to develop the analytical system of regional economy, realize common data management, operation, graphic processing functions etc., strengthen statistic analysis and optimize the functions of spatial and location analysis.

2. System Developing Platform and Structure

According to the thought of system expansibility and the need of regional economy SAS system, this system uses the systematical structure of C/S. Database uses relation database, SQLServer2000 and stores spatial data, business data, metadata etc. Logic application layer consists of bottom data layer, middle Public application components and upper application components. Bottom database engine of spatial data (Supermap SDX) and data source management database engine components (ADO.NET) compose the bottom data layer. The upper application components include thematic application components and GIS application components (Supermap components). Components accomplish the mutual use through COM interface. Implementation level achieves the user's dynamic interactions and various functions of the system through user interface（GUI）. Detailed structure is illustrated in Chart1.

GIS exploring platform selects component object platform, (Component GIS) SuperMap Objects. SuperMap Objects is the geographic information system combing GIS with component technology. It provides GIS functions from symbol customization to visual map, from map collection to building spatial data and from two to third dimension so as to fully use the reusability of the component to raise the efficiency and the quality[7-9].

3. Basic functions of system

Regional economy SAS system mainly uses GIS to statistically analyze regional economy data and its result is visualized on the chart. It is convenient for users to explore the spatial connection of regional economy development effectively. Meanwhile, it presents different types of statistical charts. The system is able to supply the functions of attribute data entry and editing, management of database, spatial statistic analysis, spatial query analysis, information report and cartography export. The functions of the system are illustrated in Fig.2.

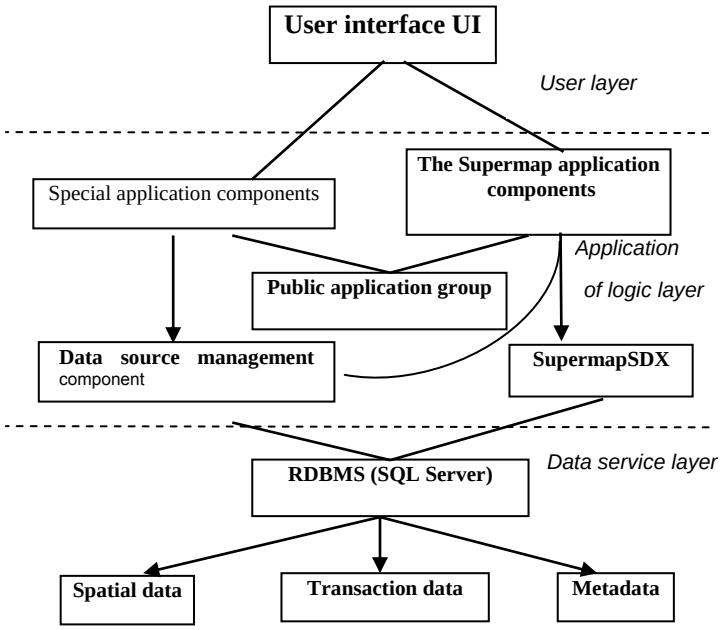

Fig.1 The system architecture based on GIS

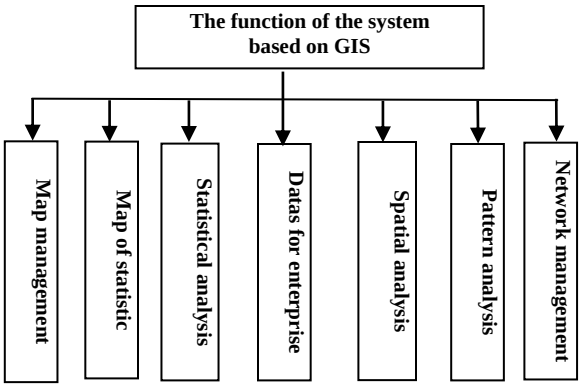

Fig. 2 The function of SAS based on GIS.

4. Database design

They SAS/GIS software uses two basic types of data which are spatial data and attribute data. The spatial data describes the location, shape, and interrelationships of map features. The attribute data provide information that relates to the map features. The spatial data represent point features, line features and an area features of map. To represent point, line, and area features in the map, SAS/GIS software defines the following topological features in the spatial data. The spatial data coordinate space can be represented in any numeric units even those that include arbitrary values. Coordinates that are stored as longitude and latitude values have a maximum usable precision of about one centimeter. Representations of map

features are implemented with one or more chains, attribute data are all other data that are related to map features in some way, including the data to analyze in the context of the map. Attribute data can be stored in the spatial database.

System data includes various statistical data tables, such as administrative region table, industrial and mining enterprises table, investment table, industry information table, tax table etc.

4.1 Administrative Region Table

The administrative region table mainly introduces its geographic location, general survey of the cities and so on.

4.2 Industry Information Table

Industry information table is made up of industry gross product, scale structure, main economic benefit indices. Main economic benefit indices enable to define the fields of regional codes, industry value-added rate, total asset contribution rate, asset-liability rate, the turnover rate of circulating assets, industry cost profit rate, product sale ratio and so on.

4.3Fixed Asset Investment Information Table

Fixed Asset Investment Information Table consists of the following tables: regional codes, fixed asset investment of the whole country, basic construction investment etc. Fixed asset investment of the whole country defines the fields of national economy, collective economy, individual economy, jointly operated economy etc.

5. Main Function Module Design of System

The system provides the modules of management of regional economy data, spatial query, calculation of statistic analysis, graphic analysis chart, space etc.

5.1 Data management of regional enterprise economy statistic

Regional enterprise economy statistic data includes categories of enterprises, products, energy consuming, sales etc. Because of a huge mass of statistic data, regional enterprise economy statistic data and spatial data are respectively input and stored. At first, input economy statistic data to a sequential document, edit and store in the relevant file of database.

5.2 Modules of Spatial query and statistic analysis

Spatial query includes buffer query, crossing query, the interaction query of chart data and attribute data etc. The system supports the statistical function and finishes the statistical function of regional economy data. For instance, those statistic information, such as total number, mean, standard deviationetc. At the same time, the system carries out the functions of spatial statistic analysis and reflects the spatial connection of economic development. These statistical data showing on the geographic base helps to make a correct decision about the development tendency of the whole region.

5.3 Geographic Analysis Module

According to different requirements, diverse charts express economy data of every administrative region. It usually adopts pie chart, point density diagram, histogram, line chart etc. Drawing the graphs of the same region at different periods visually reveals the law of regional economy development. Parts of codes are as following:

```
public SLThematicMap(Panel chartContainer,
ObservableCollection<ObservableCollection<object>>
table)
    { this.chartContainer = chartContainer;
      this.table = table;
    }  #endregion
    #region
    Dictionary<string, DataSeries> dicDataSeries = new
Dictionary<string, DataSeries>();
    DataSeries GetDataSeries(string sTitle)
    {   if (!dicDataSeries.ContainsKey(sTitle))
        {
          RenderAs renderAsEnum; // out parameters
          dicDataSeries.Add(sTitle, new DataSeries()
          {RenderAs                                    =
Enum.TryParse<RenderAs>(ChartRenderAs, true, out
renderAsEnum) ? renderAsEnum : RenderAs.Column,
            XValueType = ChartValueTypes.Auto,
            Name = sTitle,
            LegendText = sTitle,
            //YValueFormatString = "#",
            ShowInLegend = ChartShowInLegend,
          });
          if       (dicDataSeries[sTitle].RenderAs       ==
RenderAs.Pie) // (pie chart tip
          { if (chartAxisYTitle.Contains("quantity "))
              dicDataSeries[sTitle].ToolTipText          =
"#AxisXLabel -- #YValue 个(占#Percentage%)";

            else if (chartAxisYTitle.Contains("amount"))
```

```
                dicDataSeries[sTitle].ToolTipText =
"#AxisXLabel -- #YValue(#Percentage%)"; }
            else {}
          }
        return dicDataSeries[sTitle];
    }
```

Parts of query service codes are as following:

```
 void multipleQuery_Click(object sender,
RoutedEventArgs e)
    {
      MLKQueryRoot mqr = new MLKQueryRoot();
      mqr.multiQueryAction = true;
      mqr.AdvancedQuery();
    }
public SpatialResult(Dictionary<string, string>
pDictionary, double x, double y, double bufferRadius,
Graphic queryGraphic)
      : this()
    {
      _QueryGraphic = queryGraphic;
      loadData(pDictionary, x, y, bufferRadius);
    }

    /// <param name="pDictionary"
    public SpatialResult(Dictionary<string, string>
pDictionary)
      : this()
    {
      _pDictionary = pDictionary;
      loadData(_pDictionary);
    }
public SpatialResult(Dictionary<string, string>
pDictionary, Envelope rectangle, Graphic queryGraphic)
      : this()
    {
      _QueryGraphic = queryGraphic;
      loadData(pDictionary, rectangle);
    }
```

6. Conclusions

The operation result of the statistic is illustrated inFig.3 and Fig.4. The operation result of management information in the basic units is shown in Fig.5. At present, this system has Applied Statistics for Management and got a good result.

Fig.3 the statistics result

Fig.4 the statistics result

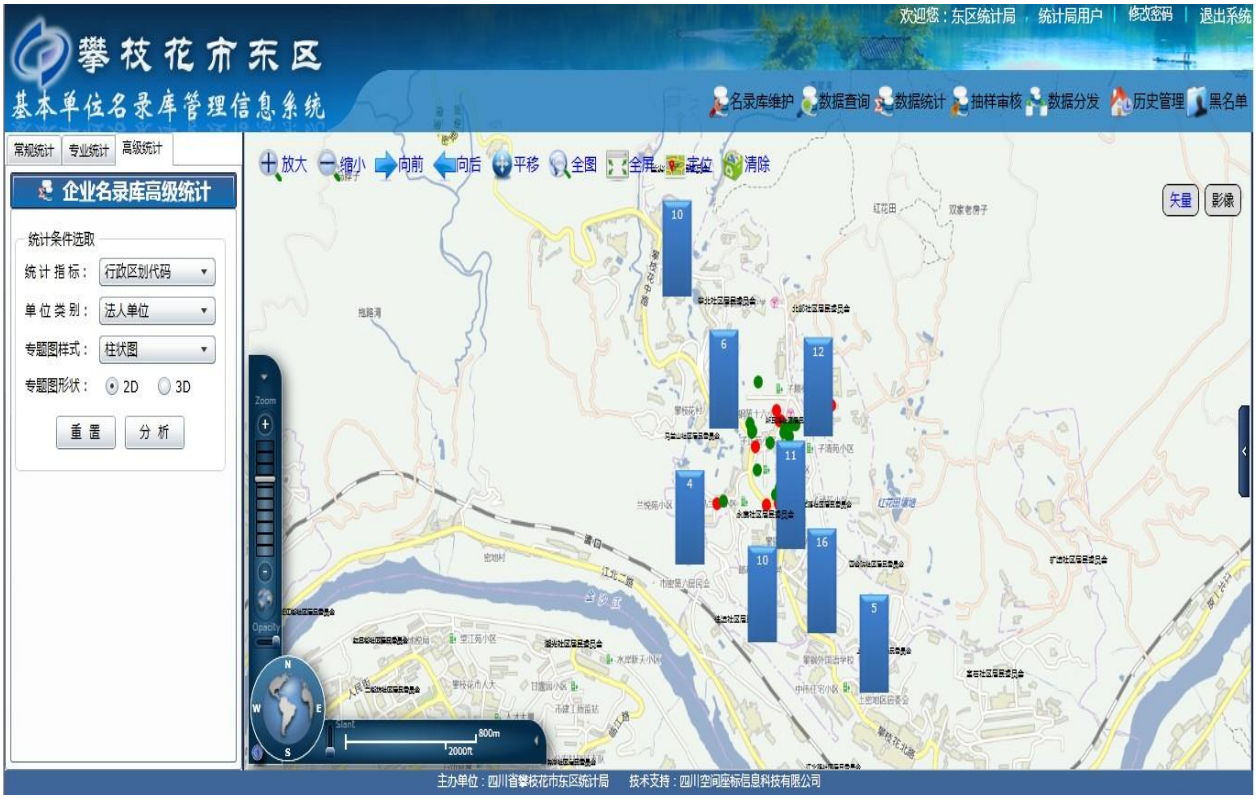

Fig.5 the statistics result based on GIS

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