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GIS-based Regional Agricultural Economic Information Query and Analysis System

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Abstract: GIS-based “Regional Agricultural Economic Information Query and Analysis System” built on spatial attribute characteristics of statistical information implements dynamic information query, dynamic generation of statistical charts and tables, and dynamic generation of spatial distribution map with geographic attributes and specialized charts, and provides a solid basis for researching geographic distribution of agricultural economic information, analyzing issues concerning the agriculture, countryside and farmers from micro and macro perspective, and making macro decisions scientifically and rationally. This paper provides the system architecture design and related function demonstration, and discusses further development direction of the system.

Keywords: GIS, Agricultural Economic, Information Query

1. Introduction

Fast growth of the information age poses higher requirements on statistical data informatization - requiring the integration of statistical data and spatial information resources to provide comprehensive and deep statistical analysis, as well as more timely and complete information services. Hence, with the fast development of social informatization and geographic space technology, the integration of statistical information and geographic space information resources has become an important part in the construction of statistical data system.[1-2]

Geographic Information System (GIS) is a computer system capable of collecting, storing, managing, analyzing, displaying and applying the data related to spatial geographic distribution on entire or part of the earth surface, and it is a universal technology for analyzing and handling massive geographic data.[3-4] GIS is an emerging frontier discipline incorporating the computer science, geography, surveying and telemetry, environmental science, urban science, spatial science, information science and management science. GIS has experienced amazing progress over the past 30 years with improving functions, increasingly showing its powerful vitality and bright prospect. At present, GIS has been widely applied in many areas including city planning, transportation, agricultural production, natural resource investigation, ecologic environment assessment, facilities management, etc..[5-6]

Since 1980s, “Rural Economic Information Database” that focuses on agricultural and rural economic statistical information has covered agricultural economic information with spatial implication in Chinese counties involving the population, farmland, crop production, etc. Since then, it has been primarily used in government agencies and research institutions, while “Regional Agricultural Economic Information Query and Analysis System” built on data resources closely related to this geographic information implements dynamic information query, dynamic generation of statistical charts and tables, and dynamic generation of spatial distribution map with geographic attributes and specialized charts by utilizing the database technology and GIS technology, and provides a solid basis for researching geographic distribution of agricultural economic information, analyzing issues concerning the agriculture, countryside and farmers from micro and macro perspective, and making macro decisions scientifically and rationally.

2. System Design Objective

To research, analyze, design and develop functions of “Regional Agricultural Economic Information Query and Analysis System” based on the database and GIS technologies, the system should realize the following main objectives:

- 1 To research visualized query and management of statistical information; provide such functions as information display, query and retrieval.
- 2 To implement statistical information analysis by utilizing spatial information analysis technology, so as to provide the analysis of agricultural economic information with spatial attributes for agricultural managers and decision makers.
- 3 To encapsulate system functions as GIS component objects and business logic component objects by utilizing the component technology, and implement the system integration by connecting the component objects to make the system scalable.

4 As critical information resource of the country, the confidentiality and security of rural economic statistical data are of very importance. Strict encryption management mechanism shall be established for the system to guarantee the database security.

3. System Function Structure

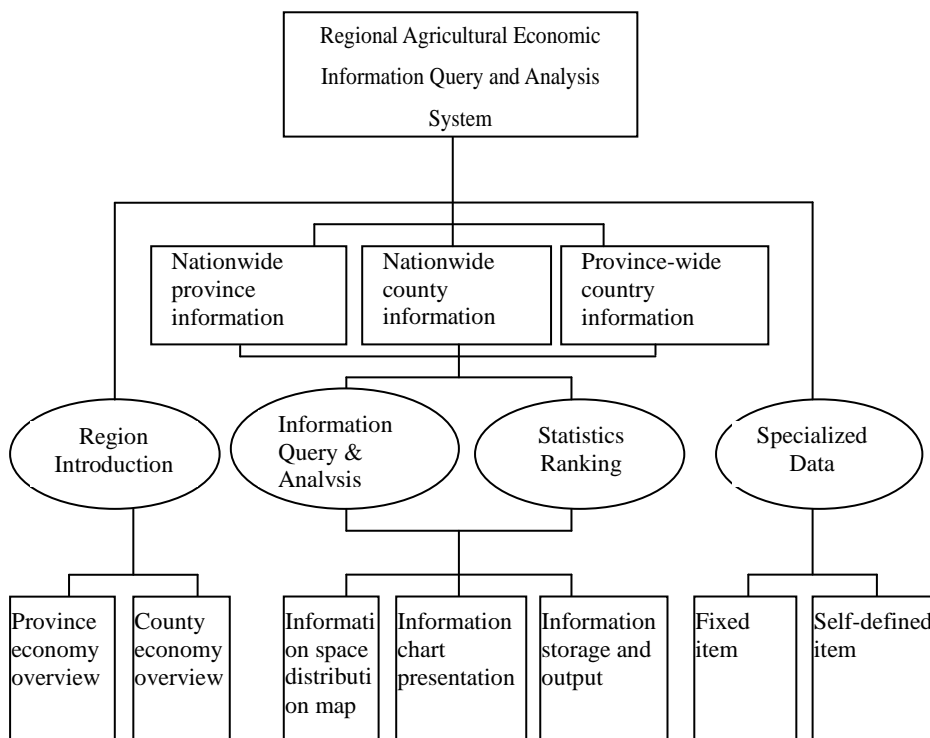


Fig. 1. System Function Structure.

Following the principle of top-down and gradual refinement structure design, the system function analysis and module division are undertaken by combining structured method and prototyping method according to different business requirements of the users. “Regional Agricultural Economic Information Query and Analysis System” consists of four modules: Region Introduction, Information Query and Analysis, Statistics Ranking and Specialized Data. The province information displayed in Region Introduction section presents main indicators like general information, economic and social development, agricultural and rural economy of the region by clicking on the map and opening different windows; the county information provides agricultural and rural economy information of each region by means of county-wide search, and marks the location of this county on the map. Information Query &

Analysis and Statistics Ranking modules provide nationwide province and county information query, statistics and analysis in the form of spatial distribution map and chart. In Specialized Data module, the system is preconfigured with advantageous industry zone of agricultural products, regional layout of unique agricultural products and nationwide agricultural product trading market through which specialized distribution map can be created by means of the query. At the same time, self-defined topic is designed, allowing the user to create the specialized item and form the specialized item distribution map as needed. Related information displayed in above modules can be saved, printed or output in file.

4. Realization and Presentation of System Function

The system can run on WindowsXP/2000 or higher. In order to ensure the system operation and background data security, the encryption lock shall be used during the software operation.

This system takes full advantages of powerful graphic presentation capability of GIS platform to provide numerous view presentation means and present the information queried and analyzed on geographic map by means of “What You See Is What You Get”, allowing the user to have a visualized perception and operation platform.

4.1 Region Introduction

This module presents agricultural and rural economic information of each province or county. In general, there are two options for selecting the information to be displayed: by clicking on related icon in the window, for example: clicking on the location of the region on the map to display related information of this region, or by inputting the name of the region to be displayed in relative window, then the system will search automatically and display all information of this icon in the database. Currently, there are 31 provinces, municipalities and autonomous regions, as well as over 2800 cities and counties in China, hence, this system displays related information of each province by clicking on the location of each province (see Figure 2), and displays the information of each county through the county search function by inputting the county name (see Figure 3).

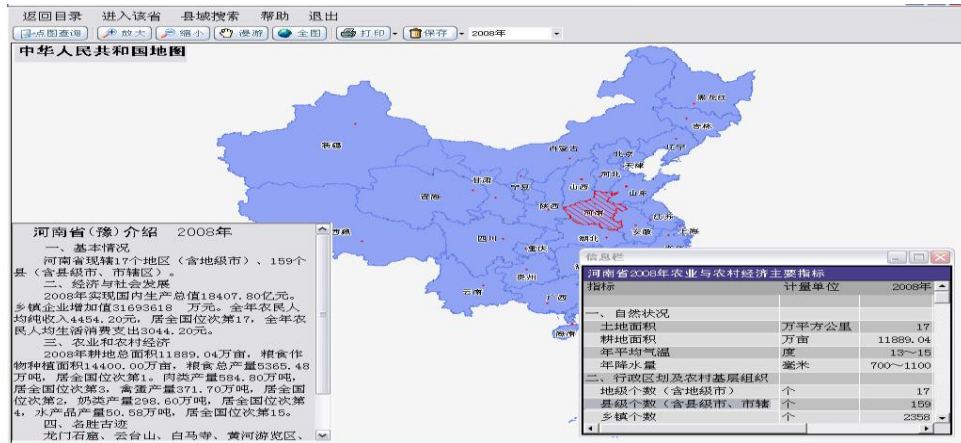


Fig. 2. Displays information of each province.

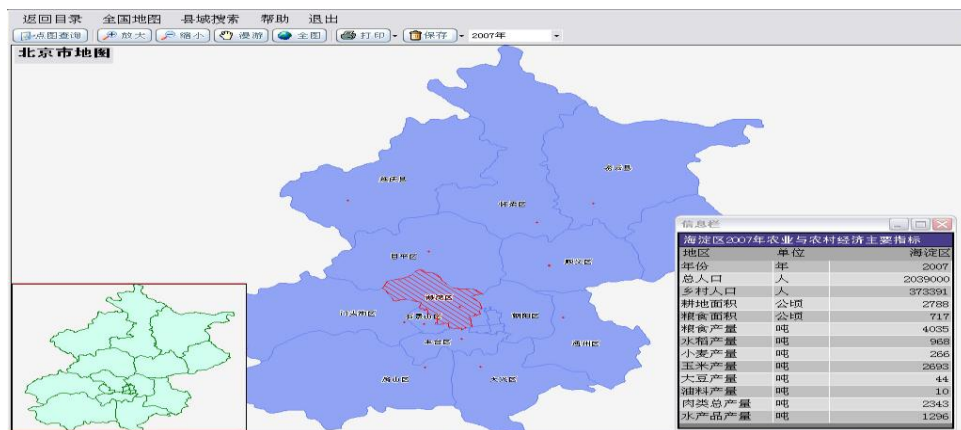


Fig. 3. Displays information of each county.

4.2 Information Query & Analysis

For users, it is especially important to capture, seize and analyze related information anytime as needed. This module provides the province or county query result in the form of the map and table quickly by clicking the year and region easily and quickly (see Figures 4 and 5), and displays the data change in the form of the chart for the purpose of analyzing agricultural and rural economic information (see Figure 5).

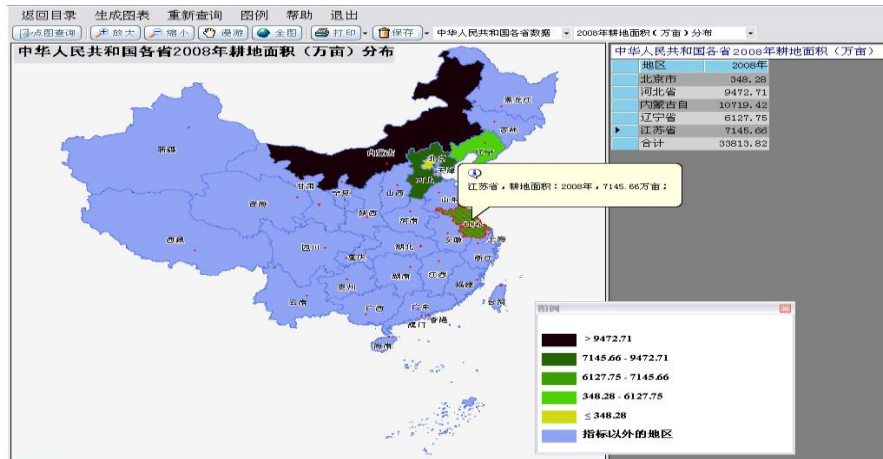


Fig. 4. The province query result.

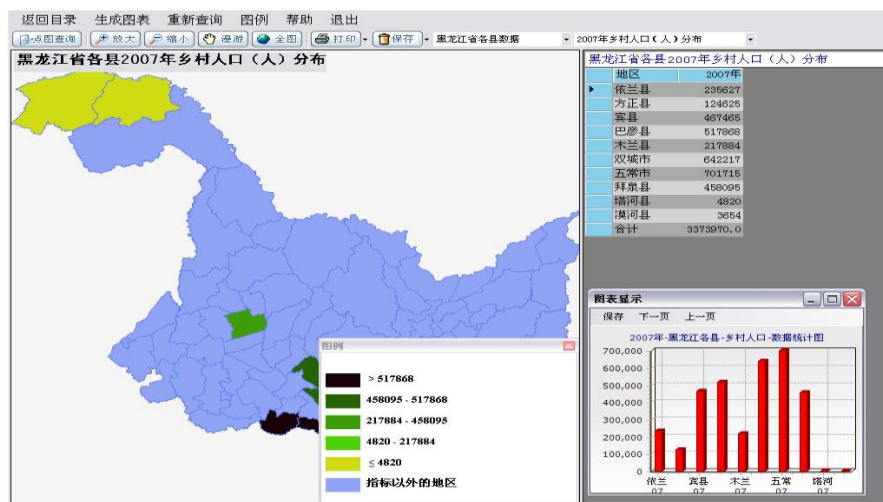


Fig. 5. The county query result.

4.3 Statistics Ranking

This module is designed to meet conventional demand of users for the utilization of agricultural economic information. Through this platform, the users can view statistics ranking of hot regions or important agricultural economic indicators they concern (see Figure 6).

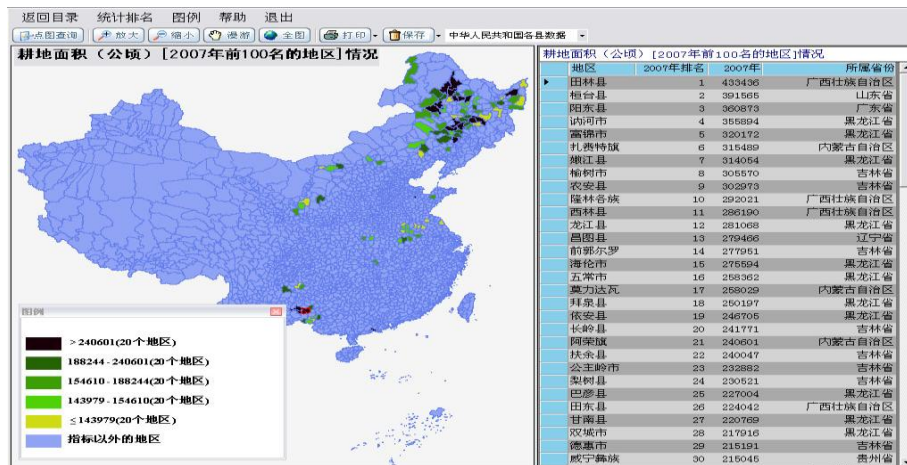


Fig. 6. Statistics Ranking.

4.4 Specialized Data

This module is mainly used by decision making department of the government and macro researchers. In this module, the system has provided the information of agricultural production and agricultural product market distribution in the country, and can display, search, locate on the map and output relative specialized information easily as needed (see Figure 7). In addition, the system is designed to provide self-defined topic function, enabling the user to design different specialized data at will and create the specialized data distribution chart to respond to instant or urgent event, and understand related agricultural and rural economic information of different regions in real time.

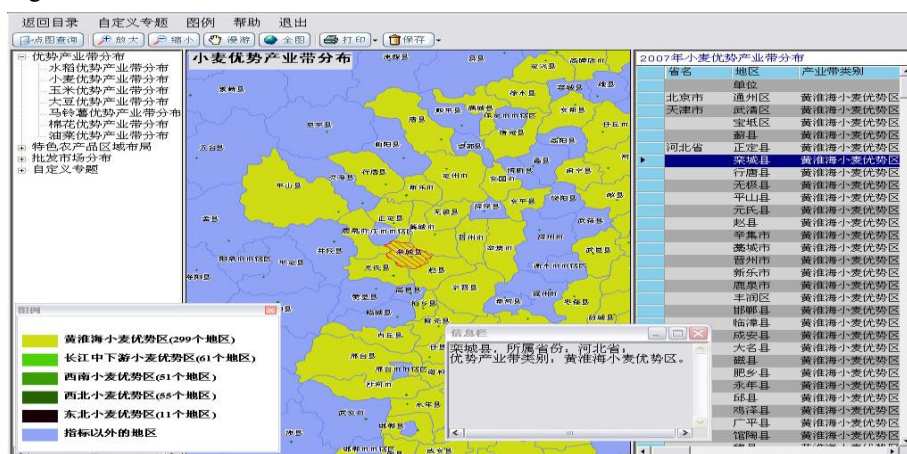


Fig. 7. Specialized Data.

5. Conclusion and Discussion

“Regional Agricultural Economic Information Query and Analysis System” takes full advantages of spatial data organization capability and spatial analysis capability of GIS technology. It can not only provide scientific and accurate basic agricultural economic data timely, accurately and comprehensively, but also lay a solid foundation for drilling down and analyzing the data of different years and different indicators, improving the data management, development and utilization level, driving the systematic management and sharing of basic data, and realizing the resource management informatization. The system has been used by related government agencies and agricultural statisticians. The result shows that the system function design accords with the work characteristics of users, and provides scientific and effective means and methods for improving the productivity and realizing the value of the data.

Of course, the system function needs further enrichment and improvement, for example, further researching and realizing and deep mining of basic data by utilizing the modeling technique, GIS route analysis and buffer analysis.

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