Agricultural Cultivated Land Information System based on C#

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Abstract

Cultivated land is the essence that is the most basic agricultural production. How to use and manage land resources scientifically is related to the survival of mankind. Through analysis and research on the existing data of agricultural utilization in Anshan, cultivated land resource information query system is designed and implemented with the C# and GIS software development technology. This paper introduces the overall structure and design ideas of the system, and discusses the realization of system function and technology.

Keywords: GIS, agricultural land, query system.

1. Introduction

With the decrease of cultivated land quantity, and the contradiction between agricultural land and economic development, it is inevitable to supplement cultivated land and excavate the potential of cultivated land. The sustainable use of land resources is the foundation of implementing sustainable development strategy in our country. As a special public resource products, the quantity and quality of cultivated land is closely related to national food security. In the maintenance of state security, social stability is of great significance. So a comprehensive grasp and scientific quantification of cultivated land quality and distribution, not only it is beneficial to the government to implement effective management, but also it is of great significance to promote the development of agriculture, rural areas and farmers rich, and to establish a conservation-minded society [1].

The query system of the farmland was established based on GIS query system, it can effectively make the data visualization, image, intuitive to express the research situation of cultivated land resources in the area and provide help for the later evaluation and regional comprehensive evaluation. The application of GIS and database technology in the study area of the terrain, geomorphology, soil, land use and other data unified management, that will promote the development of information integration. The application of GIS in agriculture began in 1980s in China that is mainly used in the areas of agricultural regionalization land management, agricultural meteorological services [2].

1.1. Classification and distribution of cultivated land

The terrain of Anshan is high in the southeast and low in the northwest. Southeast belongs to the extension of the Qianshan Mountains, General is 400-600 meters above sea level. It is located in the southeastern margin of the Songliao Plain in the middle latitude, and it belongs to the temperate monsoon climate zone. The total land area is 925235.05 hectares. Cultivated land is 244729.66 hectares, which is

concentrated in the western and central plains region along the river. There is rice, corn, soybeans, sorghum and peanuts, hemp, tobacco, etc. Which is the production base of commodity grain in Liaoning.

There are various types of soil parent materials in Anshan. In addition to the residential area and the river surface, there are 6 kinds of soil, 16 sub species, 53 genera and 87 species. Brown soil is the largest soil of 6 kinds with an area of 552691 hectares, accounting for about 65.9% of the total area of the city. Which is mainly distributed in the southeast of mountainous and hilly terrain. The area of meadow soil is 265672 hectares, mainly in the alluvial plain along the river, accounting for about 31.7% of the total area of the city. The other 4 soil types accounted for the proportion of the total area of soil in turn: 11205 hectares of paddy soil, accounting for about 1.3%; marsh soil of 4135 hectares, accounting for about 0.5%; sandy soil of 3746 hectares, accounting for 0.5%; saline soil, accounting for 0.1% [3,4,5].

1.2. Classification of cultivated land fertility

According to the ministry of agriculture of cultivated land quality survey and evaluation procedures and related standards, the city's land is divided into 5 levels through comprehensive analysis. One to four levels of arable land accounts for over 80% of the total area, cultivated land area is better. The area and proportion of the cultivated land is shown in table 1.

Table 1 Classification Standard of cultivated land fertility comprehensive index in Anshan

Grade	IFI	Area	Ratio
一	〉=0.8961	25676.63	10.9
二	0.8376～0.8961	54999.23	23.35
三	0.7722～0.8376	77403.6	32.87
四	0.7027～0.7722	56852.18	24.14
五	<0.7027	20575.70	8.74

The first-class is mainly distributed in Haicheng, Taian County, and the area of flat terrain, deep soil with more than 60cm, and the soil nutrient is very high. The ideal conditions of irrigation and drainage in these areas, the main planting area of maize and rice, high yield, high yield cultivated land mainly for the city. The second-class is mainly distributed in Haicheng, Taian County, the land is characterized by deep soil, high nutrient content. But some land has certain limitation, but the overall fertility is better, and higher capacity, is a relatively good soil type. The third-class is scattered in the entire city of Anshan, mainly concentrated in Taian County, Haicheng City, Xiuyan County and Qianshan District, generally in flat terrain, irrigation conditions. The fertility is medium, and the obstacle factors of soil have great influence on agricultural production. The fourth-class is mainly distributed in Xiuyan, Haicheng. The common feature of the soil is that soil is barren, the drainage system is basically sound. A variety of obstacles in the soil for agricultural production is heavy. The fifth-class is mainly distributed in Xiuyan, Haicheng. The soil nutrient is poor with shallow soil. The serious influence factors of various obstacles in the soil for agricultural production that is the main reason for the low yield of crops.

2. The GIS

GIS (Geographic Information System, GIS) is a computer-based emerging technologies. Surrounding the research, development and application of this technology, a cross and borderline subject is formed, that is the technology System of spatial data management and research. It can process spatial data

according to the geographical coordinate or space, research on relationship of the effective management of data, a variety of spatial entities each other. Through the comprehensive analysis of various factors, it can quickly meet the needs of the application of information, and can express the data processing results in the form of a map, graph.

This article uses geographical information system based on MapInfo platform of secondary development technique, the main features include:

(1) Map expression and processing functions

It can handle point, line, area, and other graphical elements. It can handle GIF, TIF and other commonly used raster images. Have a map of powerful editing features.

(2) The MapInfo built-in relational database management system, support SQL queries, to access the various database through ODBC.

(3) The data query analysis function

For the analysis of the simple query, MapInfo provides object query tools, regional query, query buffer query and analysis function.

3. The function of the three systems design

Agricultural cultivated land information query module includes: basic geographic information, agricultural information static, dynamic agricultural information. Basic geographic information includes: the town center, the information such as drainage, roads, administrative division, realize the map load, amplification, narrow, remove, roaming and other basic operations. You can also view the map attribute table, and scaling to the Layer of elements was carried out on the map annotation has been saved as a Layer file operations, but also realize the function of data export to Excel in the application form. The last is print output. Static agriculture information includes topographic map, soil map and land utilization present situation chart, such as cultivated land resource attribute data information. Dynamic agricultural information includes the meteorological information (light, temperature, rainfall, etc.), soil nutrient abundance index, crop fertilization standard, crops diseases and insect pests, seeds and other related information browsing, query and other operations, provide data support for the relevant personnel to make a decision.

4. Program realization of the system

4.1. Map loaded

Anshan administrative zoning map were obtained through the website. And then based on this background projection, multiple layers were painted, the layer properties were changed, to carry on the vector quantization, tagging were processed. Finally the map can reasonable express the data. First of all, using the drawing tools to convert images into tiff format.

Then data vector quantization, mainly shapefile files were established, respectively highway file, polygon county border file, and name of villages and towns file.
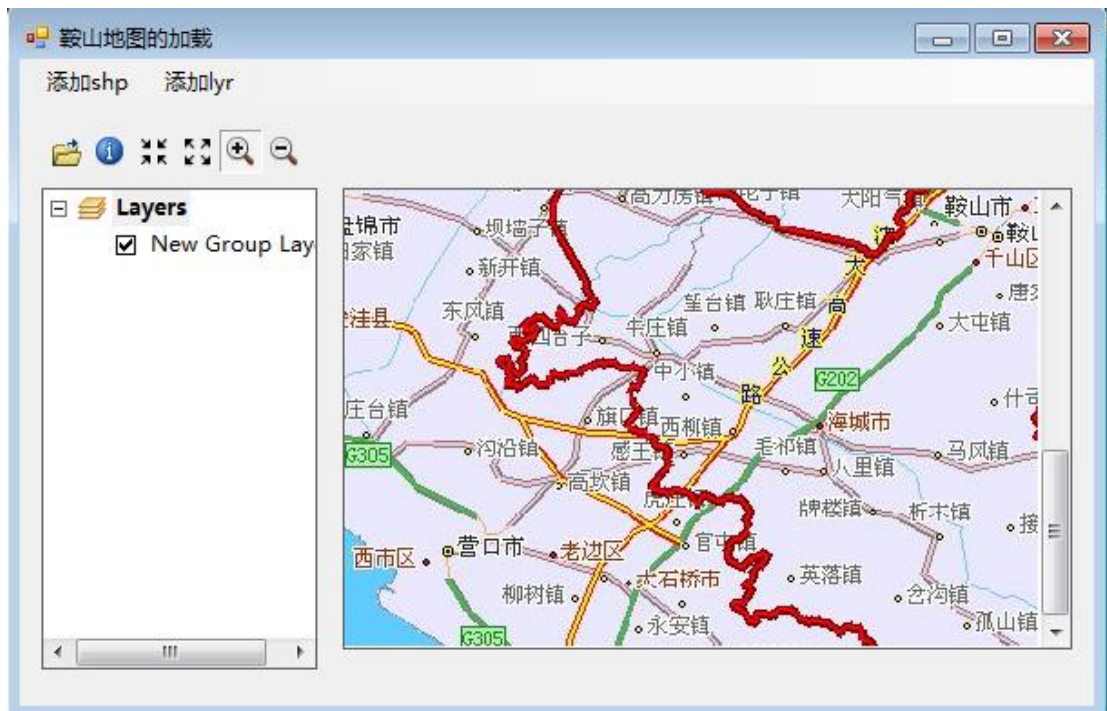
Fig.1 Anshan map loading

4.2. System login

Using C# development system login permissions management, divided into the super administrator and general user.
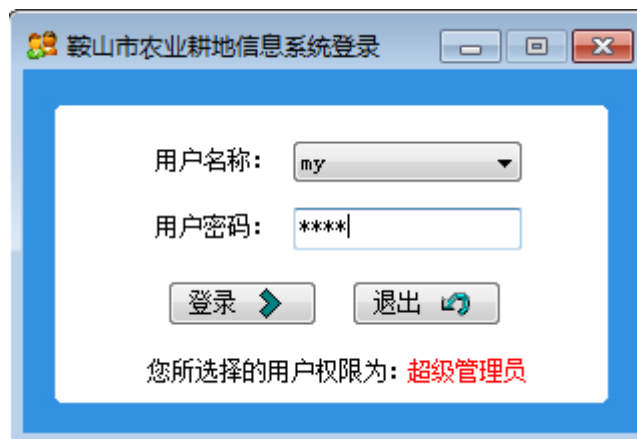

Fig.2 System login

4.3. The main page

After the success of the login system home page is as follows:

Fig.3 The main page

4. Conclusion

Through the use of this system, it can efficiently manage massive multi temporal land use data, effectively realize the dynamic management of land resources. For the land management department it can provide scientific and detailed cultivated land resources. With land use data and information, for the renovation of the departments of land and resources and resources, it will provide a scientific basis for environmental protection, etc.

Acknowledgements

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