Design and Implementation of Agricultural Communication Service System Based on Embedded Gis

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Abstract: With the deepening of the concepts of "digital China" and "digital city" and the continuous development of related applications, geographic information systems have become closer and closer to people's lives, and the development and application of geographic information systems have received more and more attention. How to conveniently and effectively collect GIS data that meets the accuracy requirements is a basic problem facing GIS development. Therefore, the development and research of GIS data acquisition system has become a hot spot today.

1. Introduction

With the rapid development of China's economic construction, the continuous expansion of the city scale and people's more and more frequent activities, spatial information has also attracted more and more attention[1]. According to statistics, 80% of the information that modern people contact and use in daily life, economy and social activities is related to spatial information. The operation of spatial information is the feature of GIS from other information systems. Therefore, the acquisition, management and application of spatial data has become a new research hotspot. At present, the main methods of spatial data collection are remote sensing, modern measurement, mapping and GPS[2]. Among them, the large-scale collection of image data adopts the remote sensing method, and the spatial discrete data collection uses the field data collection method of combining measurement and GPS. With regard to remote sensing, aerial photography and other spatial data collection methods, the data collected through field data collection methods are more detailed. In addition to obtaining the necessary spatial data, the field data collection method can also obtain some relevant attribute data at the same time, which is usually practical.

2. An analysis of the Development at Home and Abroad

2.1. Application of Embedded Data Acquisition System

The basic data content required by data forms a data collection mode from terminal to server and server, and promotes the collection of edge data. In addition, work flow and management are embedded in the application of data collection system[3]. This application is mainly used for sales, maintenance, patrol and other industries with mobile functions. In this industry, people do pipeline maintenance and outdoor work, such as patrol police. The embedded data acquisition program meets the mobile office needs of these industries. This program can display the mobile devices carried by the field operators on the map, so as to get the position information of the person in charge anytime and anywhere, and realize the monitoring and management functions. At the same time, the system can send tasks through wireless network and assign tasks to employees[4]. The task is received by the mobile device and transmits the task status of the system. Therefore, the management department can grasp it in real time during working hours.

2.2. Development Analysis of Embedded Data Acquisition System

Embedded data collection system is the application of embedded system. With regard to the current product situation, the openness of these products will generally be cut by different

manufacturers to protect the products. However, for users in the professional field, it is necessary to adjust and expand the function of data acquisition products according to the actual requirements. Therefore, it is very important to improve the product openness[5]. Due to the emergence of open-source software projects, especially the open-source functions of Linux operating system, developers can fully explore. Many development files allow developers to provide the assurance needed to develop an embedded data collection system. Therefore, open source embedded GPS / GIS data acquisition system based on open source software is the development trend of embedded data acquisition system[6]. In addition, the embedded data collection system based on open source software also has good security. At the same time, some open source software is free.

Table 1 Comparison of several mainstream embedded GUI platforms

Characteristic	MiniGUI	Microwindows	QT/Embedded
Authorization clause	LGPL	MPL/LGPL	LGPL/GPL
API	Win32	X,Win32	QT
Function library size	300KB	300KB	600KB
System consumption	Small	More	More
Portability	Slightly worse	Preferably	Very nice

3. Theory, Method And Key Technology of Embedded Data Acquisition System

3.1. Gis Related Technologies

Geographic information system is an information system based on geographic information. Computer software and hardware, access, management, operation, analysis, simulation and data display about supporting specific geographic model analysis methods, providing users with real-time performance in a variety of spaces, using dynamic geographic information. Information management, regulation and decision-making play a very important role. In the system, today's world is regarded as a series of geographical elements and phenomena. Therefore, geographical phenomena generally have two parts: spatial location information and non spatial location information[7]. And the phenomenon information related to geographical location is an integral part of information retrieval. Geographic information is the object of geographic information system. Geographic information is the information related to spatial distribution, which is used to express the inherent quantity, quality, distribution characteristics, laws, connection of surface objects and environment. The symbolic representation of the relationship between geographical features and phenomena is geographic data including spatial location, attribute features and time-domain features[8]. Spatial location is the most important sign to identify geographic information. Describes the location of the function. The spatial location can be described in the following two forms. Latitude, longitude coordinates and other reference absolute frame. Distance, direction, separation, intersection, inclusion, relative position of adjacent objects and other relative reference frames. Attribute characteristics are qualitative and characteristic descriptions, and the data corresponding to attribute characteristics are attribute data. Time domain function refers to the time and period of geographic data collection[9]. Because geographic data is collected at different times and periods in the same region, time data is very important for environmental simulation analysis. Therefore, more and more attention has been paid to the research of GIS.

3.2. Spatial Data Collection

Spatial data collection refers to the digitization of all kinds of information used to describe the geographic information data being collected, pointing to several methods instead of being digitized, and memory system, which can manage and analyze data transformation. As a technical means to obtain spatial data, there are map digitization, aerial photos, remote sensing image processing, field data collection, etc.

The digitization of map is the digital processing of existing paper map. At present, the digital generator has two installation methods. The basic process of hand tracking is vectorization:

scanning the independent graphics on the raster, tracking various components by hand, processing the relationship between components, establishing the corresponding phase relationship, and finally forming the vector map. Advantages: simple operation and low technical content. Disadvantages: manual operation is very random, so it is difficult to ensure the accuracy and data consistency. The basic process of automatic scanning and vectorization is to scan the existing graphics, and the scanning equipment will directly quantify them, establish the corresponding phase relationship, and form the vectorization. Advantages: high speed, time saving, labor saving, high automation[10]. Disadvantages: currently in the R & D stage. As with the corresponding scanning and processing software, the resolution limit of hardware, speed, format and price is the theoretical obstacle to overcome these difficulties, and has not been widely used. However, with the development of software and hardware technology in the future, it is expected to solve the problem of Automatic Scanning Vectorization and make the technology practical.

Digital photo measurement is often used for image data. Basic process: digital data is collected by digital photo measuring equipment and software, and finally edited into a map. Advantages: this method has many advantages, high-precision map, can form a variety of products, such as digital large model DTM, digital elevation model DEM, digital orthohoto DOM, digital line drawing DLG, digital raster DRG, etc. Disadvantages: software and hardware equipment, high technical requirements and high cost requirements.

At present, the methods used for field data collection are plate survey, total station survey and GPS survey. Basic process: directly generate digital map on site by GPS, electronic master station, etc. This method can be used when the existing schema and aerial camera cannot be used, because the new area needs large-scale topographic mapping or high-precision feature point area mapping. Advantages: high precision and strong real-time. Disadvantages: low speed, heavy labor burden, not easy to collect in large areas. The purpose of this paper is to achieve the application of embedded GPS / GIS technology in the field data collection with the goal of collecting GPS field data, combined with embedded GIS technology.

4. Embedded System

Embedded system is a special application-oriented computer system based on computer technology. Both software and hardware can be customized. Compared with general computer system, embedded system is usually designed for specific purpose, which has strict requirements for function, reliability, cost, size and power consumption. Embedded system is mainly composed of embedded processor, related hardware and embedded software system. This is a system that runs independently by integrating software and hardware. The hardware configuration of embedded system mainly includes embedded processor and various peripheral devices. Compared with high performance general purpose processors, these embedded processors are very economical and practical. Peripheral devices typically include various interface controllers, memory, and communication devices. These peripherals and device performance are often selected and added to the system based on actual needs. Basic software related to embedded system hardware, operating system, communication protocol, database system, standardized browser and other application software. Embedded software system, embedded operating system and graphical user interface are two very important components. More advanced applications, especially those requiring user interaction, are often used together.

5. Development Process of Embedded System

The development of embedded system is a process of using a set of physical hardware and software to complete the required functions. Therefore, in the development process of embedded system, software design and hardware design work closely together. At present, the development of embedded system mainly follows the procedure of general technology development. This includes system requirements analysis, architecture design, software, hardware, mechanical system design, system integration and system testing.

6. Conclusion

It is hoped that the design and implementation of the agricultural communication service system based on Embedded GIS will be helpful to the agriculture of our country.

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