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Vehicle Information Acquisition and Communication System Based on Multi-Satellite Fusion, CAN Bus and GPS

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Abstract:This paper proposes a GPS and GPRS-based multifunctional vehicle terminal design scheme, which uses an embedded platform based on S3C2440 (bit 23 microprocessor of ARM920T core) and operating system, expands GPS navigation module and GPRS module, video surveillance The module integrates the CAN bus interface to realize vehicle navigation, wireless Internet access, CAN bus communication, and video monitoring functions, and fully meets people's requirements for car safety, convenience and comfort. The GPRS navigation module selects the JP13 receiver, and completes the related hardware circuit design. The navigation system adopts navigation software design based on the eSuperMap platform, which can realize electronic map display and operation, satellite positioning information display, path analysis, navigation and other functions.

Keywords: Vehicle Information, Communication System, Multi-Satellite Fusion, GPS

1. INTRODUCTION

Urban traffic problems are becoming more and more serious with the progress of urbanization. In most areas of the world, the contradiction between traffic problems and urbanization is becoming more and more acute. Traffic problems cause casualties, waste of time and human resources, etc. These problems are becoming more and more obvious, but at the same time, in the process of urbanization, the development of urban road traffic has obviously lags behind the progress of urbanization, especially the development speed of the number of vehicles. To a certain extent, the traffic problem has become an obstacle to the further development of the city, and an obstacle to economic and social development [1-6].

Intelligent transportation systems are now the most popular and all-socialized projects to be developed. The difference between intelligent transportation and previous transportation systems is that intelligent transportation pays more attention to the importance of information transmission, and intelligent transportation systems use the most Advanced technology integrates information technology, electronic technology, control theory, etc. Through the application of advanced technology and the establishment of models, real-time organic connections between vehicles, roads, and information service centers can be formed. In the intelligent transportation system model, the information center not only obtains the operating information of the vehicle, but also obtains the general traffic information of the road, and at the same time it can deliver this information to the car owner in real time. CAN bus, as a kind of reliable automobile computer network CAN bus, has now begun to be applied in advanced automobiles, so that all automobile computer control units can share all information and resources through CAN bus, so as to simplify wiring and reduce the number of sensors. The purpose of avoiding duplication of control functions, improving system reliability and maintainability, reducing costs, and better matching and coordinating various control systems [7-14].

In turn, the power, operational stability, and safety of the car have risen to new heights. With the development of automotive electronic technology, CAN bus communication protocol with high flexibility, simple scalability, excellent anti-interference and error correction capabilities will be more widely used in automotive electronic control systems. The remote monitoring system of public transportation vehicles is mainly used for remote dispatching and monitoring management of public transportation companies. Its equipment consists of a host and a display, installed on the terminal bus, built-in GPS satellite receiving module and wireless communication module, receiving GPS satellite positioning signals around the clock, and displaying the terminal vehicle's operating information latitude, longitude, time, speed, direction, etc. anytime, anywhere , It is transmitted to the main server of the dispatching command center through the network, which is convenient for the center to timely and accurately monitor and manage. When an emergency situation is encountered, the dispatching command center of the bus company can dispatch and command terminal vehicles by means of on-board phone or text message.

At the same time, the client uses the Internet to log in to the main server database at any time, query the location information of each terminal vehicle, or send instructions to it. Through the on-board terminal and on-site dispatch monitoring, video monitoring of vehicles can be realized. The monitoring system will automatically alarm when the passenger flow increases the density of the train, or when the shuttle vehicle is speeding, does not follow the established route or stays outside the station for too long. Of course, in addition to these information services, the information service center can also provide users with entertainment, consulting and other services. The mobile information system is produced with the intelligent transportation system, and it is also a very important part of the intelligent transportation system. The mobile information system can exchange real-time information with users. Users can obtain information such as life-related information, business-related information, traffic-related information, etc., and the system can obtain information from users that is convenient for managing and

monitoring vehicles. The combination of mobile information system and other services such as blood navigation makes it more convenient for users to travel. At the same time, the mobile information system also integrates some security-related services, such as remote control locks, anti-theft alarms and other emergency measures. In the past, the bus terminal was based on 51 single-chip technology. The 51 single-chip hardware development platform realizes the main functions of GPS positioning solution [15-21].

2. THE PROPOSED METHODOLOGY

2.1 The GPS Vehicle System

All functions of the vehicle terminal are basically based on location information, so the acquisition of location information is of utmost importance. At this stage, most of the vehicle terminals on the market use GPS positioning systems, but due to the deliberate deviation of GPS in the Asia-Pacific region, the current positioning accuracy is not very high; moreover, GPS does not promise to use free of charge, and it may be closed at any time. risk. Although the Beidou satellite navigation system can meet the needs of vehicle terminals, it is not a system that operates stably on a global scale. The system is still under construction. During this period, there may still be a lot of problems to be solved, which may cause system instability [22-24].

Therefore, what is used in this design is based on Beidou/GPS dual-mode satellite positioning to achieve location information acquisition. The main functions of the car navigation module include positioning information reception and display functions, including initializing the serial port and class, reading the receiver's real-time positioning information, improving the positioning information for navigation, and displaying the real-time position information of the vehicle itself, such as longitude, latitude, and speed. The map display and operation are displayed on the display unit, including map display, movement, zoom in and zoom out, real-time display of vehicle position and other functions. Route planning and navigation functions. By entering the starting point and end point, the best driving route is calculated and displayed on the electronic map. According to the position of the vehicle itself, guide the car to follow the set route.

The module in this system adopts the company's module, and the data transmission interface between the module and the host adopts a standard three-wire serial interface. The signal data of the position of the vehicle terminal is collected through the carrier board, and the collected data is transmitted to further the data transmission rate can reach long, which can meet the needs of high-speed acquisition of real-time position information data. The power supply in the carrier board is also a linear stabilized power supply, which provides a linear stabilized power supply for the carrier board. In this system, a triode is used as the restart switch of the module, and this signal is controlled by the processor. In addition, the module is easy to use, stable in performance, and simple in interface circuit design.

2.2 The Multi-Satellite Fusion and CAN Bus

CAN, as a communication protocol describing the way of information transfer between devices in the automotive environment, is used to exchange information between ECUs of various electronic control devices on the vehicle to form a serial communication network that effectively supports distributed control or real-time control. The bus has significant features and advantages such as strong real-time data communication between nodes in the network, short development cycle, and has formed an international standard trend. It provides a powerful way for distributed control systems to realize real-time and reliable data communication between nodes. support.

The security data receiving module uses CAN bus as the communication protocol, and is mainly responsible for receiving, controlling and displaying the position coordinates and status values of the mobile terminal from the navigation data processing module that cooperates with the corresponding gravity sensor, photoelectric sensor and electromagnetic induction sensor. Real-time data. The MS320F2812-based digital information processing chip DSP can be used as the main body, and devices such as GPIO and SPI can be integrated to ensure that it provides high-speed and safe data processing functions. According to the way of function realization, the entire vehicle-mounted terminal is divided into two levels. The bottom layer is hardware resources. It mainly includes a core embedded hardware platform, including CPU, Flash and clock circuits to realize the functions of the central controller. Its main function is to control peripheral function chips through various interfaces to achieve specific functions. The peripheral chip is another part, which is connected to the vehicle's acquisition interface, which mainly includes the Beidou/GPS dual-mode satellite positioning module, GPRS wireless communication module and CAN information acquisition module.

2.3 The GPS Multi-Satellite Fusion and CAN Bus Vehicle Information Collection

The main control unit includes MCU, external FLASH, SDRAM, and peripheral clock circuits, etc., which make the MCU work normally; the vehicle data acquisition unit includes a high-speed CAN bus, a low-speed CAN bus, switch and analog acquisition interfaces, For some vehicles, these quantities can already fully cover the variables of the vehicle state, and there are acceleration sensors and vibration sensors in the vehicle data collection unit, which can independently measure the acceleration of the vehicle and independently perceive the state of the vehicle.

The vehicle-mounted data acquisition and communication device is responsible for collecting CAN real-time data and GPS data, and performing data preprocessing, system parameter configuration transfer, and at the same time transmitting real-time data to the on-board computer, and transmitting real-time data to the remote monitoring center through 3G wireless routing. The vehicle-mounted data collection and communication device collects equipment status information and construction operation data of large construction vehicles, as well as GPS geographic location information including time, longitude, latitude, speed, and direction. These data messages can be sent to the vehicle terminal display device through the network port communication, and transmitted to the remote monitoring point through 3G wireless transmission. When the external demand for the collection volume changes, it can be added or deleted through the powerful configuration function of the software, and the system supports remote and local configuration. For example, you can change the frequency of data transmission, configure the relevant parameters of 3G wireless routing, and the collection volume and collection channel of the CAN collection module. The entire device is to be applied to the industrial site, and its environment is relatively harsh, with high temperature, strong electromagnetic interference, humidity, compression resistance, seismic resistance, and corrosion all need to be

considered. Therefore, the design of on-board data acquisition and communication devices must consider these the influence of factors. For the functions to be realized by the vehicle-mounted data acquisition and communication device, that is, data acquisition, wireless communication.

3. CONCLUSIONS

The design of this vehicle terminal is mainly to provide high-precision location services for vehicles and monitoring platforms. This function is mainly realized by the TD3017A chip produced by Dongguan Taidou Microelectronics Technology Co., Ltd., which enables the vehicle terminal to have Beidou/GPS dual-mode satellite positioning Ability, its positioning accuracy depends on the mode with the highest accuracy, which combines the advantages of the two into one. Secondly, the vehicle information collection function is realized. The main information collected here is CAN bus information, because with the development of automotive electronics, a large number of sensors are used in automotive electronic systems, and these sensors are all connected to the CAN bus.

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