

Research on Design and Implementation of Display System of Intelligent Bus Board Based on GPRS

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Abstract. In recent years, China's urbanization process is accelerating. The rapid growth of urban population has brought tremendous pressure on urban transportation system. In order to improve the informatization level of urban public traffic management and relieve the pressure of urban traffic, this paper develops an intelligent bus board display system based on GPRS. The hardware includes the modules of master controller, Wireless Transceiver and LED display. The software includes the modules of data transmission, data processing and data display. The intelligent bus board based on GPRS meets the needs of the management of the city bus stop and has broad market prospects.

Introduction

Urban public transport is the lifeblood of the city, is one of the main signs of the realization of urban modernization. With the steady growth of China's economic development and the rapid pace of urbanization, the scale of the city gradually expanded, the population has increased significantly, which has brought tremendous pressure to the urban transportation industry. Urban public transport is an important infrastructure which is closely related to people's production and life. The important position of urban public transport industry in urban development. Bus priority strategy is significant, the city public transportation system has been paid more and more attention. According to the national conditions to encourage and attract people choose to take bus travel, will greatly weaken the traffic pressure, improve traffic conditions from a great extent. At present, the city public transport industry has increased the investment in fixed assets, the supply growth is more, but only to increase the hardware facilities and cannot fully improve the effective utilization, software management cannot be ignored. According to the national economic and social development. To speed up the process of urbanization, city and intercity rail transportation in the next ten years will be in the expansion of the network size, improve the structure, improve the quality, the rapid expansion of the transportation capacity, and constantly improve the level of equipment development period. Public transportation is the artery of urban economic development and the key to improve the comprehensive competitiveness of cities. The sustained growth of the national economy will bring the rapid growth of the demand of residents' travel, safe and reliable, economic and efficient, convenient and comfortable and even personalized travel demand is increasing. The government continues to improve the service capacity, service quality and service efficiency of urban public transport, to meet the needs of the masses of the people.

Hardware Design of Display System of Intelligent Bus Board Based on GPRS

Master Controller Module. The main control module uses MCS-51 series microcontroller, control and information interaction between TC45, server, and will be responsible for the information analysis of the received and sent to the LED dot matrix display module and each car, indicating each car running position and the distance to the station. The communication between the LED module and the GPRS module is based on the protocol standard, and the communication between the computer and the display control module is carried out. The module consists of a pair of infrared sensors. When the object is not blocked, the receiver can receive the light emitted by the transmitting tube, and the output of the receiving tube is low. The receiving tube cannot receive the light emitted by the

transmitting tube, and the output of the receiving tube is high. In this system, the sensor is connected with the shaft. When the bus movement axis of each turn, a certain number of pulses. The device will be generated by the pulse signal input MSP430 microcontroller. Single chip microcomputer to receive the signal to count, through the wheel radius to calculate the distance traveled. Whenever the bus to the bus stop when the count value cleared, according to the distance between the two bus stop in the microcontroller to get the distance from the next stop. A basic device of bus monitoring center is server. The utility model is used for receiving the position information, the speed information and the leaf spring variable information of the bus of the bus terminal which is transmitted by GPRS. The bus system monitoring center can real-time grasp every bus location, speed, congestion information can be adjusted in real time on the departure interval through the driving position and the degree of congestion can also assess the performance of the driver through the data.

Wireless Transceiver Module. GPRS DTU is a kind of wireless data terminal for Internet of things, which can provide long distance data transmission function by using GPRS network. GPRS DTU module provides an interface, and MSP430 microcontroller for data exchange. The transmission distance of the city is relatively wide coverage. The bus stop is composed of GPRS module, PC and liquid display. The GPRS module is used to receive location information, public transport system monitoring center sent over the bus speed information and congestion information inside the bus and then send the data in a RS232 level through the serial transmission PC, analysis and processing of the PC data, the information data embedding position, speed and degree of the crowded bus to the system, the system will these conditions directly in the liquid product is displayed on a display. Passengers in the bus station waiting for the car can be seen from the electronic bus stop to see the location of their car, speed, congestion, through these three factors to make decisions. When you see that you are going to ride the car is still far away, and the speed is slow, you can consider whether to transfer to other routes to reverse the vehicle to reach the destination. If you see the bus stop bus is too crowded, you can take a taxi to reach the destination. The data transmission module has a moderate operating frequency, and the frequency stability is very high. The utility model is especially suitable for wireless remote control and data transmission system with multiple sending and receiving. The resonator frequency stability after the crystal LC oscillator frequency stability and poor consistency in general, even with high-quality fine-tuning capacitance temperature changes and vibration frequency is also very difficult to guarantee not tuned to shift. The transmitting module without encoding integrated circuit. This structure can be easily made it and other fixed encoding circuit, rolling code circuit and MCU interface, without having to consider the encoding circuit operating voltage and output value of small amplitude signal.

LED Display Module. The utility model relates to a LED module, which is composed of a plurality of rows and a plurality of light emitting diode quadrilateral modules. At least one group of two sides of the opposite side wall is provided with a plurality of concave convex grooves, wherein, the concave grooves of the two opposite sides can be in the form of a corresponding shape and can also be symmetrical. LED module is the LED according to certain rules and then packaged together, together with some of the water treatment products, is the LED module. The main surface of the quadrilateral module can be provided with a decorative structure for the fuzzy module splicing limit. The utility model from the visual and optical angle, so the formation of dislocation line short lines, using a linear visual, visual scanning from the top down when not taking into account the dislocation two, is bound to the formation of numerous dislocation discontinuous short line segments, so as to eliminate the mosaic phenomenon due to the formation of the LED display module and the gap between. The LED module is applied widely are LED products, there are also great differences in the structure and electronics, is to use a simple circuit board with LED's shell and became a LED module, add some complex control, constant current source and the heat treatment to make life LED and better luminous intensity. Remote RFID system reader, continuous emission for activation of low-frequency radio waves of RF card, RF card issued by the receiving and carrying target identification code of the high frequency radio waves, the microprocessor software processing, to extract the real object code, and the digital information to control computer through standard serial transmission RS232.

Software Design of Display System of Intelligent Bus Board Based on GPRS

Data Transmission Module. The data transmission module is a wireless data transmission module which adopts the functions of digital signal processing, digital modulation and demodulation, forward error correction and balanced soft decision. The utility model has the functions of field strength, temperature, voltage, etc., and the functions of error statistics, state alarm, network management. The radio as a communication medium, and optical fiber, microwave, line, have a certain scope. It provides the real-time and reliable data transmission of the monitoring signal in some special conditions, which has the characteristics of low cost, convenient installation and maintenance. The main program uses the system structure of state machine, the program mainly has 6 states, namely, free to receive position information, send location information, screening sites, network connectivity, self: the state machine contains a set of state set, a set of input symbols, a mapping of input symbols and when the computer program before the state to die a state transition function into the first initialization, the chip internal hardware and software of all state variables, registers initialization and set the serial working mode, set the baud rate and interrupt mode: when the program initialization is complete, will check whether the input information, if the information input system will enter the stage of information processing. Program to be converted to a new state, dependent on the conversion function. Because the communication time and the data length between the main controller and the GR47 module are uncertain, in order to ensure that there is no blocking, the main controller receives the serial data by interrupt. The data processing part mainly includes the analysis of the data; firstly, the road car after the site was converted into the form of coordinate data, stop when the host receives the geographic information data, coordinate with its set comparison, and find out which one is the coordinate data, and then converted into a specific site, selected from the station recently and has not reached the bus location through LED flashing lights to inform passengers of the bus information in real time.

Data Processing Module. In order to better distinguish between the human eye, the monitoring center and the bus station on the electronic map color difference. The above several color boxes indicate the weight of the bus. Green, yellow, orange, red. Color difference is larger, the ability to distinguish between the human eye, the human eye can easily distinguish the above four colors. Among them, the Green said the bus is empty, yellow bus between the empty and full load, said the bus full of orange, red, said the bus overload. The bus speed information is displayed in the box. This speed and distance information can be used to predict the arrival time. The bus monitoring system introduced in this paper and electronic bus stop, the passengers and the bus managers can visually see the real-time operation of public transport vehicles, the optimization of public transportation vehicles and line managers can according to the monitoring center data, provide better service for the day after the city traffic. Set up an electronic stop at each station. Electronic bus stop board is composed of a computer display to display the machine to the electronic map as background, when a bus through a stop sign when the FRID recognition module will receive the bus upload information and this information is transmitted to the computer through the serial port data center, unified information will be sent to stop display commands on board based on the electronic map on the location of the stop point to show. Passengers can also be based on the electronic bus stop position display to evaluate their itinerary. Considering the actual situation, such as vehicle vibration on distance sensor, distance sensor of waterproof and power supply stability to the requirements of high stability, it is better to use the SIM card fixing IP binding, which takes into account the support and the cost of mobile operators.

Data Display Module. The MCU receives the data read through the USART interface of SIM300 wireless transceiver module, and then according to the provisions of the agreement to decode the data processing, the system will stop the decoding information previously stored data with the SD card after processing in the match, the matching success will display specific information through the LED screen. According to the data flow is divided into data transmission, data processing and data display of 3 parts, which requires immediate emergency information in the display part displayed, the process for receiving data into the data processing module, data by the algorithm modified feedback to the monitoring center and update the status data of public transportation. It mainly includes the location

information, emergency information, pre arrival time and so on. GPRS is a mobile network system on the basis of the CSI system was established, GPRS data communications for sudden, small flow, high transmission rate, real-time online billing according to the flow, advantages of low power consumption, unlimited distance. Transmit information obtained data will be sent to the DTU through the serial port, DTU data packet will be sent to Internet after GPRS network, finally has a fixed public number data center server receives the data server transmits the received information to the corresponding first stop output. On the other hand, will need data processing results stored in the database, operation information the management of vehicles, in order to send the data to the platform and users online. Need to determine whether the vehicle on the site before, if the bus stop, according to its traveling direction left it the next station, then the server program will not stop the bus lines of the vehicle the label identifies the relative position and direction to update the database. The users access the database display running status of a road vehicle through the web.

Summary

This design of intelligent electronic bus stop board based on the GPRS realize the real-time display of the bus and the intelligent display of the bus stop information. The system has good reliability and stability, which is an effective way to improve the management of urban public traffic. Intelligent electronic bus stop is the future development trend, which will be widely used in intelligent traffic.

References

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