

Intelligent anti-theft alarm device of electric vehicle based on Internet

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Abstract: With the continuous progress and development of our society, green travel has become the first choice of people. Electric bikes and motorcycles are not only green, but also can effectively relieve the urban traffic pressure. However, the theft of electric vehicles also brings problems to people. In order to solve this problem, this paper studies the intelligent anti-theft alarm device of electric vehicle based on Internet. The system uses STM32 single chip as the main control chip, vibration sensor signal, and Beidou + GPS module as the trigger signal, using radio transceiver module or 4G module to realize remote control. When a threat is sensed, an alarm is sent out by a buzzer, and the electric vehicle power is cut off at the same time. The test results show that the intelligent electric vehicle anti-theft alarm system can basically achieve the anti-theft function.

1. Overall structure and function of the system

The product we designed is generally based on the three-tier structure of the Internet of things. The overall block diagram is shown in Figure 1. In the sensing layer, the hardware structure of the system is configured. In the first generation of products, the vibration sensor module is selected for the hardware sensing part to preliminarily judge the alarm signal of theft. At the same time, the Beidou + GPS module is used for position positioning. In the later products, the hardware sensor part is equipped with sound recording module, fingerprint acquisition module, face recognition acquisition module and so on. It is used to record the voice, fingerprint and face information of the thief, which is convenient for the users of our products to alarm and safeguard their rights in the future. In the sensing layer, it also has the executive module, which has two-way relay to control the oil cut-off and power-off operation of the electric vehicle or motorcycle, as well as the alarm for the buzzer module. In the network layer, we choose to use less 4G modules in the current similar products for communication to have higher transmission bandwidth. In the application layer, wechat program is added for the convenience of users to check the positioning of electric vehicles and alarm manually. Compared with the traditional electric vehicle anti-theft system, it has a great difference in system complexity. By adding microprocessors, the whole system can process the data from the sensor module mechanism more intelligently, more quickly and more accurately, thus reducing unnecessary trouble caused by misjudgment [1.2].

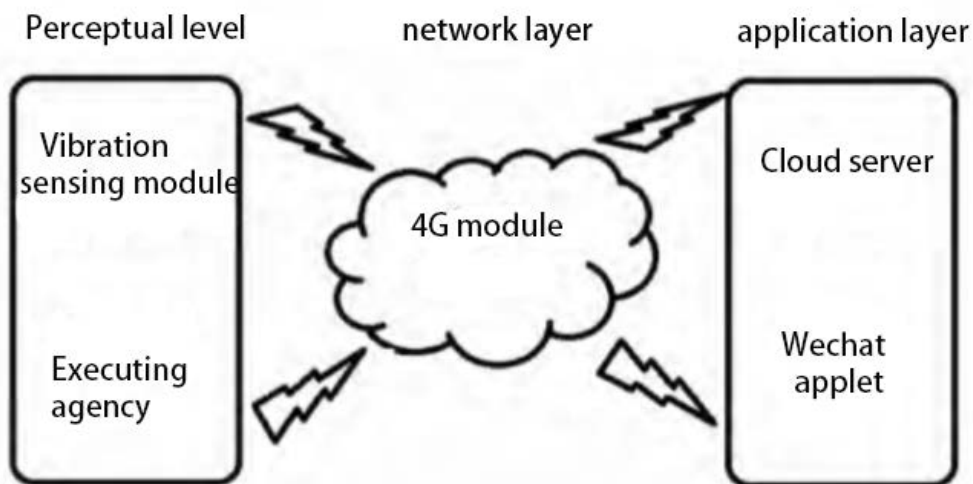


Figure 1. System block diagram.

2. System hardware design

The hardware design of the system mainly lies in the design of sensing layer, including the design of vibration sensor module and actuator.

2.1 Vibration sensor module

The main components of the vibration sensor module are LM393 voltage comparator and vibration sensor. When the vibration sensor detects the external vibration, its resistance will change. Through the voltage comparator, the detection signal will be output, and then transmitted to the single chip microcomputer for signal processing. LM393 chip contains two voltage comparators, which are independent of each other, can work at the same time or independently, and the error is within 2.0MV. Considering the need to set up power supply device, in order to save energy. Generally, we choose to put the power supply in the sleep mode. We choose the Automatic wake-up device every 5 minutes to detect the position and state of the electric vehicle. The vibration sensor can provide a vibration trigger signal of the emergency wake-up microprocessor, so as to provide a quick response mechanism. The vibration sensor can also use the mercury switch, which is a physical switch. The power consumption of the system in this case is very low when it is in sleep. Compared with the electric vehicle itself, the power consumption can be ignored.

2.2 Beidou + GPS module

The Beidou + GPS module is an integrated circuit composed of RF chip, baseband chip and core CPU, and related peripheral circuits. This design adopts Beidou + GPS module [3].

At the same time, the short message positioning function is also considered. During the function test of SMS positioning system, it needs to borrow the information receiving terminal of the equipment holder and the card installed inside the portable equipment. In order to save the test burden of the system, this positioning system only uses the above two modules to run the test independently at this stage, and it will pass the SIM card after the information receiving terminal of the equipment holder receives the relevant information. Automatic acquisition of location information, and then effective transmission of location information under the smooth operation of the overall network platform [4].

2.3 Module design of human body induction circuit

Our products integrate fingerprint acquisition module, sound acquisition module, face recognition acquisition module and pyroelectric infrared sensor as the relevant modules for human body

induction. For the circuit design of human body induction of thieves, we refer to the relevant literature, mainly using triode 9013 to amplify the human body signal received by the integrated human body induction module, and then send the amplified signal to the single-chip microcomputer for relevant processing. The main device of the human body induction module is the pyroelectric infrared sensor, which can convert the detected human body infrared signal into the electrical signal, but the electrical signal of the conversion is relatively weak, which needs to be amplified by the circuit before output. This module adopts the method of continuous triggering. When a person enters the detection range of the human body induction module, the human body module will continuously output the high level, which will not return to the low level until the person leaves. The human body induction module may have 0-3 times of high-level output when it is just started, and vibration may generate false alarm at this time, which is a normal phenomenon. The system can enter the normal standby state after a period of initialization, and the initialization time is about one minute left and right.

2.4 Actuator design

The actuator uses two relays to control the power supply of electric vehicle and the horn mechanism. The ECS at the application layer receives the data from the perception layer set by our software. Through the data we store, we can analyze the location and status of the current user's electric vehicle, whether it is the user or authorized by the user. If not, we can inform the user of the app and the control actuator through the network layer, and the relay that controls the power supply of the electric vehicle will not be opened or immediately In the off state, we have tried the buzzer module for the electric vehicle horn mechanism, and found that the alarm sound of the buzzer module is too single. We consider it more intelligent. In the second generation of products, we choose to use MP3 player, during the playing process, we can choose to control the playing content, so as to achieve the voice transmission of hollowbike.

3. System software design

The software design part of the system mainly includes the design of the microcontroller program in the sensing layer and the design of the application layer wechat small program.

The program of microcontroller is mainly the bottom program of the sense layer and the direct operation of hardware resources for the bottom layer. After the system hardware is powered on, initialize the IO equipment, timer, serial communication port, triaxial accelerometer, Beidou + GPS positioning module and other resources for normal use. After initialization, first put the microcontroller into sleep mode, wake up automatically every 5 minutes, send some perceived information to our product's cloud server through 4G module, and send it After completion, it will enter sleep mode again to reduce the power consumption of the whole alarm device. When the vibration module detects the vibration and selects the alarm, the micro controller is forced to wake up and send the sensing information to the server. Figure 2 is the program flow chart of the microcontroller.

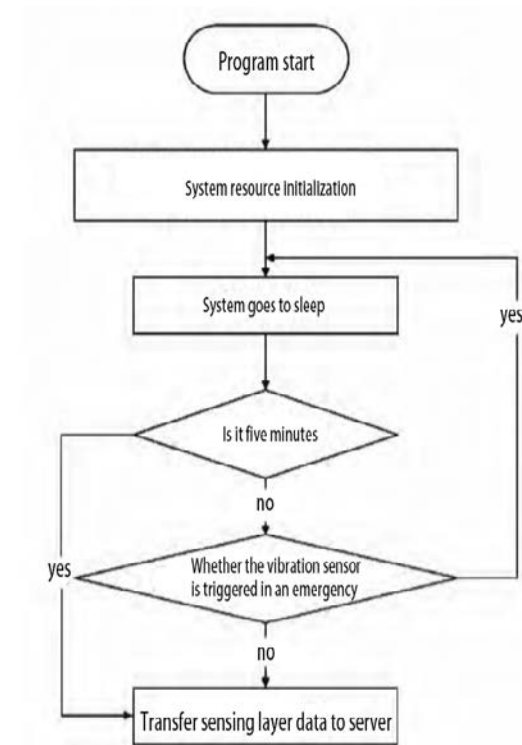


Figure 2. diagram the program flow chart of the microcontroller.



Figure 3. User interface the interface of wechat applet is shown in Figure 3.

4. Conclusion

In this paper, a set of intelligent anti-theft alarm system for electric vehicles and motorcycles is designed by using STM32 single-chip microcomputer. The circuit structure is simple, the alarm response is sensitive and it is convenient for loading. Compared with the mechanical alarm system widely used in vehicles at present, the single-chip intelligent anti-theft alarm system has stronger stability and higher level of intelligence, which is suitable for the field of vehicle safety technology and has the promotion value.

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