Design of the Brake Cooling System Based on GPS Early Warning and the Liquid Level Detection

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Keywords: GPS, Level Sensor, CPU, Brake Cooling System, Oil Consumption

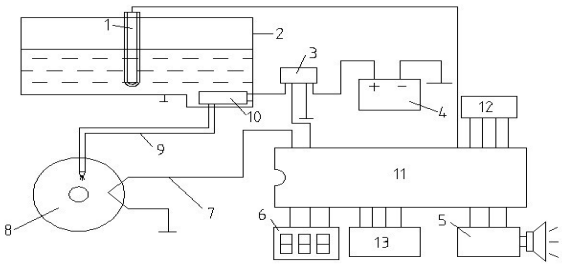
Abstract. This system is mainly to the traditional cooling system for the appropriate improvement through the cooling water tank, water pump, pipeline, water, the global positioning system GPS, liquid level sensor and the central control system. When the vehicle down a long slope, through the GPS issued an electrical signal to the CPU, the CPU sends a warning instructions to the execution unit, and owners are only to the specified water point add appropriate amount of water for downhill at this time, so then effectively reduce the downhill when the brake pad wear and the automobile fuel consumption.

Introduction

At present, the domestic automobile uses the conventional brake cooling system, and even some of the car's brake cooling system is artificially added, so that the reliability and safety of the vehicle has been severely damaged. In this paper, the main characteristics of the brake cooling system based on GPS warning and liquid level detection are the fuel consumption, although the difference is not very obvious, but with the increase of vehicle base and driving range, the difference is not obvious.

System overall structure design

The system contains the control part and the implementation part, the main part of the implementation of the intelligent pump and its related circuit. Control part mainly includes information acquisition circuit and component and information processing unit; information data acquisition part contains GPS positioning module, liquid level detection module and temperature detection module; information processing module includes central control unit and human-computer interaction interface module, LCD module, voice alarm module. The system structure diagram is shown in Fig1.



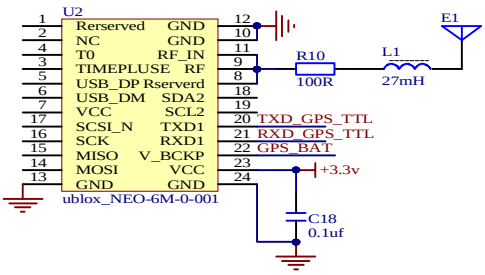
1-level sensor 2-storage tank 3-relay 4-power 5-voice alarm module
6-LCD module 7-temperature sensor 8-Brake pads 9-Water pipe
10-intelligent pump 11-CPU 12-Keyboard 13-GPS

Fig.1 The structure of system

The hardware circuit design of system

The circuit design of GPS module

The circuit design of GPS module is shown in Fig.2. The GPS module is GPS receiver, which is to achieve the positioning function, and the circuit design is shown in Fig.2. The design is the Swiss ublox company GPS NEO-6M-0-001 receiver in this system. Pin 23 is the GPS module power input pin, and the main control board to generate the 3.3V voltage interface connection, pin 22 connected to a standby battery, the system starts positioning work, which will immediately to the battery charging; in order to enhance the GPS positioning signal, external connection antenna, and when the GPS received data through the TXD_GPS_TTL communication via RS485 communication to the microcontroller serial port.



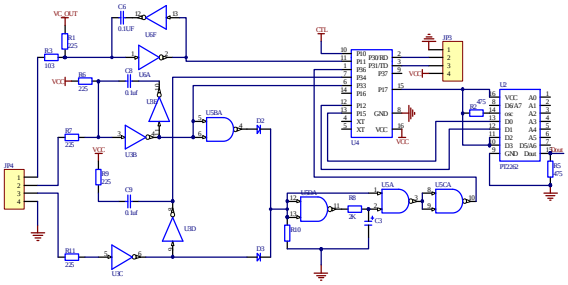


Fig.2 The circuit design of GPS module Fig.3 The circuit of liquid level sensor module

The circuit design of liquid level detection module

The main task of the field detection module circuit is to detect the liquid level value. The differential pressure sensor is designed to detect different levels of different water levels. The signal is transmitted to the host computer via a wireless transceiver module. The corresponding hardware circuit is shown in Fig.3.

The circuit design of intelligent liquid level control module

In this system, a smart pump is installed, which is controlled by an electromagnetic relay, and the relay coil is controlled by the signal from the central control unit. Control module is mainly used to the pump implementation of intelligent control, when the microcontroller I / O port output low electricity at ordinary times, by driving triode, relay coil current flows, magnetic force is generated, the relay switch pull, pumps began to connect the power. When the output is high, the relay coil does not have current, and the pump does not work. The main circuit of controlling module is shown in Fig.4.

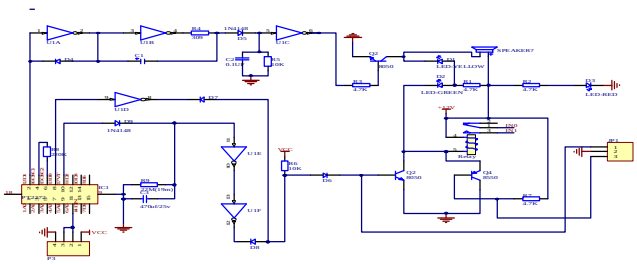


Fig.4 The circuit of controlling module

The circuit design of power module

The whole system uses 5V power supply, for the important part of the design must take into account the hardware system on the power supply with voltage stability and small ripple, of course, in the premise of effective guarantee circuit voltage stability, low power consumption is also a hot topic in today's design. As a result of the system requirements, the system has been used in the 5V power supply of the ZA3020 chip to achieve. The specific system input power supply voltage processing circuit is shown in Fig.5.

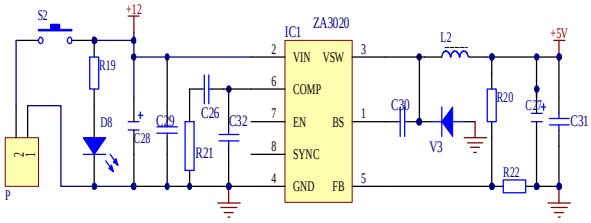


Fig.5 The circuit design of power module

In order to reduce the ripple of the 5V output power supply, the voltage output end of the ZA3020 converter uses a 22uF and 0.1uF capacitor, and the power input of the chip is also placed in a 10uF and 0.1uF filter capacitor.

System software design

After the system initialization, the GPRMC GPS data stream is collected, and the time data is extracted, which is displayed on the LCD screen after conversion. Then the system starts to collect the data of liquid level sensor. If the water level is lower than the presetting value, the system controls the voice module, and gives a voice alarm. If the owner is added to the appropriate position, the voice prompts stop, which can prevent the danger of the car in the need to make use of the cooling water without cooling water. If the water level in the normal range, the system will collect GPS data, if at this time of the longitude and latitude information and the stored in external memory data are the same or similar, if a long slope data, system will read on-chip memory data in the source longitude and latitude information exists, if there is, then the voice prompts owners in front of the far water can be added; if not, then the owner should slow down the speed, find their own water and press key to record the headwaters of the longitude and latitude information. System to temperature sensors to collect information, if the temperature exceeds the preset value, relay coil energized, pump, if water supply time over default value, the system will record the longitude and latitude information of the slope. System through the process of the cycling, will ensure that the car's brake temperature is always maintained in the preset ranging.

Summary

In this paper, the traditional cooling system is improved, and the intelligent control of the pump is realized by GPS and liquid level detection. The liquid level control technology has achieved a significant improvement in the application of the system. System integration of high degree of automation, which can reduce the driver's attention dispersion, and it will not take up too much space for driving. And it can used to monitor the amount of water at any time, and to prevent the water tank is too low or even dry and water pump in the operation of the heat dissipation is not good and cause damage.

Acknowledgements

This work is supported by the Youth Foundation Project of Guizhou Province under Grant (No. KY [2015] 457), the Project Supported by the Science and Technology Foundation of Guizhou Province under Grant (No. J (LKZS [2014]05). This work is also supported partly by the key support discipline of Guizhou province (No. [2013]18), the Project Supported by the Science and Technology Foundation of Guizhou Province under Grant (No. LH[2015]7043).

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