Design of Taximeter Based on MCU

Haifang Cong, Chenjie Zhang
Changchun University of Science and Technology, China

Abstract
With the rapid development of society and the continuous improvement of the people's living standards, the taxi which acts as a part of the public transport in the large and medium-sized cities has already become an important transport when people walk in and out. The designs of a new type of taximeter based on single chip microcomputer AT89S52 are presented. The simulation results have proved that the system is satisfied with the practical requirements of distance, time and fare counting, storing, examining, accumulating data, reminding of the excessive speed, guarding against driver cheating, and the print, speech and display function.

Keywords
AT89S52, fare counting, display, reminding of the excessive speed

1. Introduction
In recent years, with the rapid development of the taxi industry taxi has become an important part of the modern city and the necessary infrastructure to become the way people work and live. Taximeter is able to take a taxi traveling distance and how much waiting time will be priced according to the passenger, and direct display of measuring instruments fare values. The meter denominated accurately or not, is directly related to economic interests of operators and consumers. Therefore, the research of taximeter is valuable.

2. Overall design scheme of taximeter
In the system MCU collects and determines the empty light signal, and also acquires the sensor signal of distance. When the taxi starts, MCU detects a pulse signal from the Hall sensor and calculates mileage. When there is no passenger, MCU calls real time chip DS1302 procedures and then LED displays the clock data and so on. When the passenger is getting on the taxi, the empty light is turned off and the voice broadcast circuit of ISD2560 starts to work. Then the taximeter begins to price and displays the time, distance and the according price. When the passenger gets to the destination empty light is turned on and prints data. Information is stored in the AT24C02 to complete a valuation. The hardware structure diagram of taximeter is as shown in Fig.1.

3. The key circuits hardware design

3.1 MCU control core design
The system adopts MCU AT89S52 as control core. AT89S52 is a low power, high performance CMOS 8-bit microcontroller. The module includes system initialization the recognition of mileage, rate of calculation, various functional modules of organization and management, etc. Minimum control module system is shown in Fig.2.
The empty light
Keyboard control
Hall sensor
Memory circuit
Clock circuit

MCU AT89S52

Speeding remind
Voice broadcast
Print out
Display

The power supply circuit

Fig. 1 the hardware structure diagram of taximeter

Fig. 2 the circuit of minimum control module system

Fig. 3 the circuit of the power design
3.2 The power design

Because the meter’s working environment is poor, the system is required to have anti-vibration, anti-high temperature, anti-moisture, anti-electromagnetic interference capability, especially in terms of power supply interference. Such as taxi starts, engine ignition and battery charging input caused by the meter + 12 V power supply is not stable. Therefore, +12V battery power after filtering and power management chip LM7805 regulator to get +5V regulated voltage output, to ensure the entire system to work properly. It is as shown in Fig.3.

3.3 Speeding remind and buttons set part of the design

speeding remind design

Some taxi drivers in order to get more time to send more passengers they will drive at a high speed and cause some accidents. To prevent these accidents happen, in this system program by software to detect the traveling speed, when the speed is higher than the highest speed setting the red LED is on. The passengers can remind drivers not speeding, in order to avoid traffic accidents.

The taxi speed is measured through Hall sensor. The turntable of permanent magnet is connected with the axis of the wheel. As the wheel is rotated turntable, the turntable of permanent magnet will input the magnetic signal to Hall sensor. The Hall sensor turns magnetic signals into electrical signals and transmits to the microcontroller. When the turntable is rotated continuously, the Hall sensor output signals in accordance with a certain frequency, you can get the speed of information. According to the frequency of the signal, the MCU calculates the speed by the program to determine whether speeding, and generates a pulse signal BCD and frequency response to drive alarm circuit.

buttons set part design

Buttons are operating data query and data set keys. Query button placed outside the taximeter. The driver can view total operating and total operating mileage amount of one month, and a single operating amount and total mileage. When the passenger is getting on the taxi, the empty light is turned off and the meter is starting to work. The data set key is placed inside secretely and the meter must be multiple seals to prevent the driver reset the important data of operating through the buttons. These keys are set by the function / Enter, UP, DOWN keys. The circuit of speeding remind and buttons set part is as shown in Fig.4.

4. Conclusion

The system is designed with MCU AT89S52 as the core, A44E Hall sensor circuit, voice chip ISD2560, DS1302 clock chip and other chip peripherals of the new taxi meter. The taximeter can print the cumulative votes, accurate tax to prevent tax loss through writing data to the memory. According to the
data storage and invoice the driver can pay tax to the corresponding management departments. The data the in-memory will be cleared by management with special equipment.

References

