Design of Infrared Imaging System in Front of Vehicle

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Abstract. In recent years, due to the driver can not see the road ahead or safety distance is not enough to overtake caused by a variety of traffic accidents are common. In order to reduce the accidents, the design microcontroller, infrared emission and receiving module is implemented to detect whether there is the rear bodywork obstacles (such as people, animals, or other objects), and voice alarm system and LCD display alert the driver in front of the road, the speed and distance, etc., and introduces the design of the system in detail.

Keywords: Infrared imaging; System structure; AT89C52 Microcontroller.

1. Introduction
With the development and progress of society and the continuous popularization of modern vehicles, mastering the safety technology of automobile driving has gradually become the most important problem in our daily life. Nowadays, the car has gradually become an indispensable means of transportation in all aspects of our daily work and life, and the safety issues related to car driving have gradually become our most concerned issues. At present, the road traffic facilities are constantly improving, and the supervision work is increasingly strengthened. At the same time, the relevant laws and regulations are sound and perfect. Even so, the number of vehicle accidents and the number of casualties still increase.

In China's traffic accident statistics, China's road traffic safety problem is very serious, the accident rate is very high. According to the relevant information, more than 80% of the drivers are involved in the direct or indirect causes of traffic accidents. Traffic accidents have aroused great concern of the society. Traffic accidents not only endanger people's life safety, but also cause a lot of social material wealth loss.

In all traffic accidents. The incidence of traffic accidents at night is twice as high as that during the day. Because the driver is driving at night and the sky is dark, the driver's vision is not clear enough, which is easy to affect the judgment of road conditions. Therefore, the driver needs to accurately judge the position of obstacles in front of the vehicle and the real-time speed of the vehicle, so as to effectively improve the safety of the vehicle in the process of moving.

Therefore, the fundamental purpose of this system is to make full use of the infrared imaging system to carry out active speed measurement, range analysis and alarm for the running vehicles, and to prevent and eliminate all kinds of vehicle crashes and traffic accidents as far as possible.

2. Systematic Design

2.1. System Structure
The vehicle front infrared imaging system is composed of a single chip microcomputer as the core
controller, as well as infrared transmitting circuit, infrared receiving circuit, display circuit, alarm circuit and other peripheral circuits. MCU sends out control signal to drive infrared emission module to send infrared ray, and USES infrared ray receiving module to accept the returned infrared ray for amplification. After shaping, MCU system outputs relevant graphs, and carries out real-time monitoring and warning.

Figure 1. Figure with system chart.

2.2. System Control Module
The AT89C52 microcontroller is the system control core chip, which is connected to control each sub-module, receives various commands sent by the driver through the keys, and sends the status information of the detected device back to the display screen. The I/O port of the microcontroller is connected to the detected device to obtain the required state information.

Microcontroller crystal oscillator circuit: for msc-51-like crystal oscillator frequency can be selected between 1.2mhz and 12MHz, which is the corresponding choice of capacitor C 10pF--30pF. When 89C52 is used, the crystal frequency can be increased to 24MHZ. For the designed capacitor C, 30pF is used, and the crystal oscillator is 11.0592MHz. The crystal oscillator circuit is shown in figure 3-1 below, with one pin connected to XTAL1 and the other to XTAL2. MCU reset circuit: in order to prevent the program from running out of step or running disorder, power-on reset and manual reset circuit are adopted here. The circuit diagram is as follows:

Figure 2. Circuit diagram 1.

Microcontroller must have clock signal in order to work properly, because it is a sequential circuit. The 18 pins (X2) and 19 pins (X1) of the MCU chip are respectively the output and input ends of the
in-chip reverse amplifier. As long as a crystal oscillator is connected between the 18 pins (X2) and 19 pins (X1) (the control system adopts a frequency of 12IMHz), the clock circuit required by the MCU can be constituted by connecting the two pins in series with a 30PF capacitor. The clock circuit is shown as follows:

![Figure 3. Circuit diagram2.](image)

The 9th pin RST(Reset) of the MCU chip is the Reset signal input terminal. Single chip microcomputer system in the boot or in the process of work due to some kind of interference and make the program out of control, or in the work of the program in some kind of state of the dead cycle need to reset. The reset of AT series MCU is generally realized by external circuit, and the signal is highly charged and effective, which is input by RST pin. The machine can only reset normally when the pin keeps high level for 2 cycles. Reset is intended to make the MCU and all other functions as shown in figure 2-3. In this design, as a simplified model, the RST foot is directly pulled down to achieve only boot reset. Reverts to a primitive state and performs other tasks from that state.

![Figure 4. Circuit diagram3.](image)

2.3. Circuit Design of Transmission System

In the design of command key circuit, the external key of P2.1 is connected with the MCU, and the external key is scanned. The external interrupt is generated by the key, and the instruction of the key is sent to the MCU. After the key is encoded by the MCU, the signal instruction is sent to the infrared transmitting tube.

In transmission circuit design, the infrared light emitting diode is used as the infrared emitting interface. In the infrared emitting circuit, the single-chip microcomputer sends the coded instructions through the P3.7 port to connect the infrared emitting diode. The wiring diagram of the single-chip microcomputer and the infrared diode is as follows:
2.4. Acceptance Circuit Design
In this design, a CCD camera is connected to the outside of the P3.2 port by a single chip microcomputer, and the CCD camera is driven to receive the signal to produce an identifiable electrical signal.

3. Conclusion
This paper proposes the overall design idea of the infrared imaging system in front of the vehicle. The system uses infrared light as transmitter, infrared imaging sensor -- CCD chip as receiver, DSP system as video processing software, AT89C52 SCM as the core control module of the system. The system firstly transmits infrared rays through the transmitting module, uses different types of objects in the front area to reflect infrared rays with different intensity, and uses the receiving module to receive, and finally realizes the real-time presentation of the road conditions in front.

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