

# Design of Intelligent Vehicle Obstacle Avoidance System Based on ATmega16

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**Abstract.** With the increasing levels of high-tech and industrial automation process progresses, the intelligent vehicle is widely used to all kinds of toys and another production's devise. It is greatly enriched the life of the people. Using infrared and ultrasonic testing on the tube black line and the obstacle, when left on the tube detects infrared black line, the car deflected to the left, the right of infrared tube black line is detected, the car to the right deflection. ATmega16 microcontroller is to control the speed and steering electric car, enabling automatic tracking avoidance function.

**Keywords:** ATmega16, Obstacle Avoidance, Intelligent Vehicle

## 1. Introduction

With the rapid development of science intelligence has become synonymous with a leading fashion. Intelligent phones, intelligent robots etc are widely used in industrial, military. It also plays an important role in deep-sea exploration, aviation aerospace, geological exploration. Intelligent vehicle is a integrated system which is composed of environmental awareness, planning decisions and multi-level driver assistance. It is the typical of high-tech complex that focused on the use of computers, modern sensors, information fusion, communications, artificial intelligence and automatic control technology. In the future the application of intelligent robot will be more and more widely, such as aerospace technology, marine energy development technology, microelectronics, manufacturing and maintenance technology, agriculture automation, bio-medicine etc.

## 2. Analysis of intelligent vehicle obstacle avoidance system

### 2.1 Principle of intelligent vehicle obstacle avoidance

The intelligent vehicle obstacle avoidance part is to collect the information about surrounding obstacles and return to the microcontroller for processing. It is composed of ultrasonic modules and two pulse-modulated reflectance infrared transmitter receivers. Ultrasonic is used to measure distance. The changes of ultrasonic return signal can make ATmega16 generate interrupt in order to determine obstacles. When the distance is greater than a certain value, the vehicle can move forward; when the distance is less than a certain value, ATmega16 microcontroller can process it to realize the obstacle avoidance.

### 2.2 Selection of intelligent vehicle obstacle avoidance sensor

There are various sensors that can be used for obstacle avoidance, such as Infrared tube, ultrasonic module, photoelectric switches. In this paper ultrasonic module is in association with pulse modulation of reflex infrared receiver to obstacle avoidance.

Sound wave can estimate the obstacle distance through measurement and the conditions of left front and right front through the infrared emission receiver. The pulse reflection type infrared emission receiver is stable, cheap and also can reduce the pressure of ATmega16.

## 3. Design of intelligent vehicle hardware and software

The intelligent vehicle system block diagram is shown in Figure 1. Mega16 as the core of control circuit combines with peripheral circuit to complete the signal acquisition, line detection, obstacle detection, keyboard input, etc.

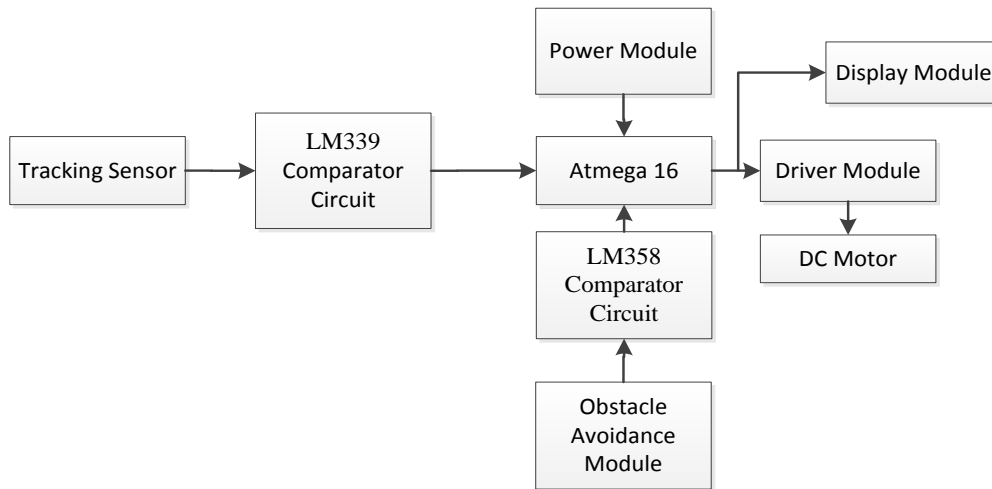


Figure 1 intelligent vehicle system block diagram

**3.1 Design of Mega16 Microprocessor**

Mega16 is a 8 bit AVR microprocessor with high performance, low power consumption, 16K bytes of in system programmable Flash (with the ability to read and write, and RWW), 512 bytes of EEPROM, 1K bytes of SRAM 32 general-purpose working registers, JTAG interface for boundary scan interrupt inside, outside, programmable serial USART ,a SPI serial port.

Microprocessor is composed of minimum system based on Atmel Mega16 which comprises a crystal oscillator and a small operation mode selection switch. It can be seen in Figure 2.

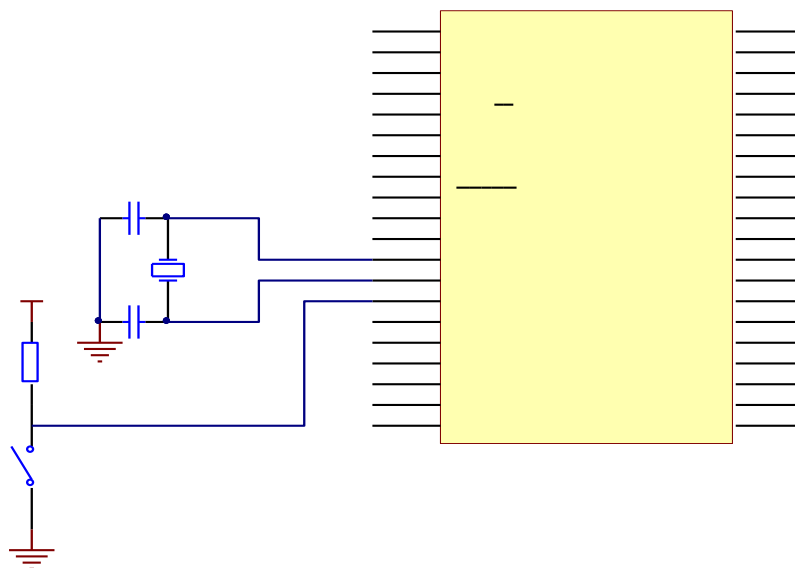


Figure 2 Microprocessor minimum system circuit diagram

**3.2 Design of avoidance circuit**

Obstacle avoidance module has two parts, including infrared detection of left front right front tube (Figure 3) and ultrasound (Figure 4).

In figure3, the left front right front circuit of obstacle avoidance sensors are pulse modulation reflective infrared transmitter receiver, but it is more easily affected by light. In figure 4 ultrasonic module has the requirements of slope of the object detected. So the combination can detect the different height of obstacles, increase the accuracy and comprehensiveness of the probe, increasing the accuracy of obstacle avoidance.

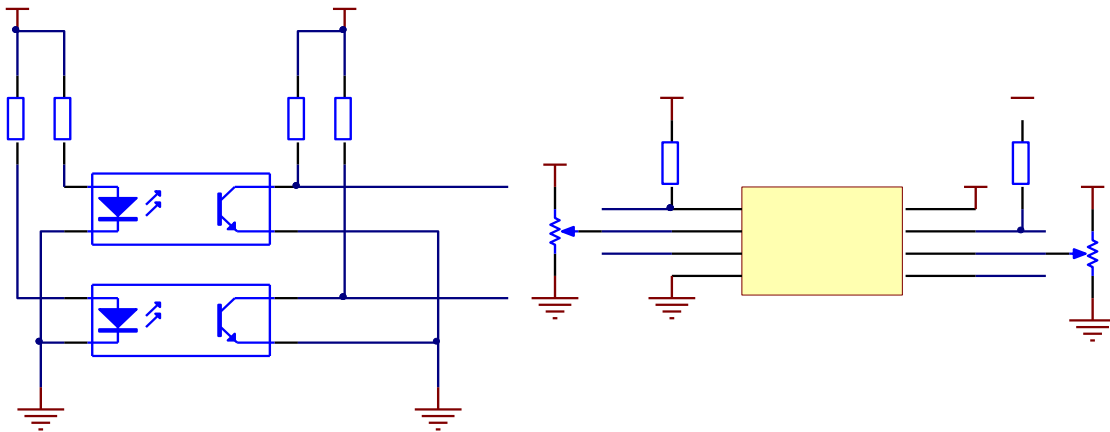


Figure 3 The left front right front circuit of obstacle avoidance

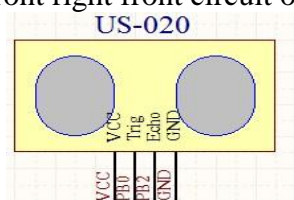


Figure 4 Ultrasonic module

### 3.3 Design of software

In this paper system uses C language program and shown good readability and portability. Obstacle avoidance subroutine is mainly to achieve barrier free judgment, so as to give the vehicle correct instructions to achieve obstacle avoidance.

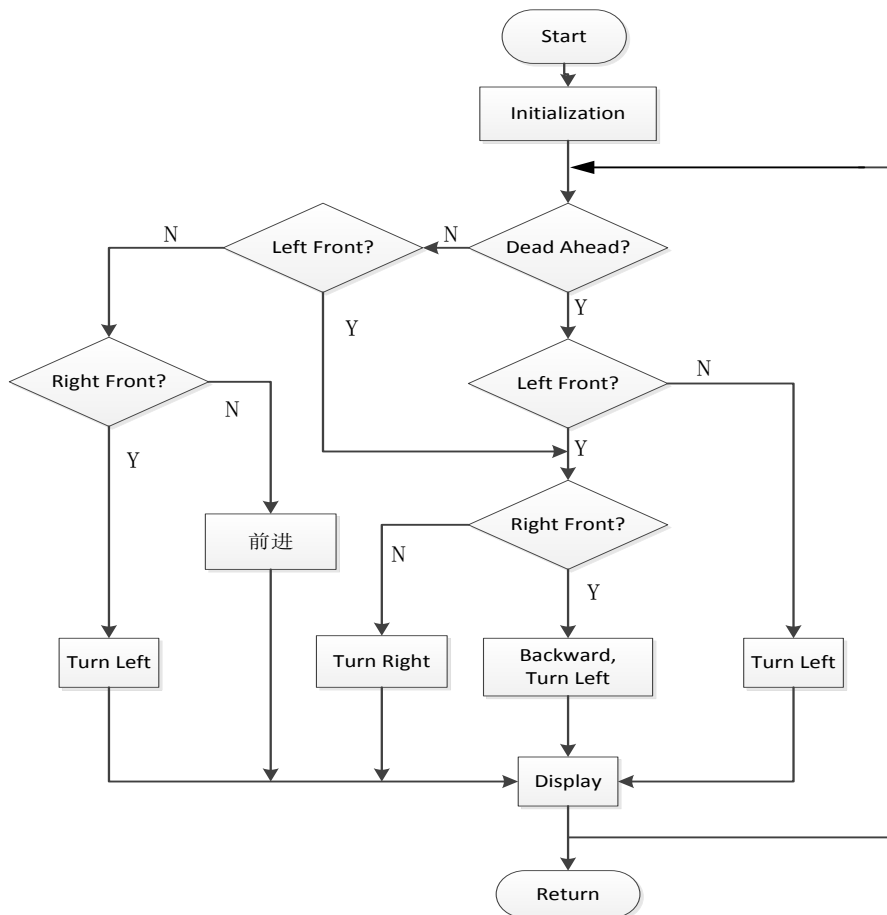


Figure 5 the program flow diagram

Obstacle avoidance sensors have three sensors to detect obstacles. Then the detection can be more accurate and comprehensive. For example, if there are obstacles in front, meanwhile there are no

obstacles in left, then the vehicle will turn left to avoid obstacles. The program flow diagram is shown in Figure 5.

#### 4. Conclusion

In this paper it is designed hardware and software of intelligent vehicle obstacle avoidance based on Mega16. Using Mega16 microcontroller to control the vehicle has good stability, convenient programming, easy to extend, etc. Finally, the experiments were carried out .On the ground with black tape sticking out different track, the car can well identify the path, obstacle avoidance, operate stably, display accurately. Experimental results show that the system has a certain anti-jamming capability.

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