

# Ultrasonic obstacle avoidance

## Ultrasonic obstacle avoidance

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The tutorial mainly demonstrates the obstacle avoidance function of the balance car combined with the ultrasonic module.

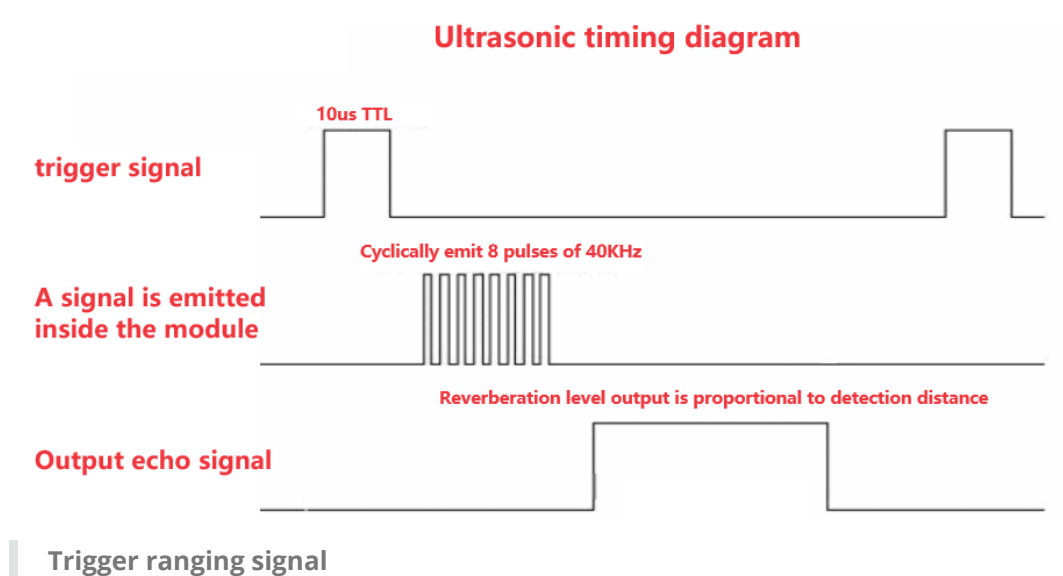
The tutorial only introduces the standard library project code

## Hardware connection

Ultrasonic module	STM32F103RCT6
VCC	5V
TRIG	PA0
ECHO	PA1
GND	GND

## Distance measurement principle

The ultrasonic module is mainly responsible for obtaining the distance between the obstacle and the car to achieve the obstacle avoidance function.



The TRIG pin sends a high level signal for more than 10us.

The ultrasonic module will automatically send 8 40KHz square waves and automatically detect whether there is a signal return

### Receive echo signal

If there is a signal return, the ECHO pin will output a high level. The duration of the high level is the time from the ultrasonic wave transmission to the return.

### Distance conversion

$$D_{distance} = \frac{T_{high} * V_{speed}}{2}$$

T: high level time of echo signal

v: sound speed (approximately equal to 340m/s)

## Main code

The tutorial mainly explains the code for obstacle avoidance. For detailed code, please refer to the corresponding project file.

### APP\_avoid

Control the direction of the car's movement according to the distance detected by ultrasonic wave.

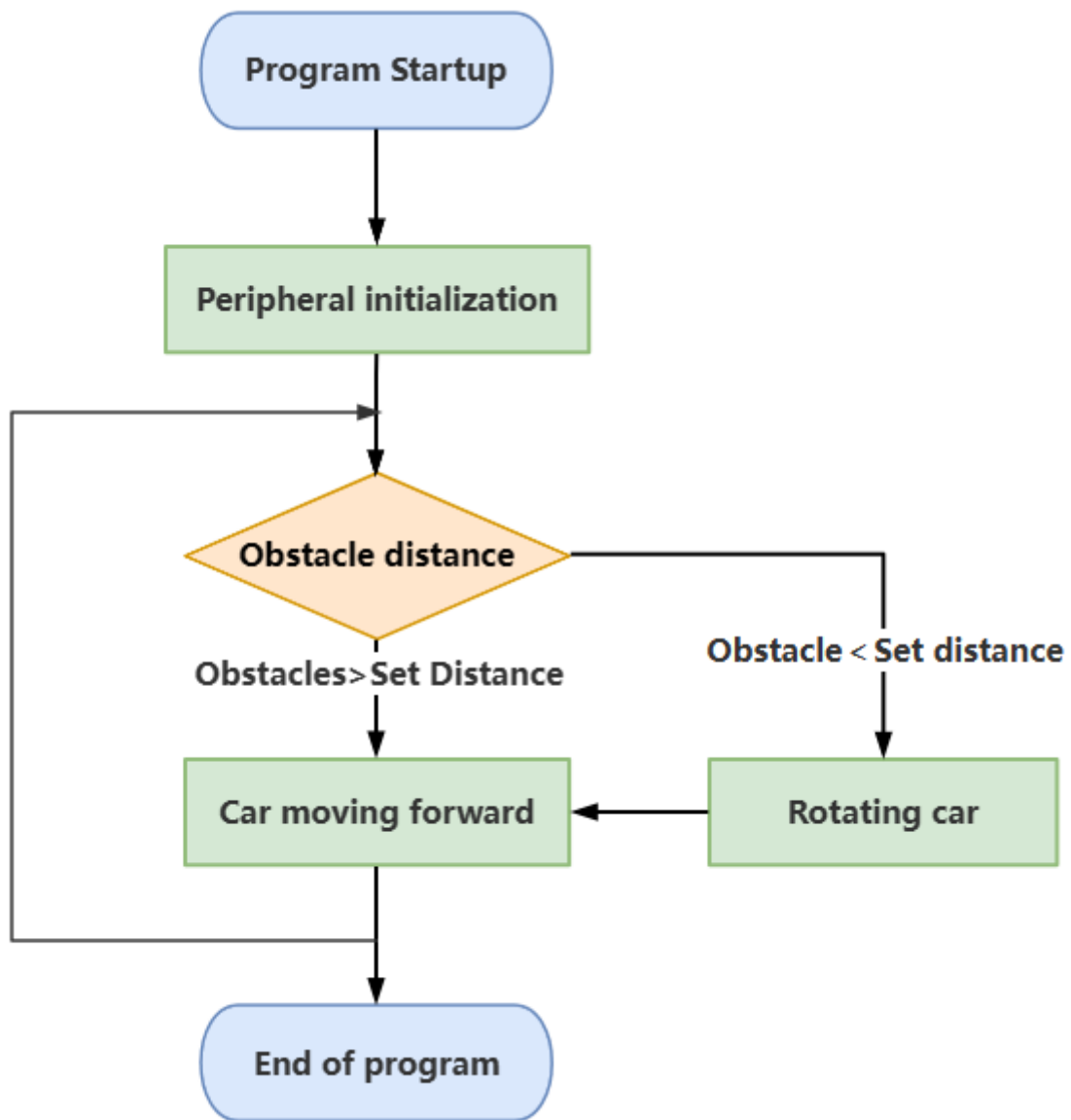
```
void APP_avoid(void)
{
    if(g_distance<250)
    {
        Move_X = -10;
        my_delay(1);

        Move_X = 0;
        Move_Z = 400;
        my_delay(2);
    }
    else
    {
        Move_X = 15;
        Move_Z = 0;
    }
}
```

Judge whether the distance is less than 25cm. If so, perform the backward and rotation actions; if greater than or equal to 25cm, the car moves forward.

## Program flow chart

Briefly introduce the process of function implementation:



## Experimental phenomenon

### Software code

The U\_avoid.hex file generated by the project compilation is located in the OBJ folder of the U\_avoid project. Find the U\_avoid.hex file corresponding to the project and use the FlyMcu software to download the program into the development board.

Product supporting materials source code path: Attachment → Source code summary → 4.Balanced\_Car\_base → 02.U\_avoid

### Experimental phenomenon

After the program is started, press KEY1 according to the OLED prompt to start the balance car obstacle avoidance function: OLED will display the distance to the obstacle in front and the inclination of the balance car in real time!

The program has voltage detection. If the voltage is less than 9.6V, the low voltage alarm will be triggered and the buzzer will sound.

Common situations for triggering voltage alarms:

1. The power switch of the development board is not turned on, and only the Type-C data cable is connected for power supply
2. The battery pack voltage is lower than 9.6V and needs to be charged in time