Ultrasonic avoid (Servo PTZ)

This tutorial is a comprehensive experiment combining multiple peripherals. You can understand individual peripherals before conducting this experiment.

1. Software-Hardware

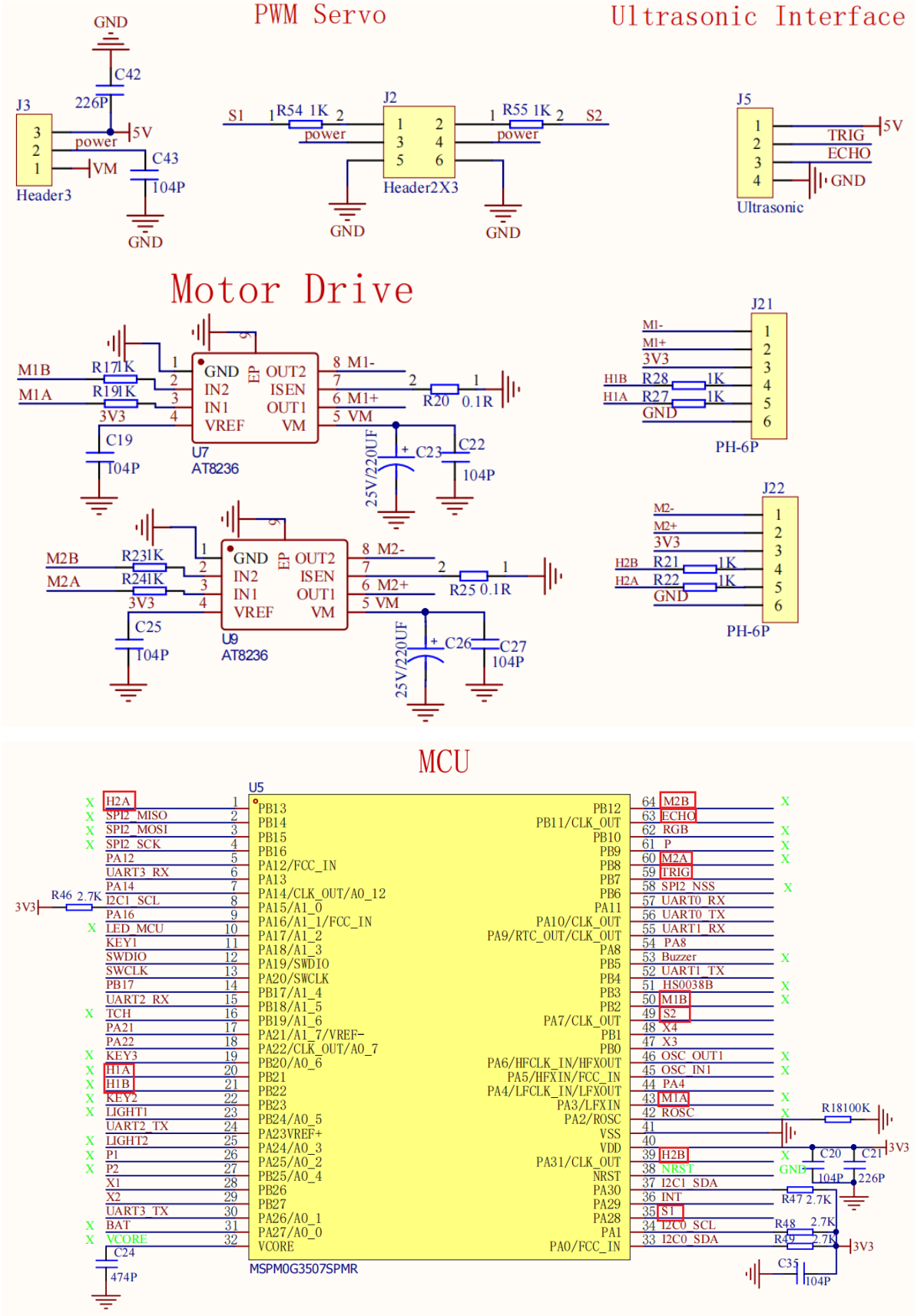
- **KEIL5**
- **MSPM0G3507 Robot Development Board**

  Ultrasonic module, Servo PTZ, TT encoded motor*2: external
- **Type-C data cable or DAP-Link**

  For program download or simulation to the development board

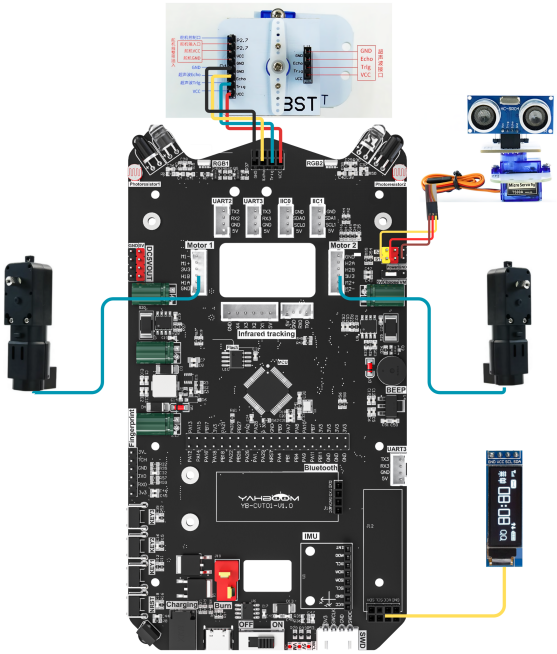
2. Brief Principle

2.1 Hardware Schematic Diagram



2.2 Physical Connection Diagram

- **Wiring**



Servo (S1)	Car	Specific Meaning
Signal line (yellow)	PA28 (yellow)	Signal line
VCC (red)	VCC (red)	Power supply
GND (brown)	GND (black)	Ground line

Servo (S2)	Car	Specific Meaning
Signal line (yellow)	PA7 (yellow)	Signal line
VCC (red)	VCC (red)	Power supply
GND (brown)	GND (black)	Ground line

Ultrasonic Module:

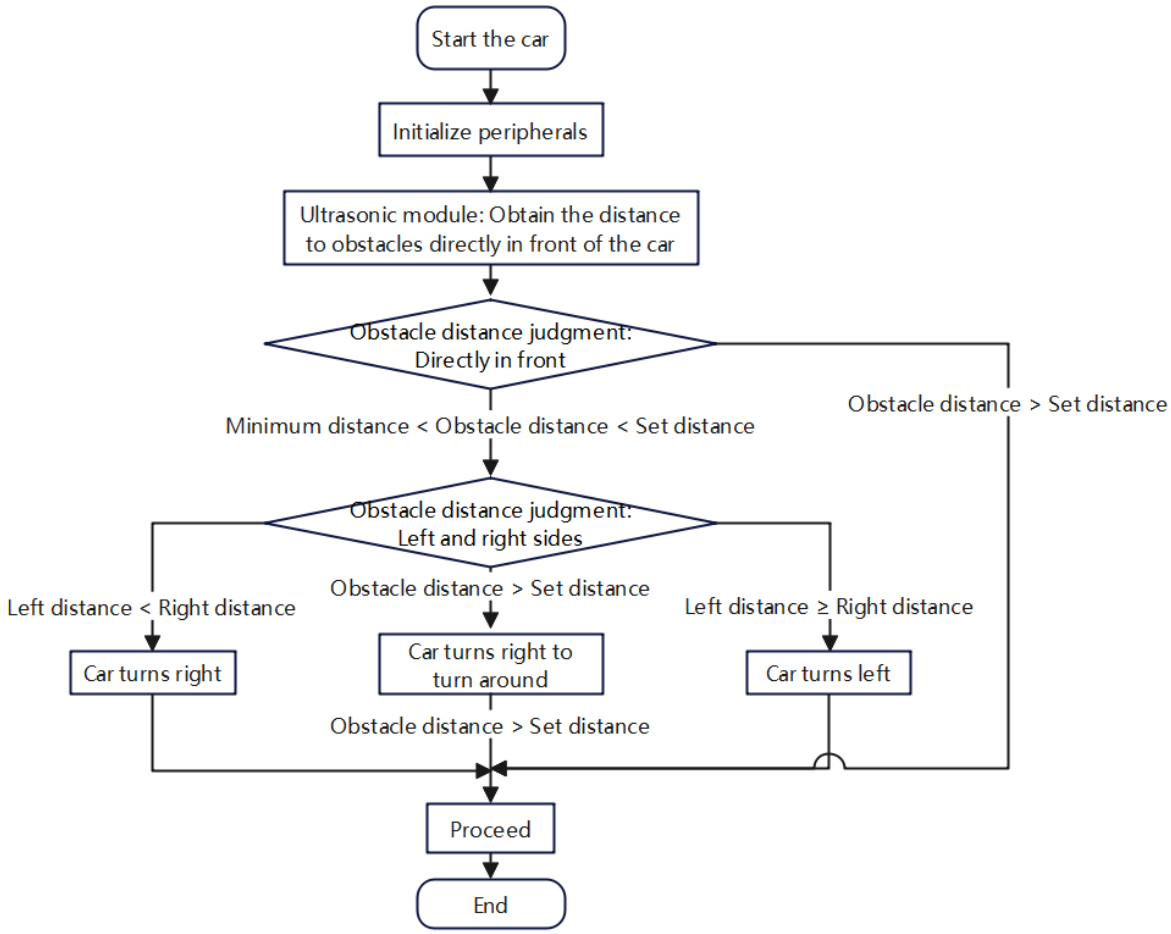
Note: When using servo PTZ, you need to add jumper cap to connect 5v and choose, see white line.

2.3 Control Principle

Obtain the distance of objects in front through the ultrasonic module on the 9G servo PTZ, servo controls left, right and front distances, and control the car to move forward, backward, turn left, and stop based on the distance.

The ultrasonic module can obtain the distance of obstacles in front. We use this distance to determine the obstacle position relative to the car:
When there is an obstacle directly in front of the car, the servo on the 9G servo PTZ will rotate to the left and right sides, finally obtaining the distances on the left and right sides of the car. We control the car to turn left or right based on these distances. The initial angle and the rotation angles to the left and right sides can be modified by changing the code.

- **Program Flowchart**



Module	Function
Ultrasonic Module	External information collection: obtain obstacle distance
Servo	Control ultrasonic module steering
Motor	Motion control

3. Main Functions

This tutorial does not use PID control for car movement

```
Functions introduced before will not be explained again!
```

> **Function: get_servo_distance**

Function Prototype	void get_servo_distance()
Function Description	Servo PTZ ultrasonic obstacle avoidance program
Input Parameters	None
Return Value	None

```
For underlying drivers, refer to Chapter 4 and Chapter 5 tutorials
For application layer, you can read the source code in the project files
yourself
```

4. Experimental Phenomenon

After successfully downloading the program, press the RESET button on the development board and observe the car's effect!

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For program download, refer to [3. Development Environment Setup and Usage:
3.Uniflash Programming]
```

Phenomenon:

With obstacle: The car first stops, then judges left and right distances, and turns left or right based on the distances

Without obstacle: The car moves forward

For specific judgment, refer to the flowchart or code.