Light following

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

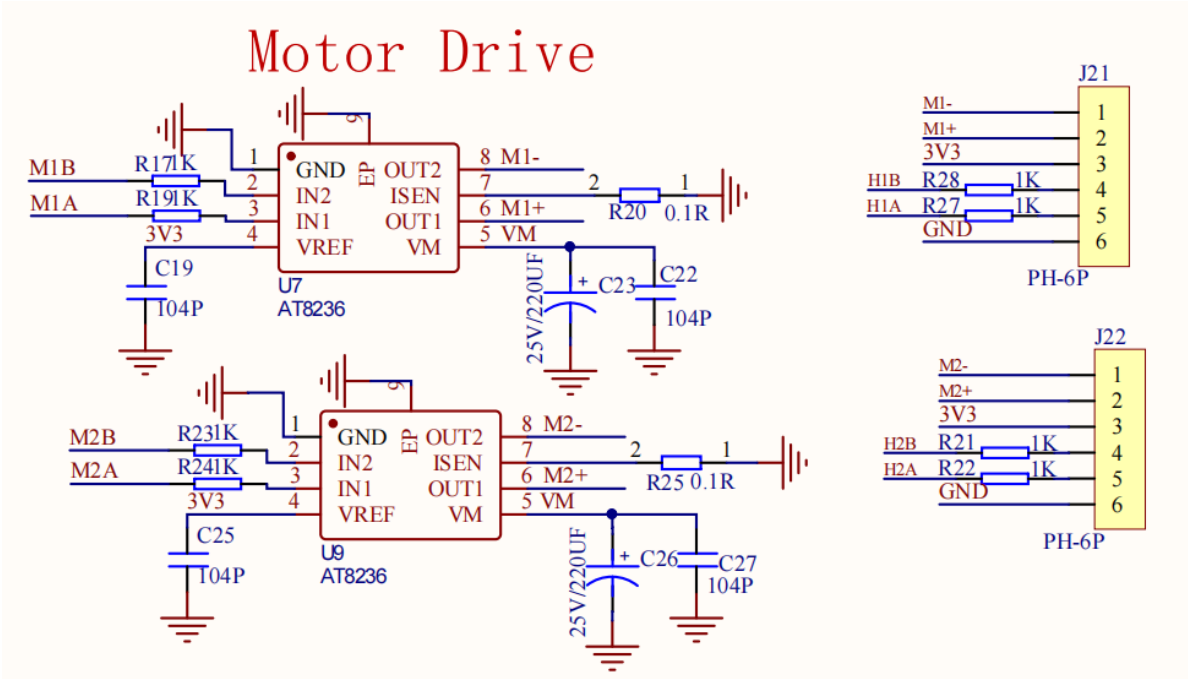
1. Software-Hardware

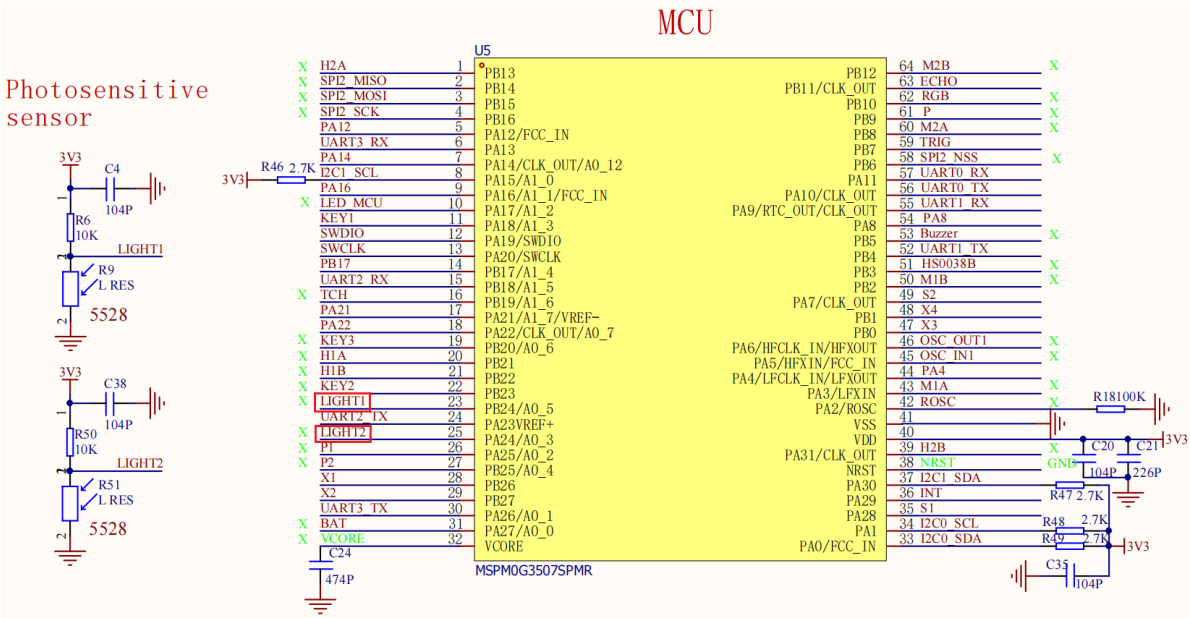
- **KEIL**
- **MSPM0G3507 Development Board**
- **Type-C data cable or DAP-Link**

  For program download or simulation to the development board

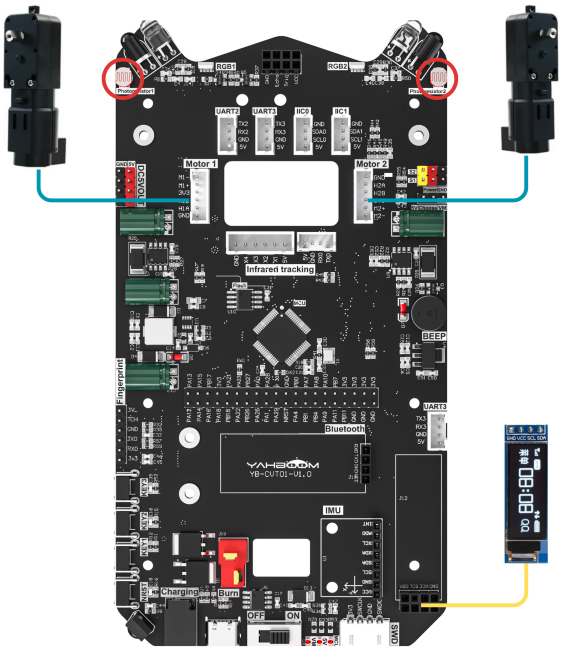
2. Brief Principle

2.1 Hardware Schematic Diagram





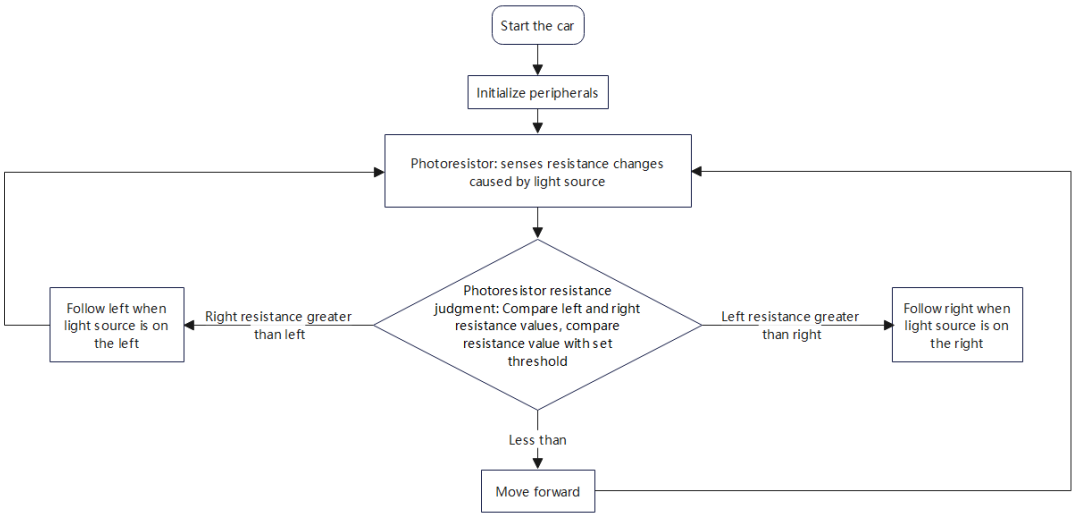
2.2 Physical Connection Diagram



2.3 Control Principle

Control car movement by obtaining photoresistor resistance values, and then changes in resistance values caused by light source position changes.

- **Program Flowchart**



- **ADC**

By using ADC (Analog-to-Digital Converter), the analog voltage output by the photosensitive sensor can be converted to digital values.

MSPM0G3507 includes one 12-bit analog-to-digital converter, and the converted value range is 0 to 2^12-1 (i.e., 0 to 4095);

Photosensitive Sensor (integrated on development board)	**Corresponding Pin**
LIGHT1	PA24
LIGHT2	PB24

- **OLED**

Product	**0.91-inch OLED Display**
Resolution	128*32
Control Chip	SSD1306
Communication Method	I2C (IIC)
Working Voltage	3.3~5V
I2C Interface	VCC: Power positive (3.3/5V) GND: Power ground SCL: I2C bus clock signal SDA: I2C bus data signal

3. Main Functions

Mainly introduces the functional code written by users, **for detailed code, you can open the project files we provide and view the source code in the Bsp folder**.

3.1 User Functions

> **Function: Get_ADC_Value**

Function Prototype	**void Get_ADC_Value()**
Function Description	Used to obtain photosensitive values
Input Parameter	None
Output Parameter	None

> **Function: Get_Sun_Run2**

Function Prototype	**void Get_Sun_Run2()**
Function Description	Light following main program, combines obtained photosensitive values with PID control to achieve following effect
Input Parameter	None
Output Parameter	None

> **Function: PID_Calculate**

Function Prototype	**float PID_Calculate(PID_TypeDef *PID,float CurrentValue)**
Function Description	PID closed-loop control calculation
Input Parameter 1	*PID: PID structure variable address
Input Parameter 2	CurrentValue: current measured value
Output Parameter	Expected output value

4. Experimental Phenomenon

After burning the program, turn on the car power, press the NRST key to run. When the car is set to move forward or be stationary according to the environment, it can move around according to the light source when moving forward, and can follow in 3 directions when stationary.

Note: Since light following is controlled based on photosensitive values, when conducting this case, you must first adjust appropriate photosensitive values for forward and backward control according to key factors.