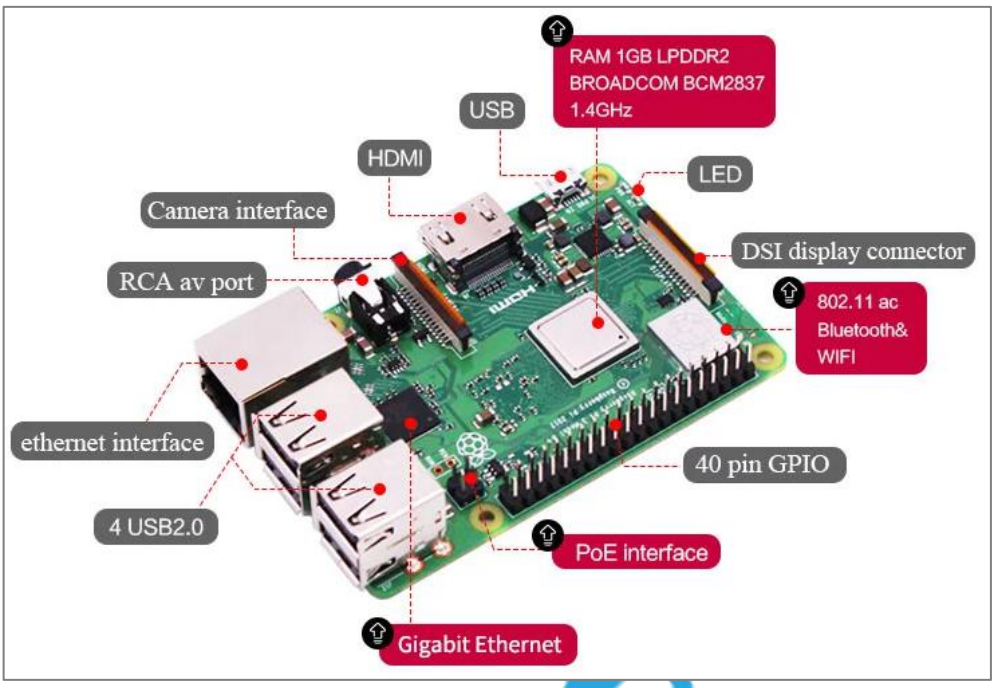
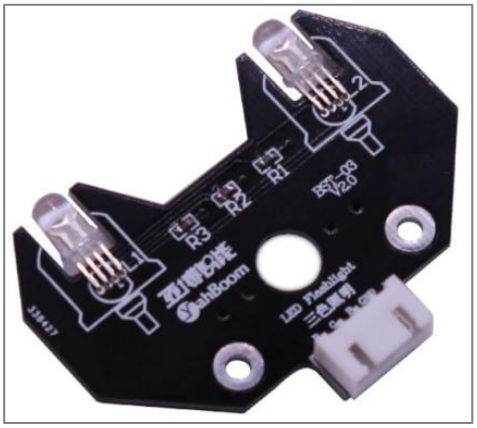
4.Raspberry Pi platform ------- ServoControlColor

1) Preparation



1-1 Raspberry Pi board

1-2 SG90 servo



1-3 RGB module

2) Purpose of Experimental

After running the ServoControlColor executable in the Raspberry Pi system. After the car will still for 0.5 s. The servo starts to turn and lights up different colors when turning to different angles.

3)Principle of experimental

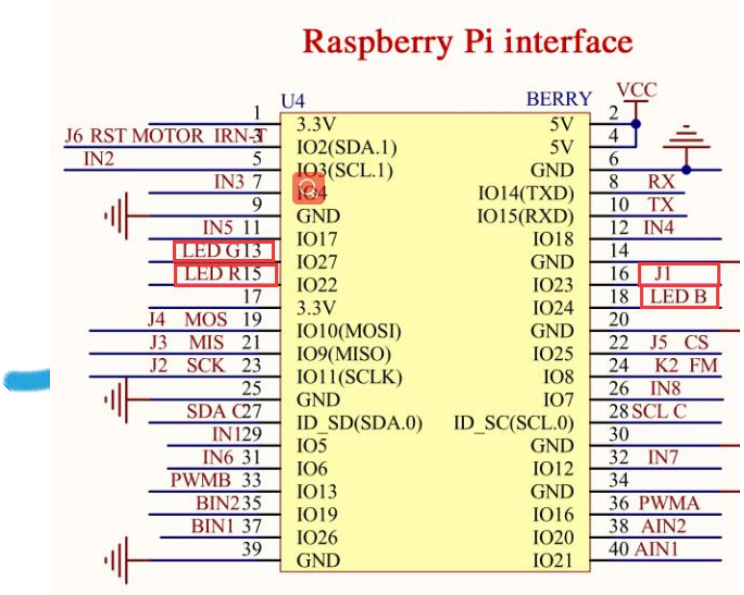
The working principle of the servo: the control signal enters the signal modulation chip from the channel of the receiver to obtain the bias voltage of the DC. It has a reference circuit inside, which generates a reference signal with a period of 20ms and a width of 1.5ms. It will compares the DC bias voltage with the voltage of the potentiometer to obtain a voltage difference and output. The positive and negative of the voltage difference is outputted to the motor drive chip to determine the forward and reverse of the motor.

Servo rotation angle is by adjusting the duty ratios of PWM (pulse width modulation) signal. The standard PWM (pulse width modulation) signal has a fixed period of 20ms (50Hz). Theoretically, pulse width distribution should be between 1 ms to 2 ms, but in fact between pulse width can be 0.5 ms and 2.5 ms. Pulse width and the servo rotation angle 0°～180° corresponds, as shown below.

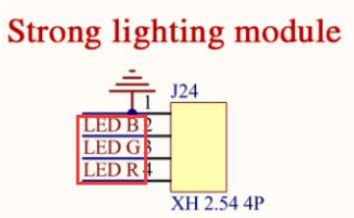
0.5ms----------0°
1.0ms----------45°
1.5ms----------90°
2.0ms----------135°
2.5ms----------180°

4)Experimental Steps

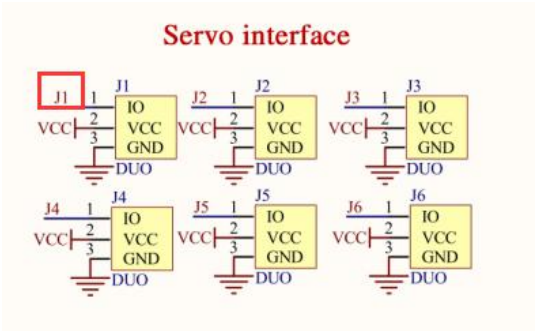
4-1 About the schematic



4-1 Raspberry Pi interface circuit diagram



4-2 RGB module interface



4-3 Servo interface

wiringPi	BCM	Funtion	Physical pin		Funtion	BCM	wiringPi
		3.3V	1	2	5V		
8	2	SDA.1	3	4	5V		
9	3	SCL.1	5	6	GND		
7	4	GPIO.7	7	8	TXD	14	15
		GND	9	10	RXD	15	16
0	17	GPIO.0	11	12	GPIO.1	18	1
2	27	GPIO.2	13	14	GND		
3	22	GPIO.3	15	16	GPIO.4	23	4
		3.3V	17	18	GPIO.5	24	5
12	10	MOSI	19	20	GND		
13	9	MISO	21	22	GPIO.6	25	6
14	11	SCLK	23	24	CE0	8	10
		GND	25	26	CE1	7	11
30	0	SDA.0	27	28	SCL.0	1	31
21	5	GPIO.21	29	30	GND		
22	6	GPIO.22	31	32	GPIO.26	12	26
23	13	GPIO.23	33	34	GND		
24	19	GPIO.24	35	36	GPIO.27	16	27
25	26	GPIO.25	37	38	GPIO.28	20	28
		GND	39	40	GPIO.29	21	29

4-4 Raspberry Pi 40 pins comparison table

(Note: SG90 Servo is be connected to steering gear interface J1)

4-2 According to the circuit schematic:

LED_R-----15(Physical pin)----- 3(wiringPi)

LED_G-----13(Physical pin)----- 2(wiringPi)

LED_B-----18(Physical pin)----- 5(wiringPi)

J1---16(Physical pin)-----4(wiringPi)

(Note: We use the wiringPi library to write code.)

4-3 About the code

Please view .py and.c file

A. For .c code

(1) We need to compile this file in the Raspberry Pi system. (Note: we need to add -lwiringPi to the library file.)
We need to input:gcc ServoControlColor.c -o ServoControlColor -lwiringPi
(2)We need to run the compiled executable file in the Raspberry Pi system.We need to input: ./ServoControlColor

```
pi@yahboom4wd:~/SmartCar $ gcc ServoControlCorlor.c -o ServoControlCorlor -lwiringPi
pi@yahboom4wd:~/SmartCar $ ./ServoControlCorlor
```

(3)We can input: ctrl+c to stop this process, which mean is send a signal to the linux kernel to terminate the current process, but the state of the relevant pin is uncertain at this time, we also need to run a script to initialize all pins.
(Note:The initpin.sh script file is included in the SmartCar/python directory.)
You need to input: chmod 777 initpin.sh
./initpin.sh

```
pi@yahboom4wd:~/SmartCar $ sudo chmod 777 initpin.sh
pi@yahboom4wd:~/SmartCar $ ./initpin.sh
```

B. For python code
(1) We need to input following command to run python code.
python ServoControlColorVersion1.py
python ServoControlColorVersion2.py

```
pi@yahboom4wd:~/python $ python ServoControlColorVersion1.py
```

(2) We can input: ctrl+c to stop this process, which mean is send a signal to the linux kernel to terminate the current process, but the state of the relevant pin is uncertain at this time, we also need to run a script to initialize all pins.
(3) You need to input: chmod 777 initpin.sh
./initpin.sh

```
pi@yahboom4wd:~/SmartCar $ sudo chmod 777 initpin.sh
pi@yahboom4wd:~/SmartCar $ ./initpin.sh
```

After completing the above steps, the experiment is over.

5) Experimental phenomenon
When we run the program, the servo starts to turn and lights up different colors when turning to different angles.