5.1 Using of GPIO

Note: In the image operating system provided by Yahboom, the APP remote control process is enabled by default, in order to avoid multiple occupations of internal resources, causing some functions to fail to operate normally.

Before you running the code of this course, please follow the following to close the APP remote control process.

If you want to permanently close the function of the APP control process that starts automatically after booting, execute the following command:

```
sudo systemctl disable jetbotmini_start
```

If you want to permanently open the function of the APP control process that starts automatically after booting, execute the following command:

```
sudo systemctl enable jetbotmini_start
```

If you do not restart Jetbotmini to restart the APP control process function, execute the following command:

```
sudo systemctl stop jetbotmini_start
sudo systemctl start jetbotmini_start
```

5.1.1 Introduction to GPIO port resources

As shown in the figure below, it is the GPIO port table on the Jetson Nano of the main control board used by Jetbot Mini. Its GPIO port is the same as the Raspberry Pi interface. Its driver file and its usage method are all related to the Raspberry Pi GPIO port. similar.

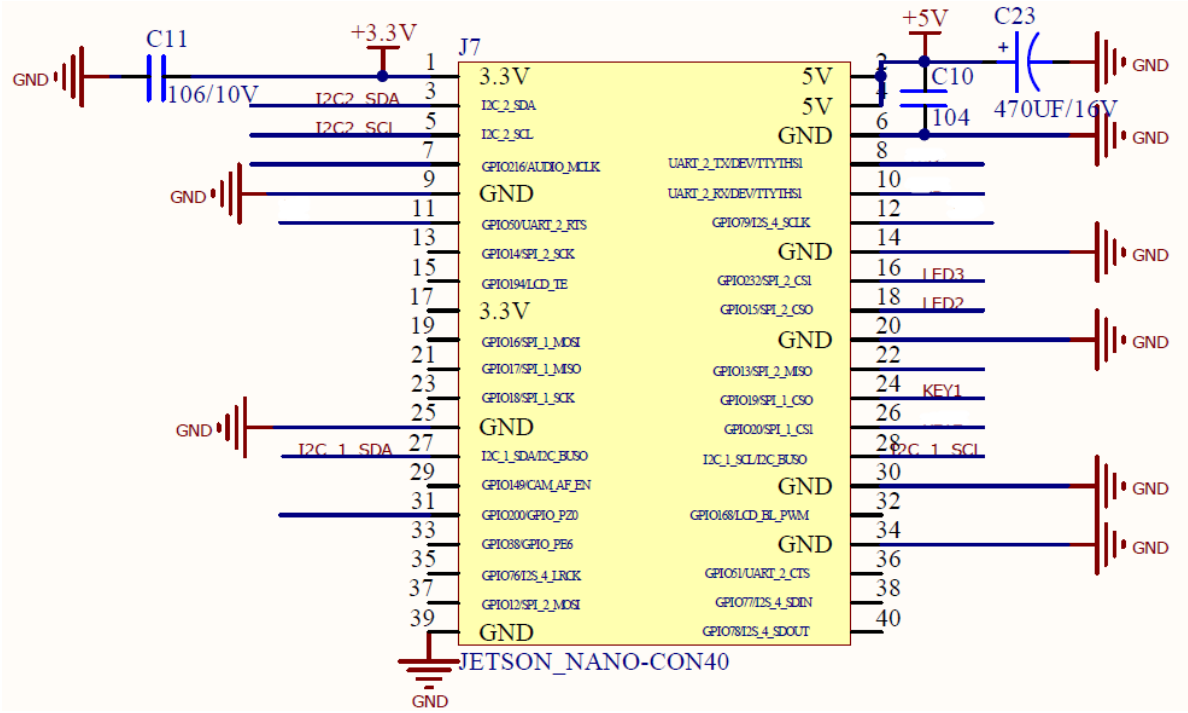
Jetson Nano J41 Header					
Sysfs GPIO	Name	Pin	Pin	Name	Sysfs GPIO
	3.3 VDC *Power*	1	2	**5.0 VDC** *Power*	
	I2C_2_SDA *I2C Bus 1*	3	4	**5.0 VDC** *Power*	
	I2C_2_SCL *I2C Bus 1*	5	6	**GND**	
gpio216	**AUDIO_MCLK**	7	8	**UART_2_TX** */dev/ttyTHS1*	
	GND	9	10	**UART_2_RX** */dev/ttyTHS1*	
gpio50	**UART_2_RTS**	11	12	**I2S_4_SCLK**	gpio79
gpio14	**SPI_2_SCK**	13	14	**GND**	
gpio194	**LCD_TE**	15	16	**SPI_2_CS1**	gpio232
	3.3 VDC *Power*	17	18	**SPI_2_CS0**	gpio15
gpio16	**SPI_1_MOSI**	19	20	**GND**	
gpio17	**SPI_1_MISO**	21	22	**SPI_2_MISO**	gpio13
gpio18	**SPI_1_SCK**	23	24	**SPI_1_CS0**	gpio19
	GND	25	26	**SPI_1_CS1**	gpio20
	I2C_1_SDA *I2C Bus 0*	27	28	**I2C_1_SCL** *I2C Bus 0*	
gpio149	**CAM_AF_EN**	29	30	**GND**	
gpio200	**GPIO_PZ0**	31	32	**LCD_BL_PWM**	gpio168
gpio38	**GPIO_PE6**	33	34	**GND**	
gpio76	**I2S_4_LRCK**	35	36	**UART_2_CTS**	gpio51
gpio12	**SPI_2_MOSI**	37	38	**I2S_4_SDIN**	gpio77
	GND	39	40	**I2S_4_SDOUT**	gpio78

But when we program, the BCM code number is generally used, as shown in the following figure:

BCM	Function	Physical pin		Function	BCM
	3V3	1	2	5V	
2	SDA	3	4	5V	
3	SCL	5	6	GND	
4	D4	7	8	D14(TXD)	14
	GND	9	10	D15(RXD)	15
17	D17	11	12	D18	18
27	D27	13	14	GND	
22	D22	15	16	D23	23
	3V3	17	18	D24	24
10	D10	19	20	GND	
9	D9	21	22	D25	25
11	D11	23	24	D8	8
	GND	25	26	D7	7
0	DO(ID_SD)	27	28	D1(ID_SC)	1
5	D5	29	30	GND	
6	D6	31	32	D12	12
13	D13	33	34	GND	
19	D19	35	36	D16	16
26	D26	37	38	D20	20
	GND	39	40	D21	21

After reading the GPIO structure of Jetsonnano, then I will introduce to you the interface pin diagrams used in our Jetbotmini expansion board. From the Jetbotmini expansion board interface diagram, we will give an example of the relative applied pins as follows:

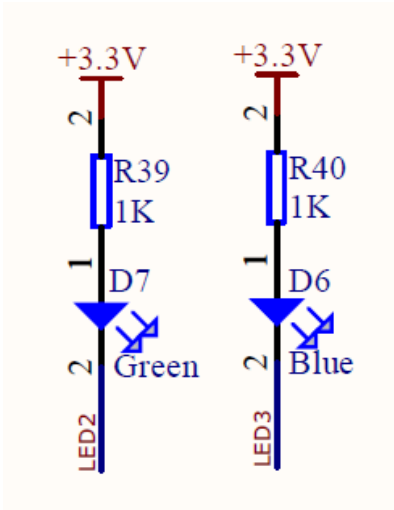
Number of BCM	Function	Corresponding peripheral
1、0	I2C1: SCL、SDA	OLED
3、2	I2C2: SCL、SDA	Coprocessor
24、23	LED2、LED3	Onboard Light
8	KEY	Button



After reading the above introduction, now we should be able to understand the GPIO ports used and their corresponding functions, let's try to use them one by one!

If you are not using the Jetbotmini factory image provided by Yahboom, please confirm whether the relevant usage rights are enabled according to the operation in the section 3.4.1 Enable Peripheral Permissions before using GPIO.

5.1.2 Light up On board LED



As I said to you above, Jetson nano's GPIO port structure and the Raspberry Pi GPIO port driver can be shared. In the Jetson nano GPIO driver, define the called name as RPi.GPIO or Jetson.GPIO. Calling Jetson's GPIO port with RPi.GPIO or Jetson.GPIO can successfully call the GPIO driver.

We can see that the general steps to use the GPIO port to light up the LED light are:

1. Set GPIO port mode
2. Set GPIO output mode/input mode
3. Set the initial level of the GPIO port

It can be seen from the schematic diagram that the GPIO port is turned on at a low level to light up the LED light. After executing the above code, we can see that the green onboard LED indicator will flip 4 times per second and blink 2 times per second.

The corresponding complete source code is located:

/home/jetson/Notebooks/English/3.Use_of_GPIO/1.Turn_on_the_LED/Turn_on_the_green_LED.ipynb

Among them, the code of [Turn_on_the_blue_LED] is the same except for the different GPIO ports that it drives. You can try to run it to see the phenomenon.

5.1.3 Use of buttons

Above we have used the GPIO port to operate the onboard LED indicator. The only difference between the use of the buttons on Jetbotmini is that the GPIO is set to input mode. Of course, if it is set to input mode, there is no starting point. One statement. Let's see the source code implementation process:

```
import RPi.GPIO as GPIO
import time
# Pin Definitons:
led_pin = 24  # BOARD pin 24 green
but_pin = 8  # BOARD pin 8   key1
def main():
    prev_value = None
    # Pin Setup:
    GPIO.setmode(GPIO.BCM)  # BCM
    GPIO.setup(led_pin, GPIO.OUT)  # LED pin set as output
    GPIO.setup(but_pin, GPIO.IN)  # Button pin set as input
    # Initial state for LEDs:
    GPIO.output(led_pin, GPIO.LOW)
    print("Starting demo now!")
    try:
        while True:
            curr_value = GPIO.input(but_pin)
            if curr_value != prev_value:
                GPIO.output(led_pin, not curr_value)
                prev_value = curr_value
                print("Outputting {} to Pin {}".format(curr_value, led_pin))
#             time.sleep(0.5)
    finally:
        GPIO.cleanup()  # cleanup all GPIO
if __name__ == '__main__':
    main()
```

Here we use the LED we just learned to remind when monitoring key events, and use the on-board green LED to indicate the state of the key. When the key is pressed, the green LED indicator is extinguished, and when the pressed key is released , The green indicator light is lit. When a key event occurs, the current status will be printed at the bottom of the cell when the key is pressed and when the key is released. And will be below.

The corresponding complete source code is located:

/home/jetson/Notebooks/English/3.Use_of_GPIO/2.Use_of_keys/Use_of_keys.ipynb