

Chapter 1 Installation of Python Libraries(Important)

In this chapter, we will do some necessary foundational preparation work: Start your Raspberry Pi and install some necessary libraries. And we will assemble the robot in the next chapter.

Caution: Do NOT install it without referring to the tutorial. Otherwise, it may cause installation errors and damage the components.

Note:

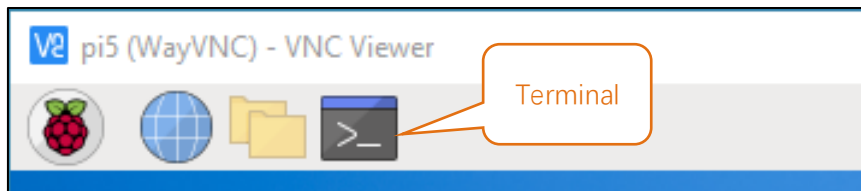
- 1, **Please use Raspberry Pi OS with Desktop**
- 2, The installation of libraries takes much time. **You can power Raspberry Pi with a power supply Cable.**
- 3, If you are using **remote desktop** to login Raspberry Pi, you need to use [VNC viewer](#).

You can watch this video while reading this chapter: <https://youtu.be/cVrwOoORItE>

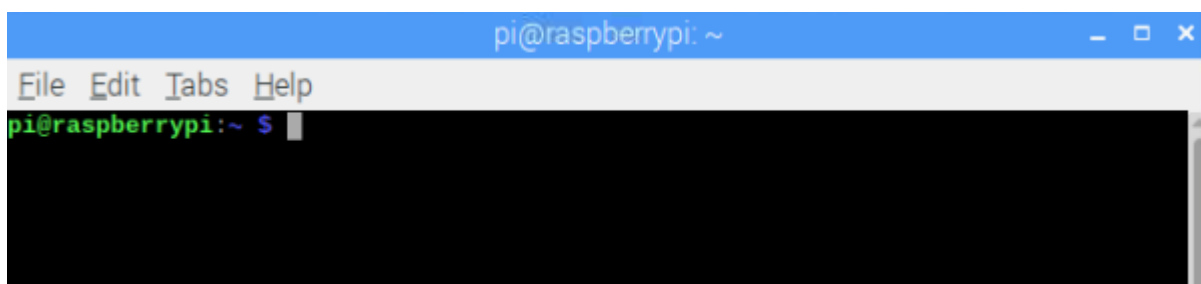
We will help you with any concerns via support@freenove.com

Step 1 Obtain the Code

To download the code, you can power Raspberry Pi with a power supply cable **or** switch on S1 (Power Switch). Then open the Raspberry Pi and the terminal. You can open the terminal by clicking as shown below, or you can press "CTRL + ALT + T" on the desktop.



The terminal is shown below:



Enter the following commands in the terminal to obtain the robot's code and save it to the user's directory "Pi". (Note that here are two commands, please enter them one by one in order.)

```
cd ~  
git clone --depth 1  
https://github.com/Freenove/Freenove\_Big\_Hexapod\_Robot\_Kit\_for\_Raspberry\_Pi.git
```

Downloading need much time. Please wait with patience.

You can also find and download the code by visiting our official website (<http://www.freenove.com>) or our GitHub repository (<https://github.com/freenove>).

Note: all codes of the robot are written with Python3. If run with Python2, it may cause errors.

Set Python3 as default python (Necessary)

First, execute python to check the default python on your Raspberry Pi. Press Ctrl-Z to exit.

```
pi@raspberrypi:~ $ python
```

If it is python3, you can skip this section.

If it is python2, you need execute the following commands to set default python to python3.

1. Enter directory /usr/bin

```
cd /usr/bin
```

2. Delete the original python link.

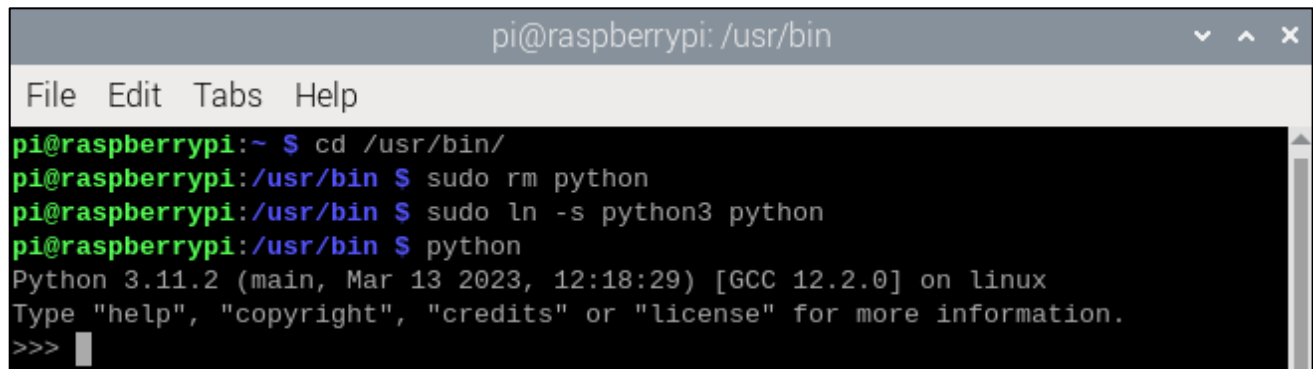
```
sudo rm python
```

3. Create new python links to python3.

```
sudo ln -s python3 python
```

4. Check python. Press Ctrl-Z to exit.

```
python
```



```
pi@raspberrypi: /usr/bin
File Edit Tabs Help
pi@raspberrypi:~ $ cd /usr/bin/
pi@raspberrypi:/usr/bin $ sudo rm python
pi@raspberrypi:/usr/bin $ sudo ln -s python3 python
pi@raspberrypi:/usr/bin $ python
Python 3.11.2 (main, Mar 13 2023, 12:18:29) [GCC 12.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> █
```

If you want to set python2 as default python in **other projects**, just repeat the commands above and change python3 to python2.

Shortcut Key

Now, we will introduce several shortcuts that are very **useful** and **commonly used** in terminal.

1. **up and down arrow keys**. History commands can be quickly brought back by using up and down arrow keys, which are very useful when you need to reuse certain commands.

When you need to type command, pressing “↑” will bring back the previous command, and pressing “↓” will bring back the latter command.

2. **Tab key**. The Tab key can automatically complete the command/path you want to type. When there are multiple commands/paths conforming to the already typed letter, pressing Tab key once won't have any result. And pressing Tab key again will list all the eligible options. This command/path will be directly completed when there is only one eligible option.

As shown below, under the '~' directory, enter the Documents directory with the “cd” command. After typing “cd D”, press Tab key, then there is no response. Press Tab key again, then all the files/folders that begin with “D” is listed. Continue to type the character “oc”, then press the Tab key, and then “Documents” is completed automatically.

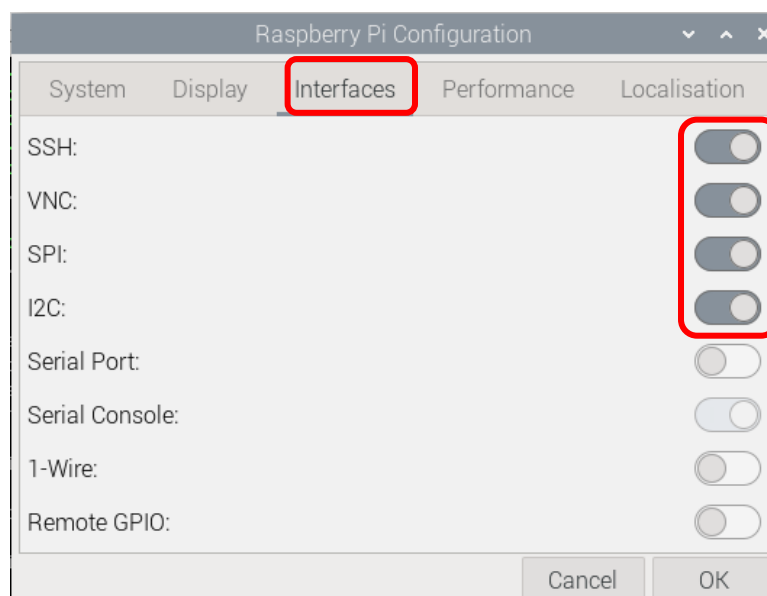
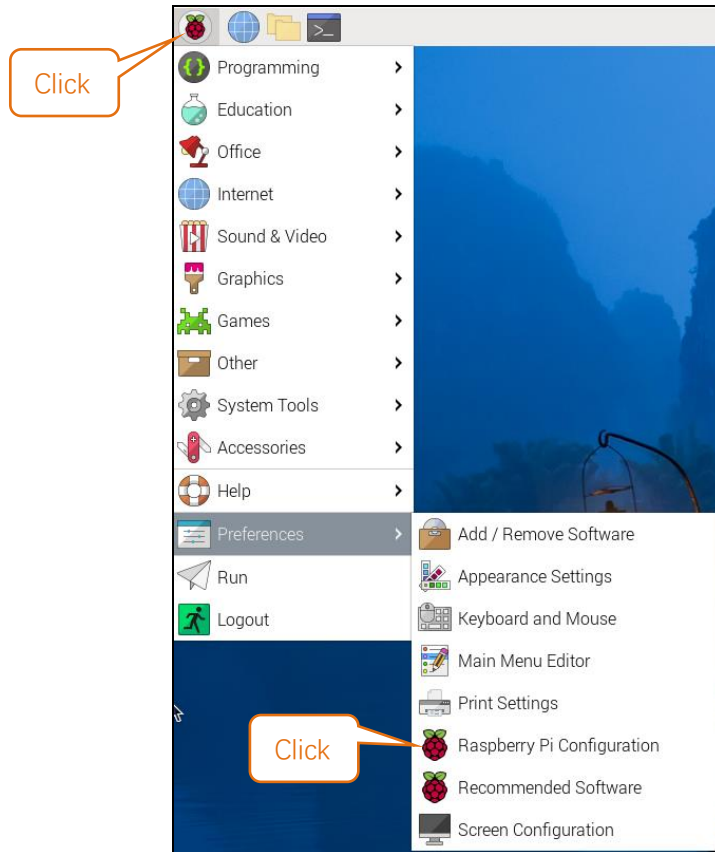
```
pi@raspberrypi:~ $ cd D
Desktop/  Documents/ Downloads/
pi@raspberrypi:~ $ cd Doc
```

```
pi@raspberrypi:~ $ cd D
Desktop/  Documents/ Downloads/
pi@raspberrypi:~ $ cd Documents/
```

Step 2 Configuration

Enable I2C, SPI and VNC

The I2C interface Raspberry Pi is disabled by default. You need to open it manually.



Note that if your connector version is V2.0, remember to turn on the SPI feature. If your connector version is V1.0, turn off the SPI feature.

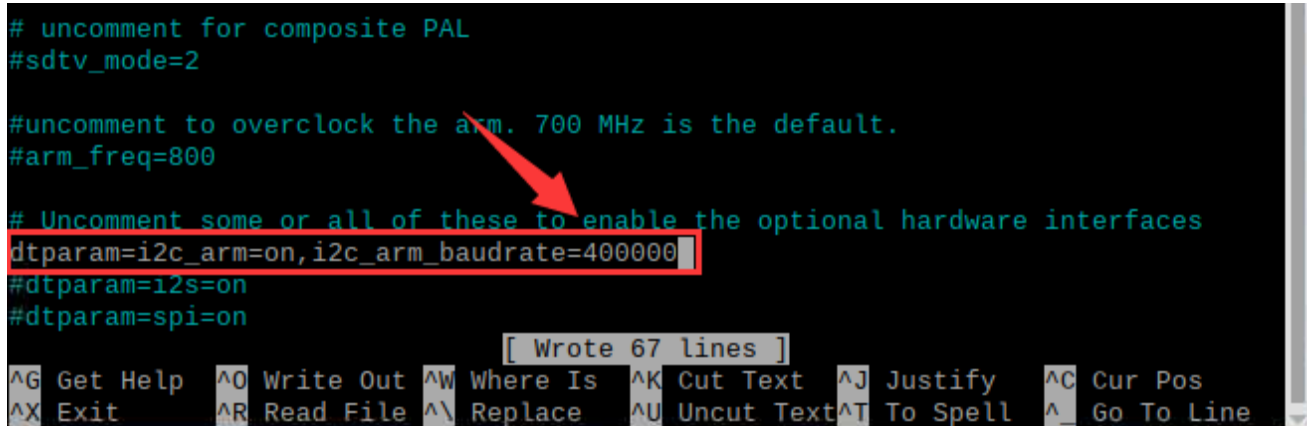
Set I2C Baud Rate

Open the terminal and enter the following command.

```
sudo nano /boot/firmware/config.txt
```

The default I2C Baud Rate is 100000. Now we change it to 400000, because this can speed up the response speed of the servos to make robot dog walk faster. If the baud rate is 100,000, the robot walks slowly.

Scrolling the middle of the mouse to find **dtparam=i2c_arm=on**, and add **"i2c_arm_baudrate=400000"**.



```
# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
#arm_freq=800

# Uncomment some or all of these to enable the optional hardware interfaces
dtparam=i2c_arm=on,i2c_arm_baudrate=400000
#dtparam=i2s=on
#dtparam=spi=on

[ Wrote 67 lines ]
^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File  ^_ Replace   ^U Uncut Text ^T To Spell  ^_ Go To Line
```

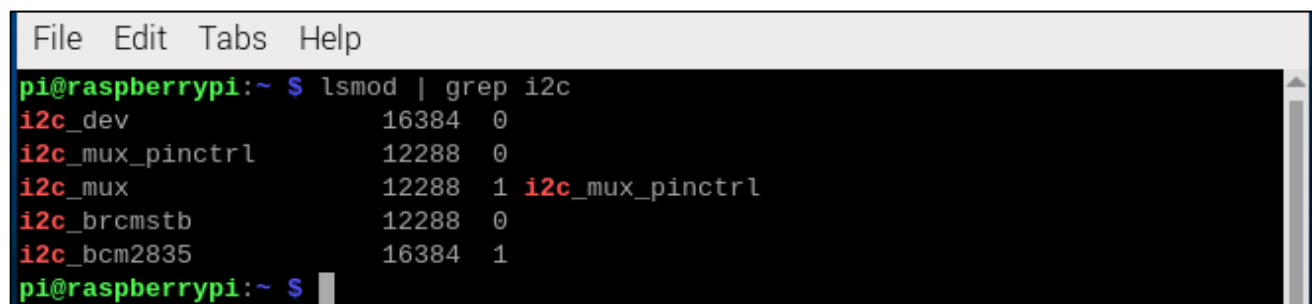
Press "CTRL"+"O" and then "Enter" to save the modified content. Then press "CTRL"+"X" to exit editing.

After the modification is completed, reboot Raspberry Pi to make the change work. You can also reboot the Raspberry Pi after completing the step 3 below.

Type a command to check whether the I2C module is enabled:

```
lsmod | grep i2c
```

If I2C module has been enabled, the following content will show up (the numbers showing in your device may be different):



```
File Edit Tabs Help
pi@raspberrypi:~ $ lsmod | grep i2c
i2c_dev                16384  0
i2c_mux_pinctrl        12288  0
i2c_mux                12288  1 i2c_mux_pinctrl
i2c_brcmstb            12288  0
i2c_bcm2835            16384  1
pi@raspberrypi:~ $
```

Install I2C-Tools

Type the command to install I2C-Tools.

```
sudo apt-get install i2c-tools
```

Install python-smbus

Python-smbus is a module of the program Python, which contains some classes and methods to operate I2C.

Type the following command to install python-smbus:

```
sudo apt-get install python3-smbus
```

Additional supplement

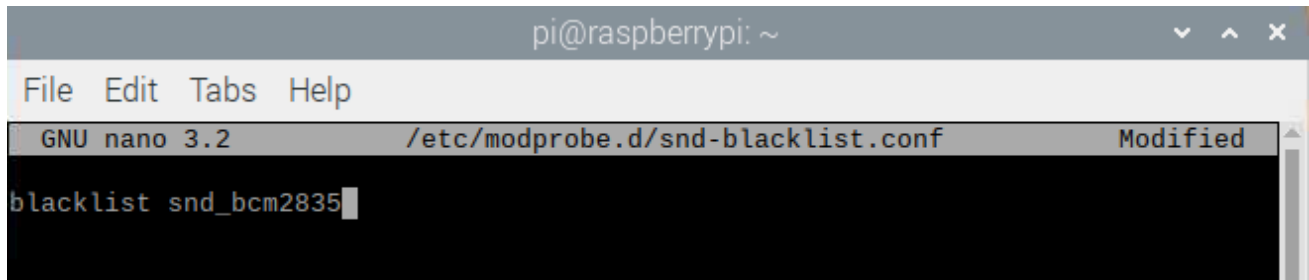
Raspberry Pi, other than 5, 4B and 400, needs to disable the audio module, otherwise the LED will not work properly.

1. Create a new snd-blacklist.conf and open it for editing

```
sudo nano /etc/modprobe.d/snd-blacklist.conf
```

Add following content: After adding the contents, you need to press Ctrl+O, Enter, Ctrl+Z.

```
blacklist snd_bcm2835
```



```
pi@raspberrypi: ~  
File Edit Tabs Help  
GNU nano 3.2 /etc/modprobe.d/snd-blacklist.conf Modified  
blacklist snd_bcm2835
```

2. We also need to edit config file.

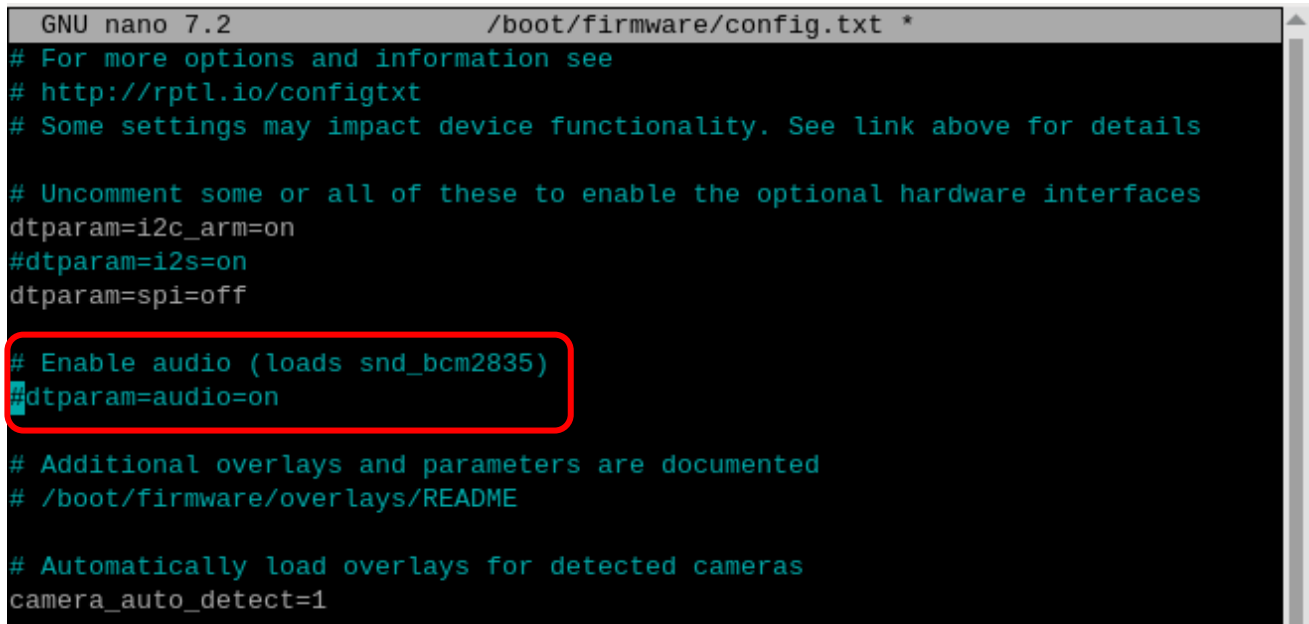
```
sudo nano /boot/firmware/config.txt
```

Find the contents of the following two lines (with Ctrl + W you can search):

```
# Enable audio (loads snd_bcm2835)  
dtparam=audio=on
```

Add # to comment out the second line. Press Ctrl+O, Enter, Ctrl+X.

```
# Enable audio (loads snd_bcm2835)  
# dtparam=audio=on
```



```
GNU nano 7.2 /boot/firmware/config.txt *  
# For more options and information see  
# http://rptl.io/configtxt  
# Some settings may impact device functionality. See link above for details  
  
# Uncomment some or all of these to enable the optional hardware interfaces  
dtparam=i2c_arm=on  
#dtparam=i2s=on  
dtparam=spi=off  
  
# Enable audio (loads snd_bcm2835)  
#dtparam=audio=on  
  
# Additional overlays and parameters are documented  
# /boot/firmware/overlays/README  
  
# Automatically load overlays for detected cameras  
camera_auto_detect=1
```

It will take effect after restarting, and you can restart after executing the next section.

If you want to restart the audio module, just restore the content modified in the above two steps.

Step 3 Execute the Installed Program

- Execute following commands to enter directory of “setup.py”.

```
cd ~/Freenove_Big_Hexapod_Robot_Kit_for_Raspberry_Pi/Code
```

- Run setup.py

```
sudo python setup.py
```

This program will automatically install the rpi_ws281x, PyQt5 library, etc. Please **reboot** the Raspberry Pi after the installation is completed, as shown below.

If it is your first time to run the script, it will ask you to input the camera type. At this point, input the content according to the camera you have. (The one included in this kit is of the type ov5647).

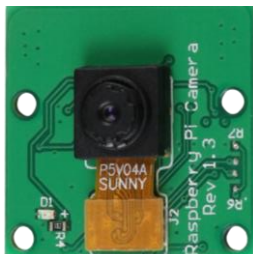
```
rpi_ws281x 4.3.4 is already the active version in easy-install.py

Installed /usr/local/lib/python3.11/dist-packages/rpi_ws281x-4.3.
Processing dependencies for rpi_ws281x==4.3.4
Finished processing dependencies for rpi_ws281x==4.3.4

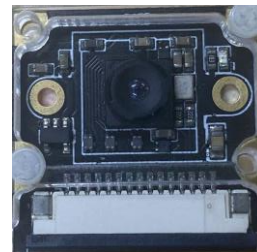
All libraries have been installed successfully.
Getting Raspberry Pi version...
Detected Raspberry Pi 5
Backing up /boot/firmware/config.txt.bak
Backup of /boot/firmware/config.txt created at /boot/firmware/con
Updated /boot/firmware/config.txt with 'dtparam=spi=on'
Updated /boot/firmware/config.txt with 'camera_auto_detect=0'

Enter the camera model (e.g., ov5647 or imx219):
```

OV5647



Imx219



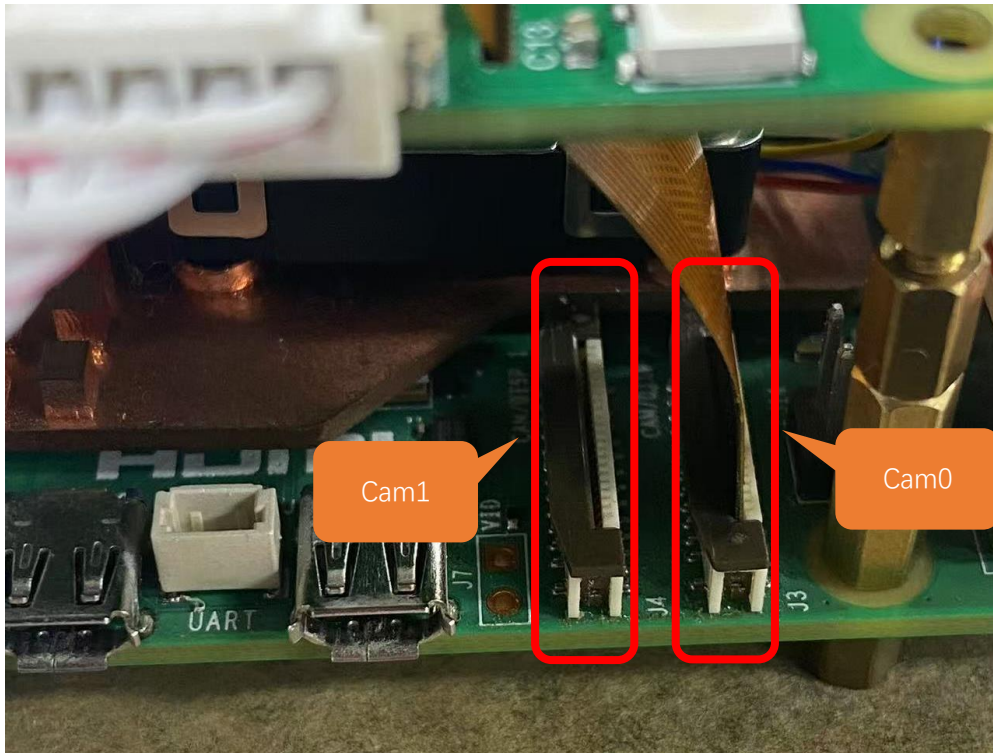
If your Rpi is a Pi 5, it will ask you which camera interface to use. You can type in **cam0** or **cam1** based on the interface you want to use.

Note: Make sure you connect the camera cable to the corresponding interface.

If it is not Raspberry Pi, this setting is not needed, as there is only camera interface available.

```
Backup of /boot/firmware/config.txt created at /boot/firmware/config.txt.bak
Updated /boot/firmware/config.txt with 'dtparam=spi=on'
Updated /boot/firmware/config.txt with 'camera_auto_detect=0'

Enter the camera model (e.g., ov5647 or imx219): ov5647
Setting up for Raspberry Pi 5
You have a Raspberry Pi 5. Which camera port is the camera connected to? cam0 or cam1:
```

Reboot your Raspberry Pi after installing the libraries.

```
sudo reboot
```

```
You have a Raspberry Pi 5. Which camera port is the camera connected to? cam0 or cam1: cam0
Updated /boot/firmware/config.txt with 'dtoverlay=ov5647,cam0'
Please reboot your Raspberry Pi to complete the installation.
pi@raspberrypi:~/Freenove_Tank_Robot_Kit_for_Raspberry_Pi/Code $ sudo reboot
```

The reboot of the pi takes some time, please wait with patience.

If the installation fails, please rerun setup.py. After the installation is completed, restart the Raspberry Pi. Most installation failures are caused by network reasons.

```
sudo python setup.py
```