




Robot dog

Apprendre à programmer et à monter un robot

 Difficulté **Très difficile**

 Durée **25 heure(s)**

 Catégories **Électronique, Machines & Outils, Robotique**

 Coût **129 EUR (€)**

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Video d'introduction

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Introduction

Vous avez reçu un robot en kit de chez Freenove.

Pour l'assembler, vous devez vous aider du kit d'installation sur le site internet de Freenove. Le lien et le type de robot sont marqués sur la boîte du robot.

Dans ce tutoriel, nous allons nous concentrer sur le robot dog dont le comportement est proche de celui d'un chien.

Matériaux

Outils

 freenove.com

Étape 1 - Assemblage/Montage

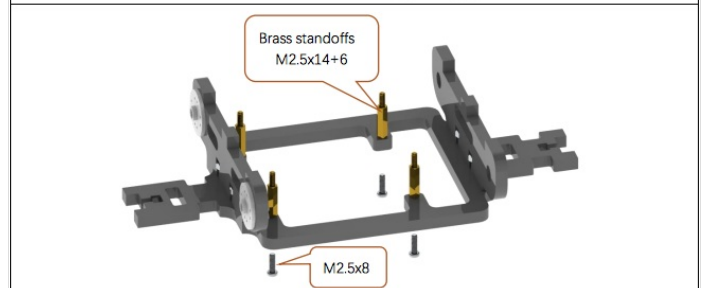
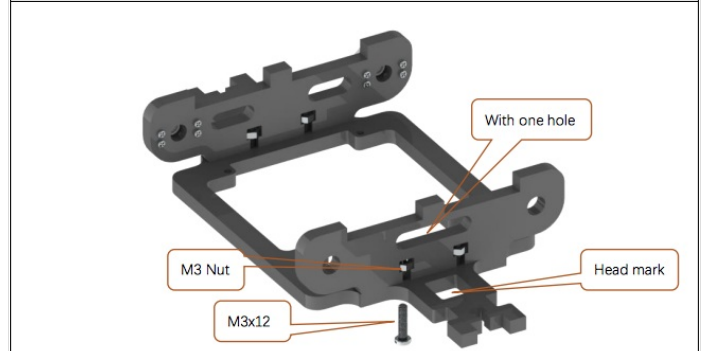
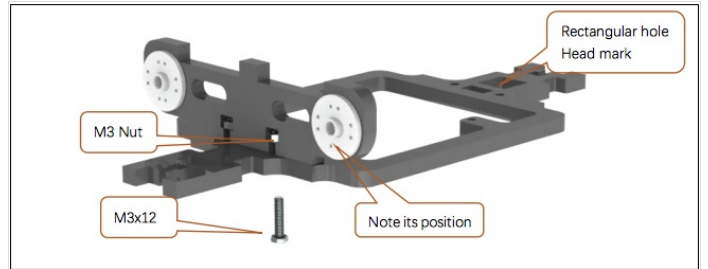
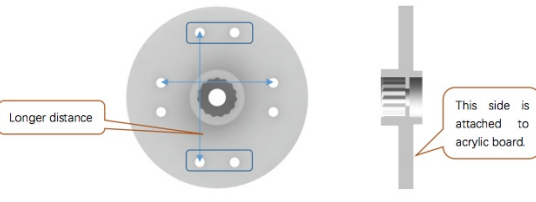
Une carte microcontrôleur sur laquelle on va connecter les 12 servo-moteurs (2 par patte), et un petit module WIFI ESP 8266 composent l'essentiel de ce robot.

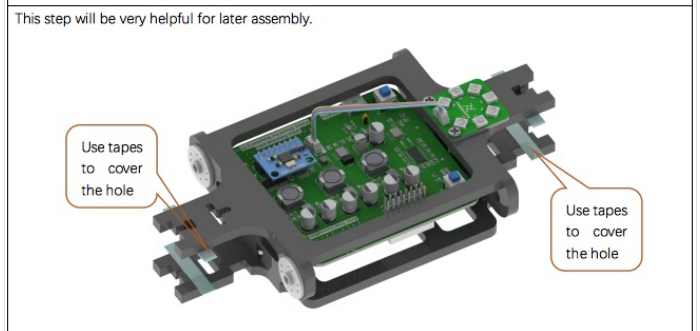
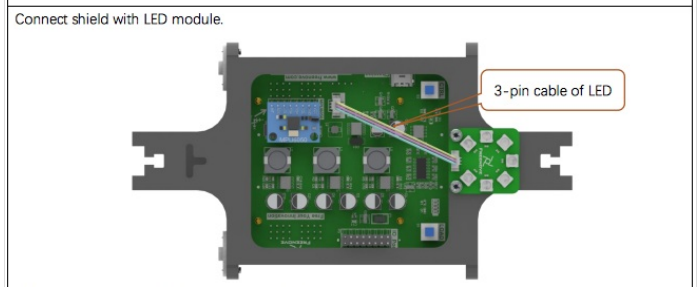
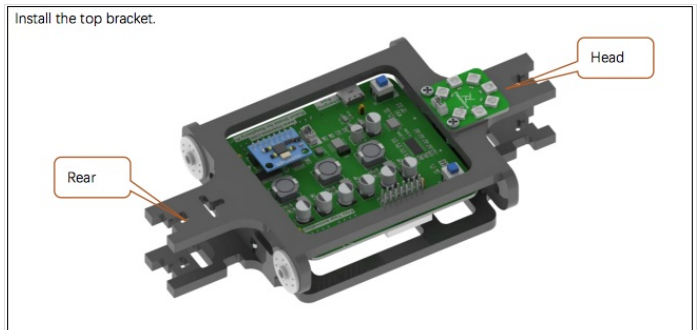
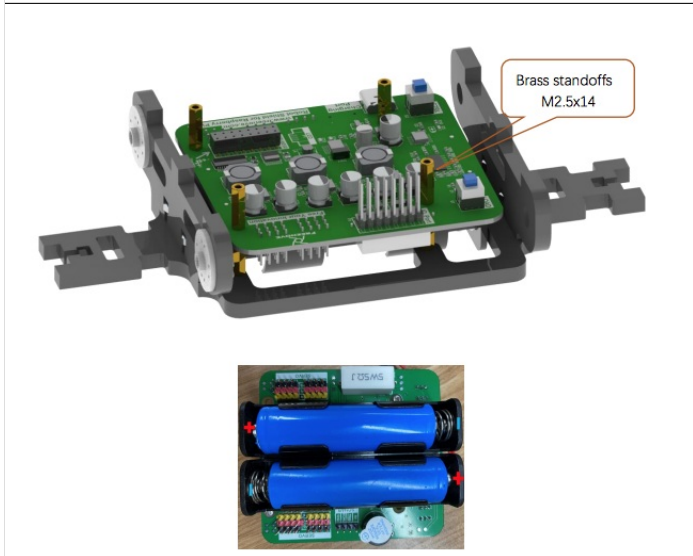
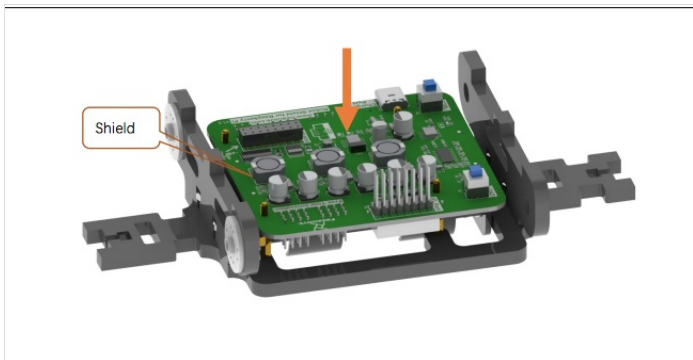
Vous trouverez dans la partie Fichiers (à côté de Outils et Matériaux) un lien vidéo pour l'assemblage.

There are 4 pairs of opposite holes on the disk servo arm, and the distance between each pair is different. Please use the 2 pairs of holes with **longer distance**.

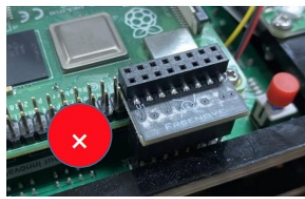
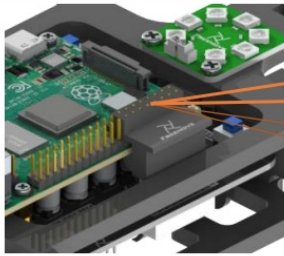
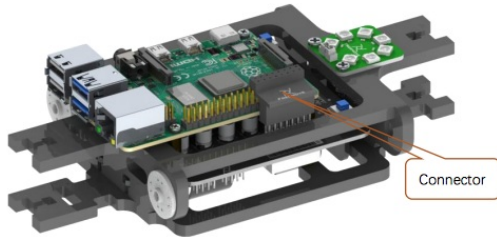


M1.2*7 screws are contained in following plastic bag.

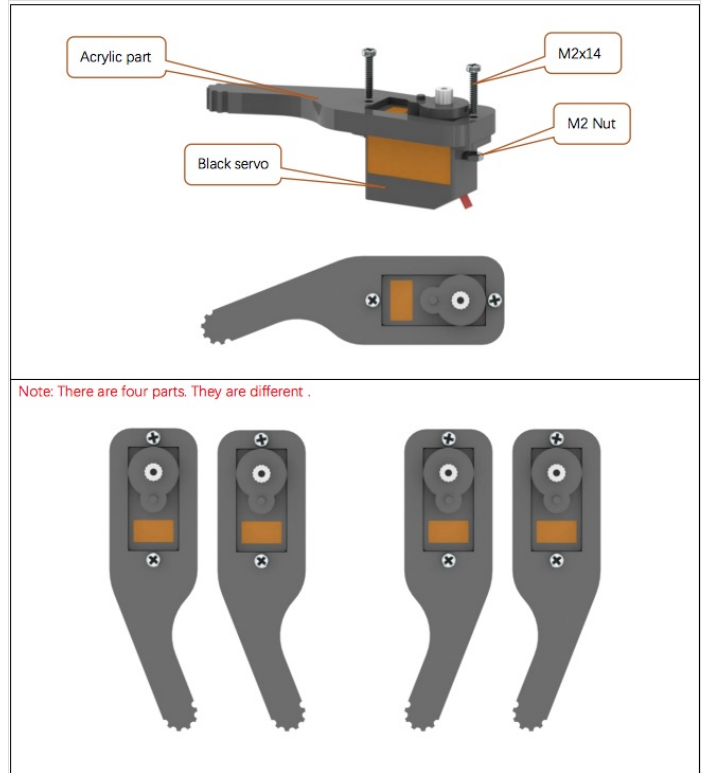




Install connector to connect Raspberry Pi and shield.

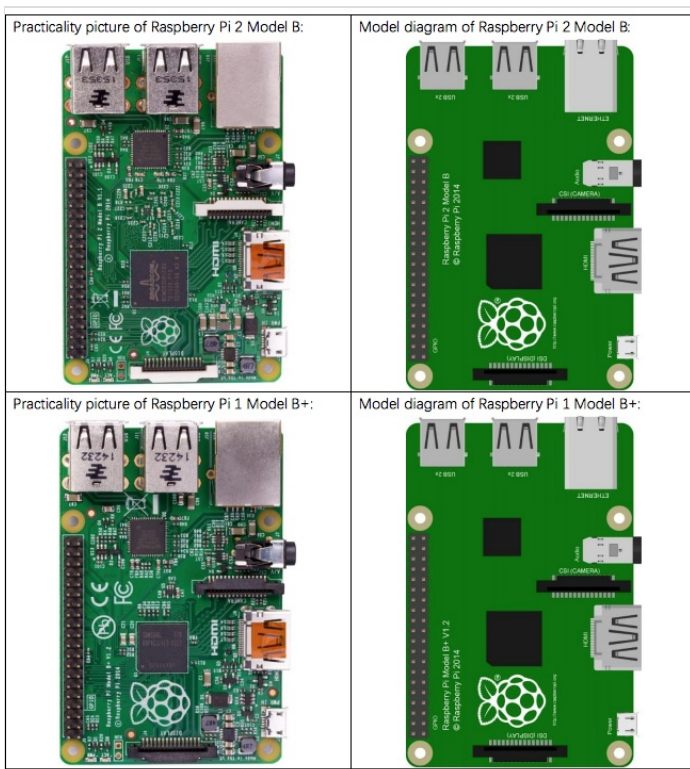


If you have any concerns, please feel free to contact us via support@freenove.com
We will offer you satisfying solution.



Étape 2 - Câblage

2 batteries de 3.7V seront nécessaires pour le faire marcher.







Chapter 0 Raspberry Pi Preparation

Install a System

Firstly, install a system for your RPI.

Component List

Required Components

| | |
|--|---|
| <p>Raspberry Pi 4B / 3B+ / 3B / 3A+ (Recommended)</p>  | <p>5V/3A Power Adapter. Different versions of Raspberry Pi have different power requirements.</p>  |
| <p>Micro USB Cable x1</p>  | <p>Micro SD Card (TF Card) x1, Card Reader x1</p>  |

This robot also supports the following versions of the Raspberry Pi, but **additional accessories** need to be prepared by yourself.

| Raspberry | Additional accessories |
|-------------------------|---|
| Raspberry Pi Zero W | Camera cable(>25cm) for zero w, 15 Pin 1.0mm Pitch to 22 Pin 0.5mm https://www.amazon.com/dp/B076Q595HJ/ |
| Raspberry Pi Zero 1.3 | wireless network adapter, Camera cable(>25cm) for zero w, 15 Pin 1.0mm Pitch to 22 Pin 0.5mm, OTG cable (USB Type micro B to USB Type A) |
| Raspberry Pi 2 Model B | wireless network adapter |
| Raspberry Pi 1 Model A+ | wireless network adapter |
| Raspberry Pi 1 Model B+ | wireless network adapter |

Power requirements of various versions of Raspberry Pi are shown in following table:

| Product | Recommended PSU current capacity | Maximum total USB peripheral current draw | Typical bare-board active current consumption |
|-------------------------------|----------------------------------|--|---|
| Raspberry Pi Model A | 700mA | 500mA | 200mA |
| Raspberry Pi Model B | 1.2A | 500mA | 500mA |
| Raspberry Pi Model A+ | 700mA | 500mA | 180mA |
| Raspberry Pi Model B+ | 1.8A | 600mA/1.2A (switchable) | 330mA |
| Raspberry Pi 2 Model B | 1.8A | 600mA/1.2A (switchable) | 350mA |
| Raspberry Pi 3 Model B | 2.5A | 1.2A | 400mA |
| Raspberry Pi 3 Model A+ | 2.5A | Limited by PSU, board, and connector ratings only. | 350mA |
| Raspberry Pi 3 Model B+ | 2.5A | 1.2A | 500mA |
| Raspberry Pi 4 Model B | 3.0A | 1.2A | 600mA |
| Raspberry Pi Zero W | 1.2A | Limited by PSU, board, and connector ratings only. | 150mA |
| Raspberry Pi Zero | 1.2A | Limited by PSU, board, and connector ratings only. | 100mA |

For more details, please refer to <https://www.raspberrypi.org/help/faqs/#powerReqs>

In addition, RPi also needs an Ethernet network cable used to connect it to a WAN (Wide Area Network). All these components are necessary for any of your projects to work. Among them, the power supply of at least 5V/2.5A, because a lack of a sufficient power supply may lead to many functional issues and even damage your RPi, we STRONGLY RECOMMEND a 5V/2.5A power supply. We also recommend using a SD Micro Card with a capacity 16GB or more (which, functions as the RPi's "hard drive") and is used to store the operating system and necessary operational files.

In future projects, the components list with a RPi will contain these required components, using only RPi as a representative rather than presenting details.

Robot Shield for Raspberry Pi

Shield Introduction

The shield is connected to the Raspberry Pi through the IO Port on the board. The positioning holes on the board are suitable for the Raspberry Pi. The features and functions are as follows.

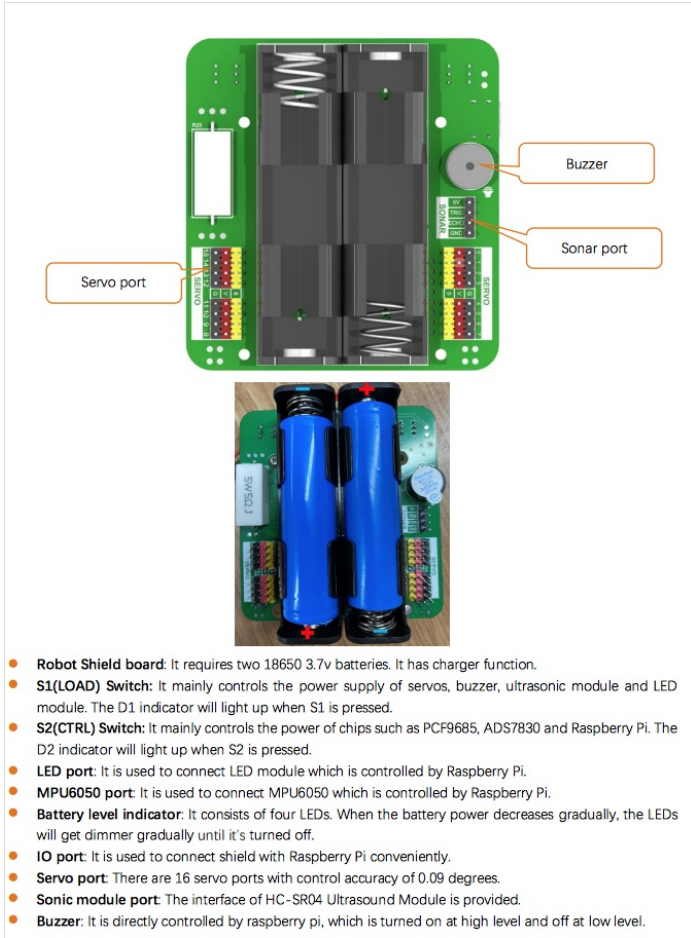
The diagram shows the Robot Shield for Raspberry Pi with the following labeled components:

- S2 (CTRL)
- Battery level indicator
- D2 indicator
- S1 (LOAD)
- D1 indicator
- IO port
- LED port
- MPU6050 port

Required but NOT Contained Parts

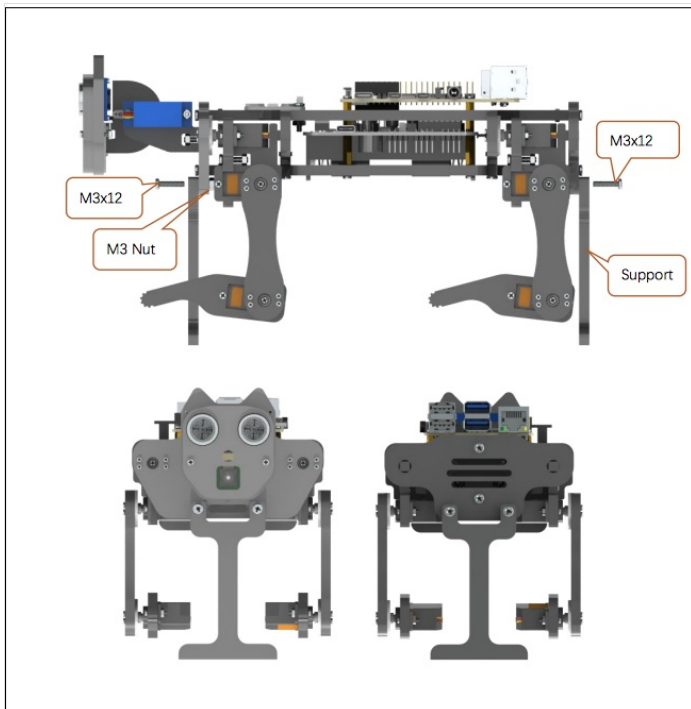
Two 18650 lithium batteries without protected board.
The continuous discharge current >10A
 It is not easy to find proper batteries on Amazon. Search 18650 3.7V high drain on eBay or other websites.

Raspberry Pi (Recommended model: Raspberry 4B / 3B+ / 3A+ / 3B) x1



Étape 3 - Calibration

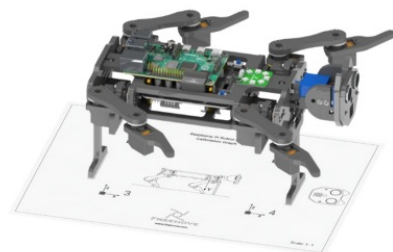
Ce robot est compatible avec l'environnement de programmation raspberry et vnc viewer



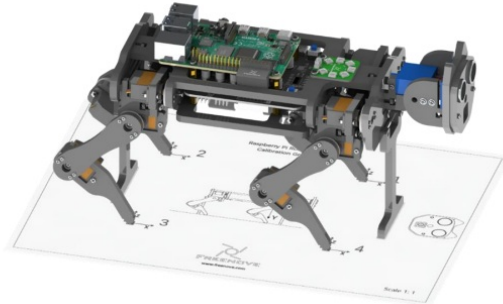
You can refer to this video: <https://youtu.be/l2v9PdwQdvY>

Calibrate the robot.

1. Lay the calibration paper on a horizontal hard table.
2. Install the **calibration** supports on the robot dog and place it on the corresponding position on the calibration paper.



3. Connect client with server successfully, click the "Calibration" button on the client, then a calibration window pops up. And the robot's legs will automatically put to the following position.



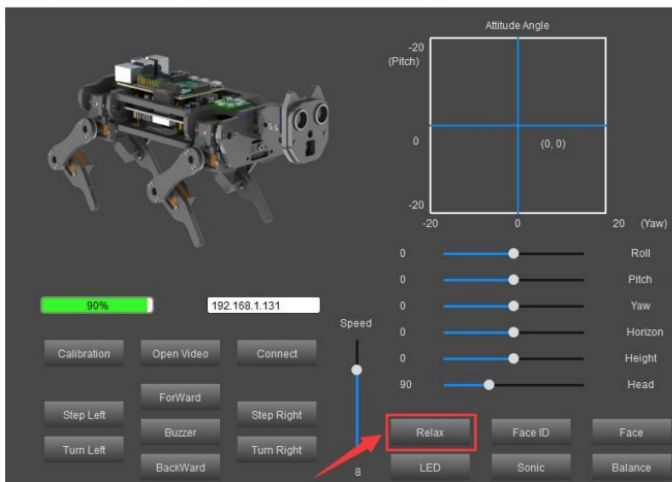
5. After all the 4 points have reached the designated position, click "Save" to save. Now calibration is completed.

NOTE:

1. It is best to have the robot dog walk on a flat hard floor. The robot dog may not walk well on other grounds.
2. There is an offset when controlling the robot dog to walk straightly, which is normal. It is caused by the installation error and the error of the servo itself. As a result, the left and right legs cannot be completely symmetrical, and may differ by 1mm or 2mm. As the walking distance accumulates, this error is constantly superimposed. Then there will be a large offset from the original position.
3. If the calibration is not good enough, it will affect walking. You can recalibrate the robot with same steps.

Control

After calibrating successfully, you can control the robot dog to move.



Relax mode.

- a) When the robot dog moves for 3 minutes at a time, it will feel tired (the servo will get hot). In order to protect the servo, the robot will get into relax mode for 1 minute. **During this time, it won't respond to any motion command.** You can still use the functions of LED, buzzer, real-time video and so on.
- b) When the robot dog moves for less than 3 minutes and rests for 1 minute. The timer will start from 0. Then the robot can move for 3 minutes again.
- c) If the robot isn't tired and is standing, when the robot does not receive motion command for 10s, it will get into relax mode. In this situation, it will respond to all commands.

Run client on Raspberry Pi(Linux) system

Install openCv library

Execute following 3 commands in turn.

```
sudo apt-get install -y libopencv-dev python3-opencv
```

```
sudo pip3 install opencv-contrib-python
```

```
sudo apt-get install -y libatlas-base-dev libjasper-dev
```

Open client

Enter the following commands at the terminal.

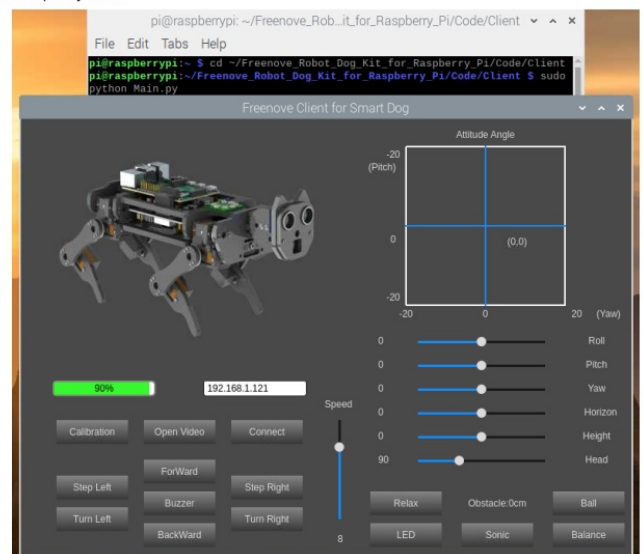
1. Use the cd command to go to the directory where Main.py is located.

```
cd ~/Freenove_Robot_Dog_Kit_for_Raspberry_Pi/Code/Client
```

2. Run Main.py:

```
sudo python Main.py
```

The interface is shown below. The face recognition cannot work well because it need more computing power than Raspberry Pi has.



Chapter 3 Module test (Required)

If you have any concerns, please feel free to contact us at support@freenove.com

The robot dog has been assembled in the previous chapter. This chapter will test each module of the robot dog. It is a necessary check for later control.

Before starting, please install the battery for the robot dog and **turn on the S1 and S2 switches**. Place the robot dog with the **calibration** supports on a horizontal table to ensure that the wiring of each servo is correct.

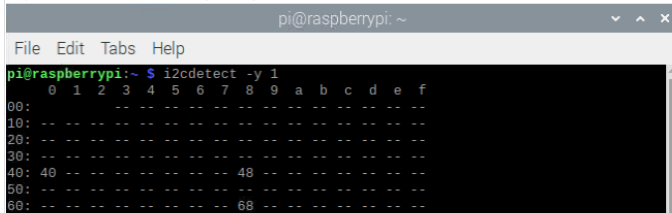
Please use VNC Viewer to build this robot when you use remote mode to login RPi, or there will be errors. Because other desktop remote doesn't support GUI.

Servo

Execute following command to check i2c address.

```
i2cdetect -y 1
```

As shown in the figure below, the addresses 0x40, 0x48, and 0x68 corresponds to the PCA9685 chip, ADS7830 chip, and MPU6050 module, respectively.

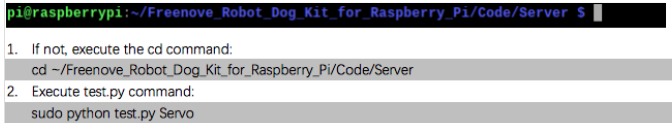


```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~$ i2cdetect -y 1  
 0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f  
00: -- -- -- -- --  
10: -- -- -- -- --  
20: -- -- -- -- --  
30: -- -- -- -- --  
40: 40 -- -- -- -- 48 -- -- -- -- --  
50: -- -- -- -- --  
60: -- -- -- -- --  
66: -- -- -- -- --  
68: -- -- -- -- --
```

Run program

Enter following commands in the terminal to test servos.

If the terminal displays the directory as below (where test.py is located). You can **directly** execute the test.py command.

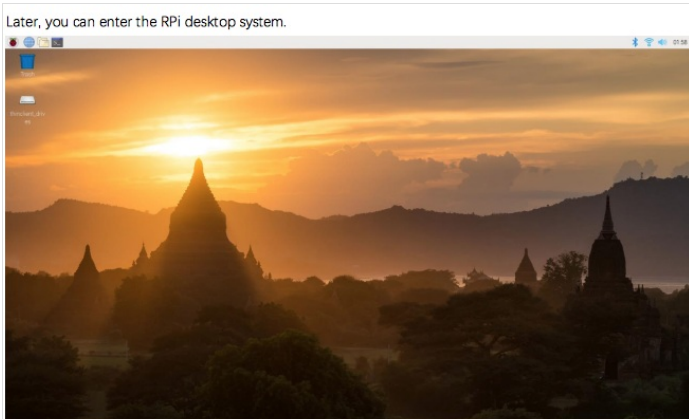


```
pi@raspberrypi:~/Freenove_Robot_Dog_Kit_for_Raspberry_Pi/Code/Server $  
1. If not, execute the cd command:  
cd ~/Freenove_Robot_Dog_Kit_for_Raspberry_Pi/Code/Server  
2. Execute test.py command:  
sudo python test.py Servo
```

Étape 4 - Programmation

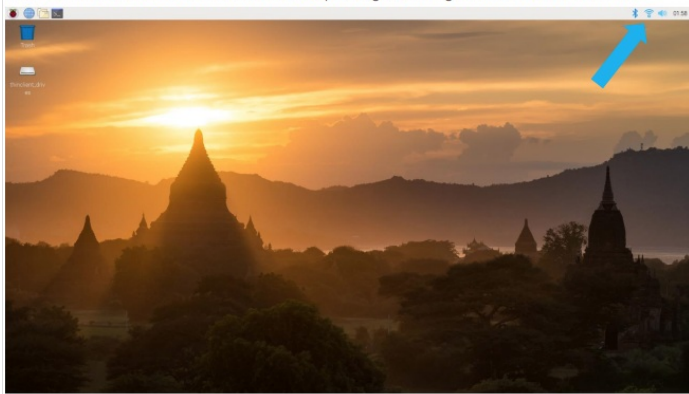
normalement avec dans le kit du robot se trouve une feuille de calibration blanche. normalement une fois monté placé simplement le robot sur la feuille.

Avertissement: en mettant le robot sur la feuille , les pattes doivent être parfaitement placé sur les point car si jamais se n'ai pas le cas, a chaque fois que vous l'allumer les pates ne seront pas droite



Here, you have successfully used the remote desktop login to RPi.

Raspberry Pi 4B/3B+/3B integrates a Wi-Fi adaptor. You can use it to connect to your Wi-Fi. Then you can use the wireless remote desktop to control your RPi. This will be helpful for the following operation. Raspberry Pi of other models can use wireless remote desktop through accessing an external USB wireless card.

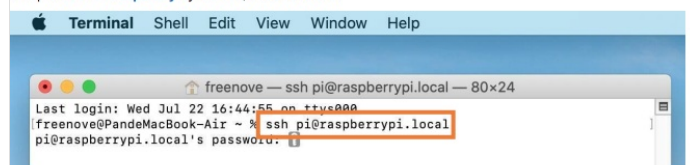


Connect your pi to the router via a network cable.

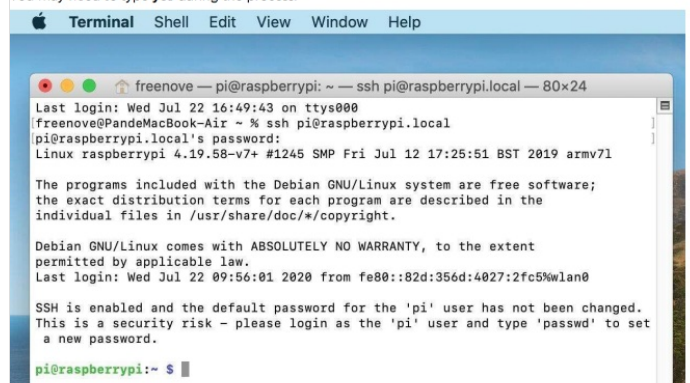
Open the terminal and type following command.

```
ssh pi@raspberrypi.local
```

The password is **raspberry** by default, case sensitive.



You may need to type **yes** during the process.



When you see **pi@raspberrypi:~ \$**, you have logged in Pi successfully. Then you can skip to next section.

You can also use the IP address to log in Pi.

Enter router client to inquiry IP address named "raspberry pi". For example, I have inquired to my RPi IP address, and it is "192.168.1.131".

Open the terminal and type following command.

```
ssh pi@192.168.1.131
```

```
Terminal Shell Edit View Window Help
freenove — pi@raspberrypi: ~ — ssh pi@192.168.1.131 — 81x44
freenove@PandeMacBook-Air ~ % ssh pi@192.168.1.131
The authenticity of host '192.168.1.131 (192.168.1.131)' can't be established.
ECDSA key fingerprint is SHA256:95hc76ISxQ/+z9TGG67136senETX60yaAaqds1ENpE4.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.1.131' (ECDSA) to the list of known hosts.
pi@192.168.1.131's password:
Linux raspberrypi 4.19.58-v7+ #1245 SMP Fri Jul 12 17:25:51 BST 2019 armv7l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Wed Jul 22 09:56:32 2020 from fe80::82d:356d:4027:2fc5%wlan0

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~$ sudo raspi-config

Raspberry Pi 3 Model A Plus Rev 1.0

Raspberry Pi Software Configuration Tool (raspi-config)

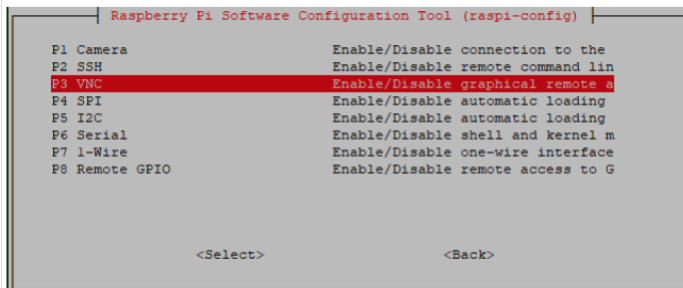
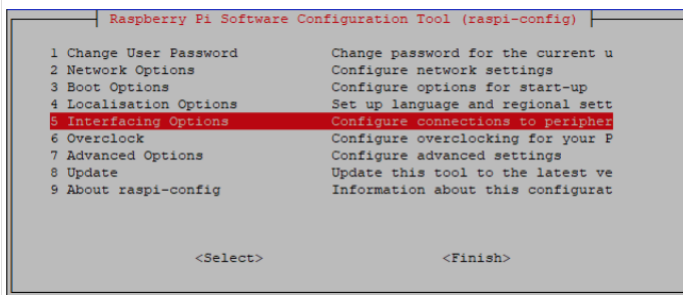
1 Change User Password Change password for the current user
2 Network Options Configure network settings
3 Boot Options Configure options for start-up
4 Localisation Options Set up language and regional settings to match your
5 Interfacing Options Configure connections to peripherals
6 Overclock Configure overclocking for your Pi
7 Advanced Options Configure advanced settings
8 Update Update this tool to the latest version
9 About raspi-config Information about this configuration tool

<Select> <Finish>
```

VNC Viewer & VNC

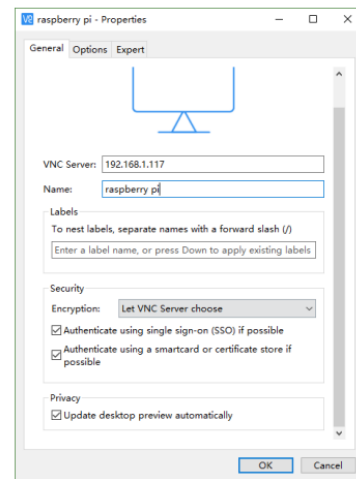
Type the following command. And select 5 Interfacing Options→P3 VNC →Yes→OK→Finish. Here Raspberry Pi may need to be restarted, and choose ok. Then open VNC interface.

```
sudo raspi-config
```



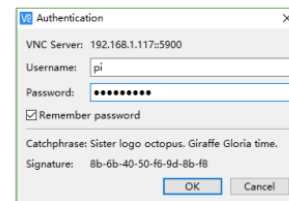
Then download and install VNC Viewer according to your computer system by clicking following link: <https://www.realvnc.com/en/connect/download/viewer/>

After installation is completed, open VNC Viewer. And click File → New Connection. Then the interface is shown below.

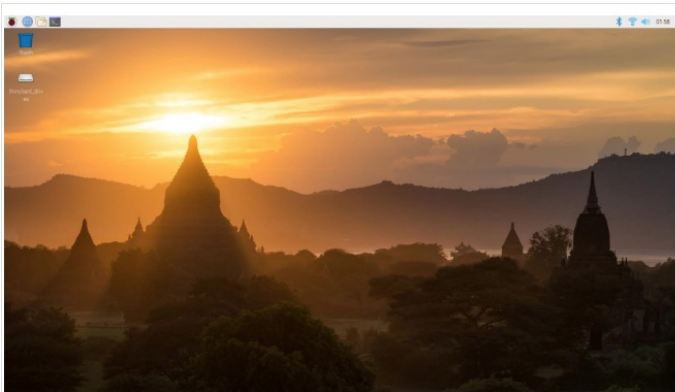


Enter IP address of your Raspberry Pi and fill in a Name. And click OK.

Then on the VNC Viewer panel, double-click new connection you just created, and the following dialog box pops up.



Enter username: **pi** and Password: **raspberry**. And click OK.

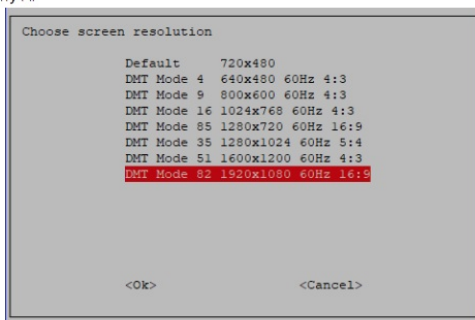


Here, you have logged in to Raspberry Pi successfully by using VNC Viewer

If the resolution ratio is not great or there is just a **little window**, you can set a proper resolution ratio via steps below.

```
sudo raspi-config
```

Select 7 Advanced Options→A5 Resolution→proper resolution ratio (set by yourself)→OK→Finish. And then reboot Raspberry Pi.



In addition, your VNC Viewer window may zoom your Raspberry Pi desktop. You can change it. On your VNC View control panel, click right key. And select Properties->Options label->Scaling. Then set proper scaling.

Need support? [✉ support@freenove.com](mailto:support@freenove.com)