




Robot hexapode

Apprendre à programmer et à monter un robot

 Difficulty **Hard**

 Duration **25 hour(s)**

 Categories **Electronics, Machines & Tools, Robotics**

 Cost **125 EUR (€)**

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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 hexapode, dont le comportement est proche de celui d'une araignée (pour rappel une araignée possède 8 pattes).

Materials

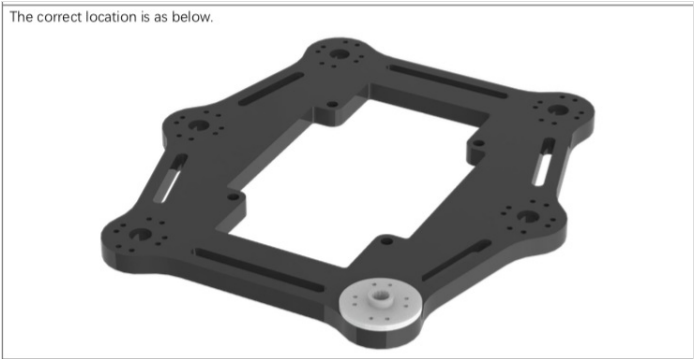
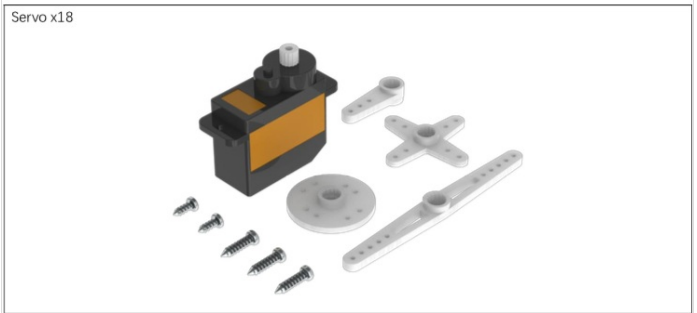
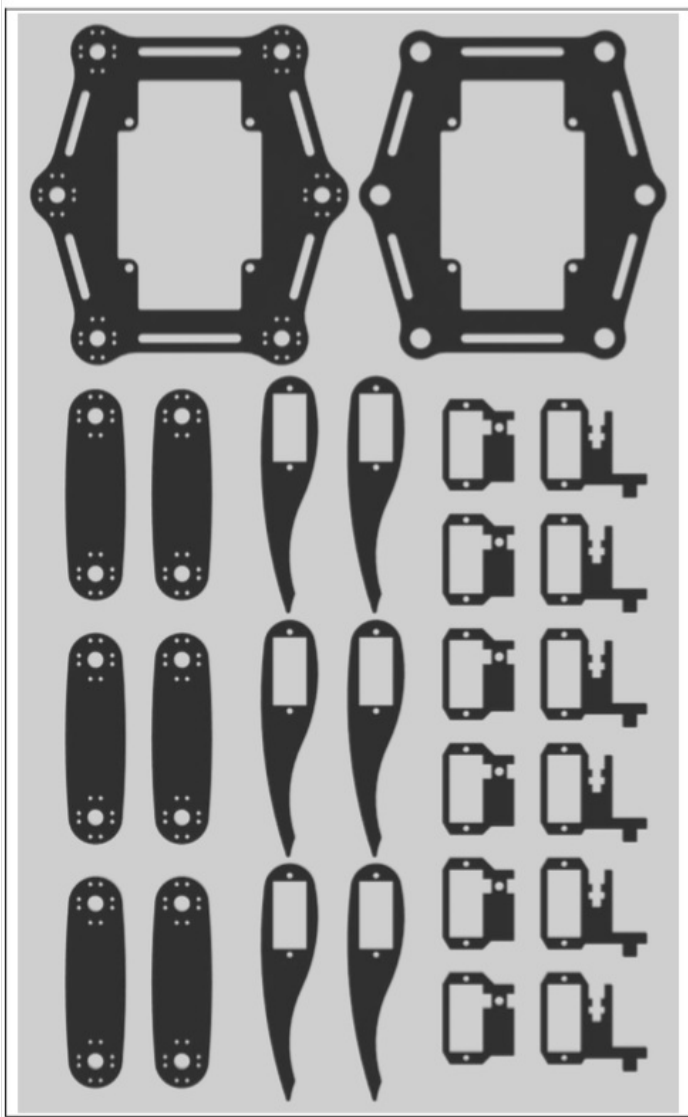
Tools

 https://www.youtube.com/watch?v=nivTZeGthf4&ab_channel=Freenove

Step 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 coté de Outils et Matériaux) un lien vidéo pour l'assemblage.




Use screws and nuts to fix two parts assembled before.




Use screws to fix the 6 parts assembled before.
Please note the installation angle of 6 parts. (Refer to the installation result at the end of this step.)
! When installing, you must keep the power on and all servos connected.

This screw is packed with servo and it is the 2 smaller of the 5 screws.




Fix them as below.



Step 2 - Câblage

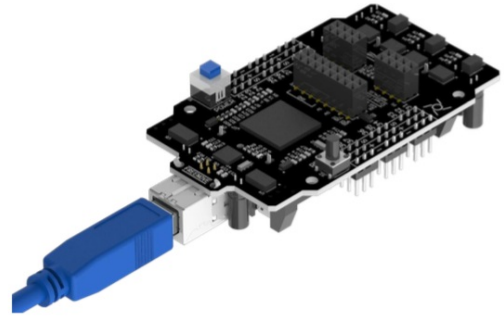
2 batteries de 3.7V seront nécessaires pour le faire marcher.

3.7V 14500 rechargeable battery x2
! Please prepare the right batteries and fully charge them before assembling.
 (Refer to "AboutBattery.pdf" for detailed information about battery.)
! Assembling without right batteries will cause installation errors, which may damage the servos.



Charger for 3.7V 14500 rechargeable battery x1
 (Any charger that can charge 3.7V 14500 rechargeable battery.)

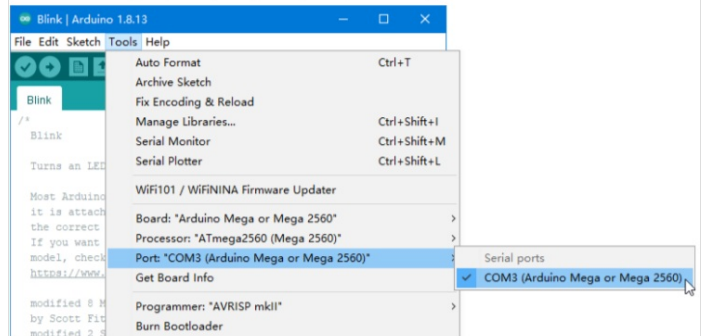
Connect the control board to your computer with a USB cable.



Select the port.

Note: Your port may be different from that in the following figure.

- On Windows: It may be COM4, COM5 (Arduino Mega or Mega 2560) or something like that.
- On Mac: It may be /dev/cu.usbserial-710, /dev/cu.usmodem7101 (Arduino Mega or Mega 2560) or something like that.
- On Linux: It may be /dev/ttyUSB0, /dev/ttyACM0 or something like that.



Note: If there are more than one ports and you cannot decide which one to choose, disconnect the USB cable and check the port. Then connect the USB cable and check the port again. The newly appeared one is the correct port.

Having problems? Contact us for help! Send mail to: support@freenove.com

Click "Verify" button.

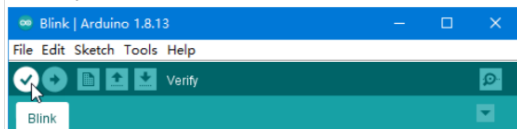
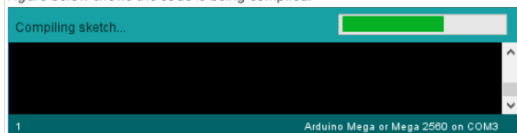
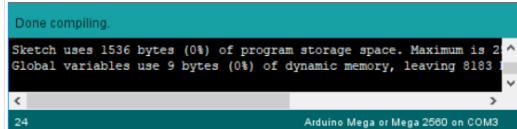


Figure below shows the code is being compiled.



Wait a moment for the compiling to be completed. Figure below shows the code size and percentage of space occupation. If there is any error in the code, the compilation will fail and the details will be shown here.



Click "Upload" button.

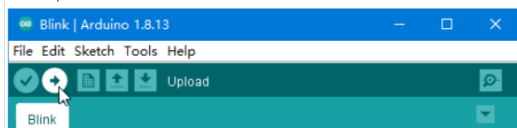
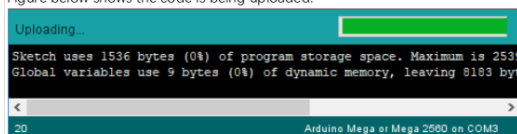
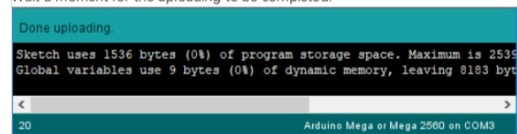


Figure below shows the code is being uploaded.

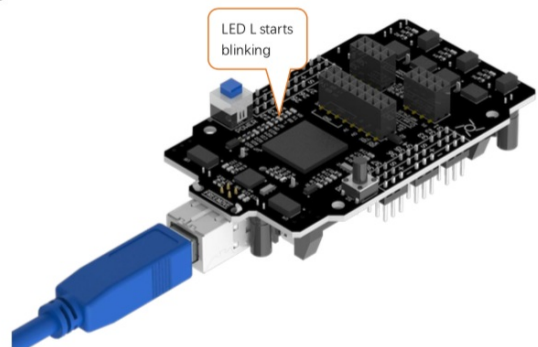


Wait a moment for the uploading to be completed.



Having problems? Contact us for help! Send mail to: support@freenove.com

After that, we will see the LED marked with "L" on the control board starts blinking. It indicates that the code is running now!

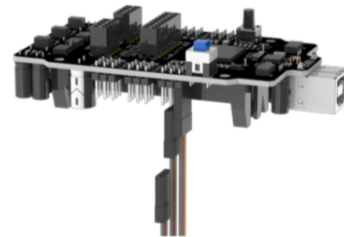


So far, we have completed the first use. I believe you have felt the joy of it.

Step 03

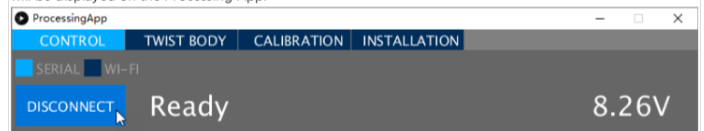
Now we will make a test and then set the control board to installation mode.

Take out all the servos and connect all of them to the control board (yellow wire of servo to S, red to +, black to -). Servos can be connected randomly to the port 22–39. (The name of the port is marked on the front of the control board.)



Then install your batteries and keep power off.

Connect the control board to computer via USB cable. Then open Processing App and click "CONNECT". After the connection succeeds, turn on the power. The servos will rotate and then stop. The battery voltage will be displayed on the Processing App.

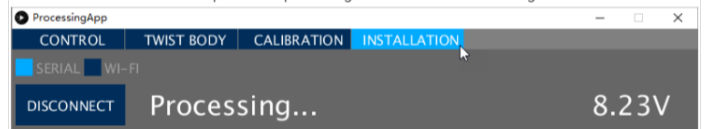


! The battery voltage should be around 8.0–8.4V.

If the voltage is less than 8V, please charge the batteries and then try again. If you still get the same result, maybe you have wrong batteries. Please check the type of your battery or check whether there is a protective board. Refer to "AboutBattery.pdf" for detailed information about battery.

If there is no problem with the voltage, then we need to set the control board to installation mode.

Click "INSTALLATION" on the top. Wait for processing and the servos will rotate again.



Click "DISCONNECT" to disconnect. The control board will restart and the servos will rotate again.

! The LED "L" on the control board now should flash three times at intervals. It is indicating that the control board is under installation mode.

If the LED L does not flash like this, you need to use Processing App to set the control board again. You have to do this step correctly. Otherwise, it will cause installation errors and damage the servos. If you meet problems, check your batteries or ask our support team for help.

! Switch the power off, disconnect the USB cable, remove the batteries and disconnect all the servos.

Now let us learn about the signal LED (LED "L" on the control board), which can indicate current state of the robot. You should always observe it, which is very important and useful. See "SignalLED.mp4" in "Videos" folder.

The signal LED will flash several times every few seconds (circularly).

In each cycle, if the LED lights up several times and then stays OFF, it indicates different working mode:

- Blinks once: ready mode. This mode should be set after completing installation and calibration of the robot.
- Blinks twice: calibration mode. This mode should be set when calibrating the robot.
- Blinks 3 times: installation mode. This mode should be set when installing the robot.

The working mode of the robot can be set through Processing App. The robot will remember the working mode you set, even if you restart the power, the robot will still enter the mode you set originally.

In each cycle, if the LED goes off several times and then stays ON, it indicates an error state: (Only applicable to V2.0 and later versions control board)

- Blinks once: power error. It indicates that the voltage of battery is too low and that it needs to be charged.

The robot will stop all movements and cut off power of all servos when there is an error. You must troubleshoot the error before you can continue to use it.

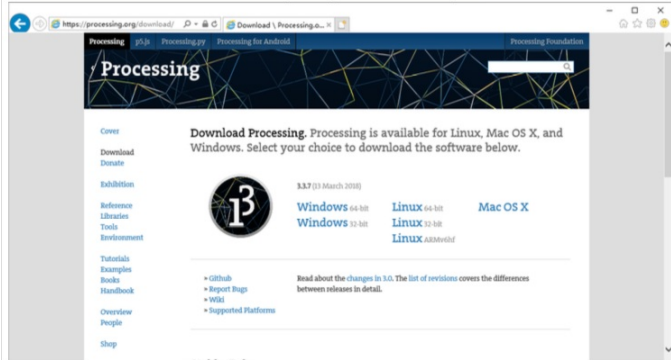
Step 3 - Programmation

Ce robot est compatible avec l'environnement de programmation Arduino et Processing sur les 3 plateformes d'exploitation (Windows, Mac Os et Linux).

Il faudra y télécharger quelques librairies : FNHR, FlexiTimer2, RF24 sur Arduino et IP5 sur Processing.

Et l'application ProcessingApp suffira à contrôler le robot.

Select the Mac, Windows, or Linux version, depending on what machine you have.



Installation on each machine is straightforward:

- On Windows, you'll have a .zip file. Double-click it, and drag the folder inside to a location on your hard disk. It could be Program Files or simply the desktop, but the important thing is for the processing folder to be pulled out of that .zip file. Then double-click processing.exe to start.
- The Mac OS X version is also a .zip file. Double-click it and drag the Processing icon to the Applications folder. If you're using someone else's machine and can't modify the Applications folder, just drag the application to the desktop. Then double-click the Processing icon to start.
- The Linux version is a .tar.gz file, which should be familiar to most Linux users. Download the file to your home directory, then open a terminal window, and type:
`tar xvfz processing-xxxx.tgz`
(Replace xxxx with the rest of the file's name, which is the version number.) This will create a folder named processing-2.0 or something similar. Then change to that directory:
`cd processing-xxxx`
and run it:
`./processing`

Processing IDE

! Please do not skip this chapter if you have never installed Processing IDE or are not familiar with it.

The Processing IDE is free and open source. It is used to write graphical programs run on computers. Most code written with it can run directly on Windows, macOS and Linux without any changes.

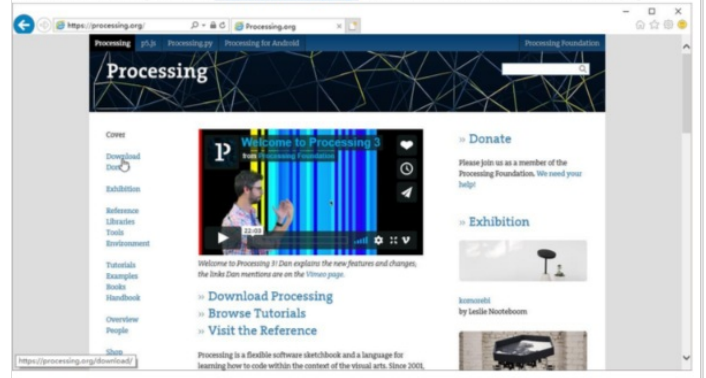
We provide a Processing sketch to configure and control the robot.

Processing IDE

Processing IDE uses Java programming language by default. Please visit <https://processing.org/>, click "Reference" for details.

! Do not worry if you do not know Java, because we provide complete code.

First, install Processing IDE. Visit <https://processing.org/>, click "Download" to enter the download page.

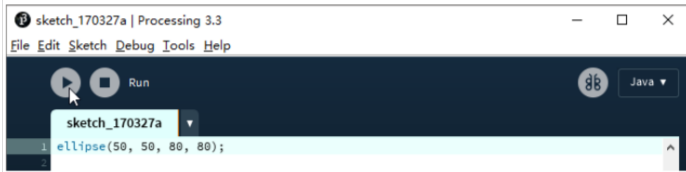


First Use

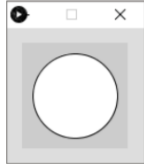
In the editor, type the following:

```
1 ellipse(50, 50, 80, 80);
```

This line of code means "draw an ellipse, with the center 50 pixels down from the top, with a width and height of 80 pixels." Click the Run button (the triangle button in the Toolbar).



If you've typed everything correctly, you'll see a circle on your screen.



If you didn't type it correctly, the Message Area will turn red and complain about an error. If this happens, make sure that you've copied the example code exactly: the numbers should be contained within parentheses and have commas between each of them, and the line should end with a semicolon.



Click "Verify" button.

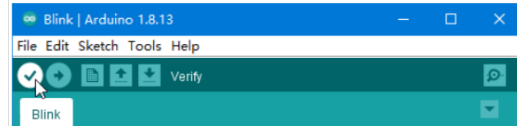
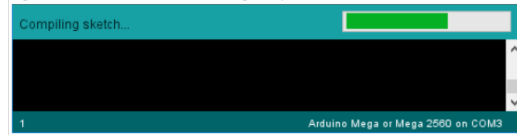
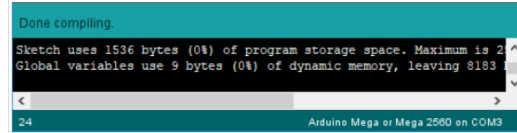


Figure below shows the code is being compiled.



Wait a moment for the compiling to be completed. Figure below shows the code size and percentage of space occupation. If there is any error in the code, the compilation will fail and the details will be shown here.



Click "Upload" button.

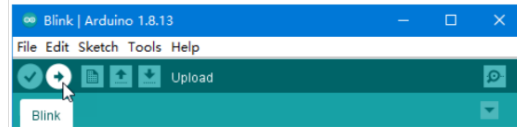
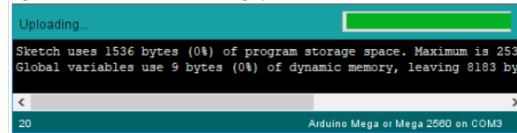
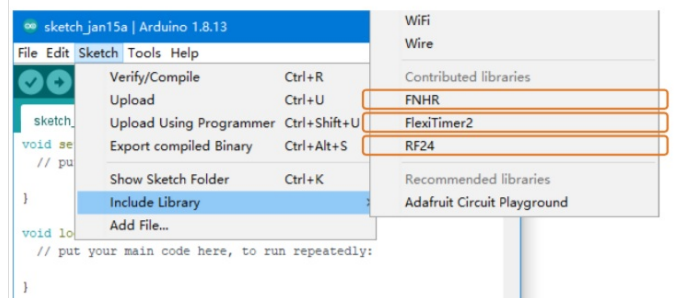


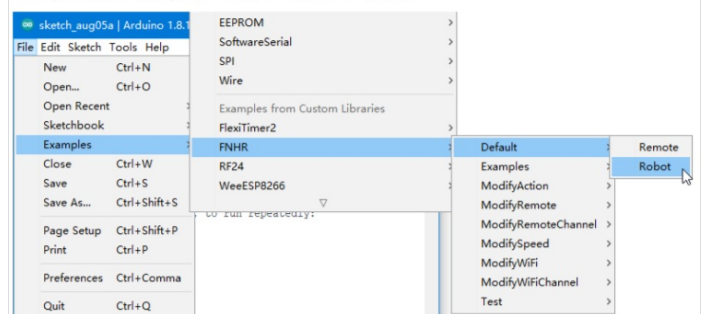
Figure below shows the code is being uploaded.



You can find the added libraries in "Sketch" > "Include Library". Make sure all the following libraries have been added.



Now open "File" > "Examples" > "FNHR" > "Default" > "Robot".



Assembly

Now let us start assembling the robot.

! Please prepare the right batteries and fully charge them before assembling. (See "AboutBattery.pdf")
Assembling without right batteries will cause installation errors, which may damage the servos.

! Please read and complete the previous chapters "Arduino IDE" and "Processing IDE" first.
In the previous chapters we showed you how to install the required software.

! Please follow the tutorial strictly and do not skip any steps.
Ask our support for help if you encounter a problem instead of ignoring it.

! Do not open files in the original ZIP file directly.
After you download the ZIP file for this product, unzip it before use.

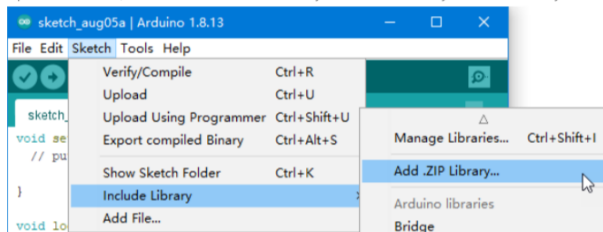
Step 01

First, we need to upload the default sketch to the control board (Freenove Crawling Robot Controller).

Libraries are collections of code that makes programming simple.

The "FNHR" (Freenove Hexapod Robot) library is used to control this robot. We need to add it and other necessary libraries to Arduino IDE.

Open Arduino IDE, click "Sketch" > "Include Library" > "Add .ZIP Library..." to add a library file.

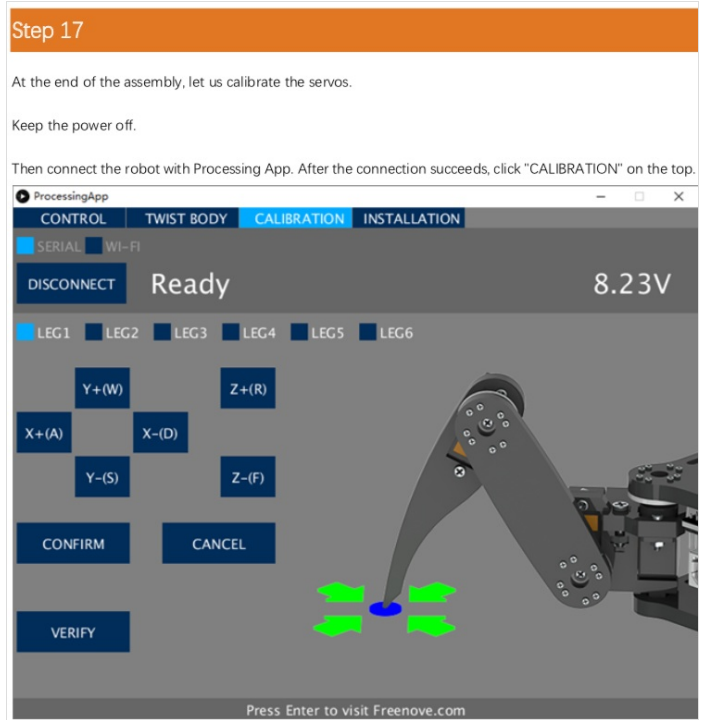
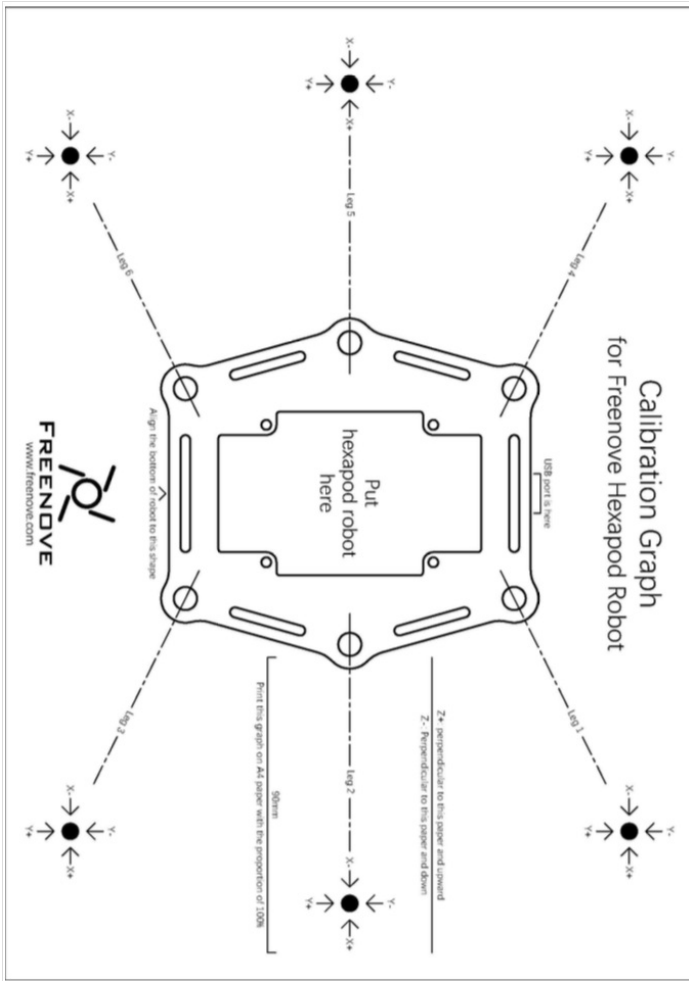


Add all library files in "ArduinoLibraries" folder. This folder is in the folder that contains this PDF tutorial.

Step 4 - Calibration

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



Then start calibrate. Select "LEG1", and then click "X+", "X-", "Y+", "Y-" and "Z+", "Z-", until the end of Leg1 is aligned with the black dots in the graph.

! Please note that each click will only move the leg by 1mm, so you may need to click many times. You can use keyboard to move the leg. The key is marked in brackets on the button.

Then select the "LEG2", "LEG3", "LEG4", "LEG5" and "LEG6" to move other legs to corresponding dots as shown below.



Click "CONFIRM" and the calibration data will be stored in the robot.

Click "VERIFY", and then the robot will restore to the state before calibration. Then converted to the state after calibration, which indicates that the calibration is completed. If the end of legs is not aligned with the dots, click RESET and restart from moving the legs to try again.

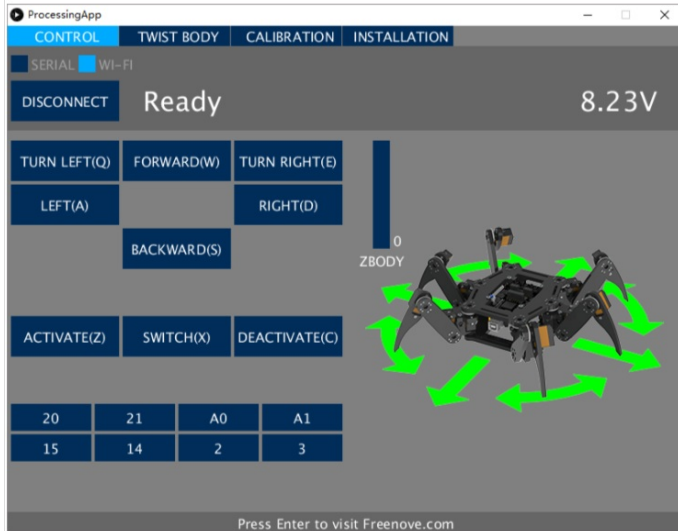
The calibration needs to be executed only once. Its data is stored in EEPROM. It will not be changed if you upload the default sketch again. If you disassemble the robot, replace the servo or control board, you need to calibrate the robot again. If you are not satisfied with the results of the latest calibration, you can also choose to calibrate again.

! If the Processing App cannot connect to the robot, please try the following:

1. Check if the ESP8266 module is installed correctly.
2. Fully charge the 14500 battery.
3. Go back to step 01 and upload the default sketch for the robot again.
4. Try different Wi-Fi channels.

Having problems? Contact us for help! Send mail to: support@freenove.com

In the "CONTROL" page, you can control the basic functions of the robot.

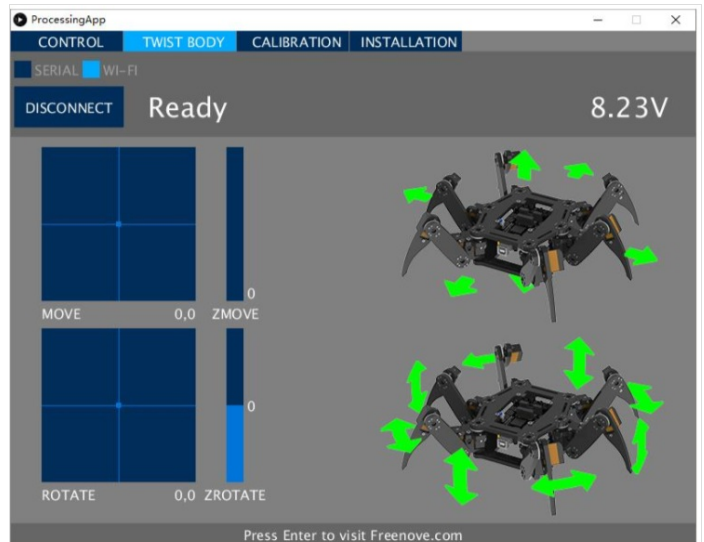


You can execute the following operation:

- Forward, backward, left, right, turn left, turn right and change body's height.
- Switch active mode and sleep mode. Sleep mode can help to save the power of batteries.
- Switch output state of IO ports. You can connect and control some output modules.

You can use keyboard to move the leg. The key is marked in brackets on the button.

In the "TWIST BODY" page, you can control the robot to move and rotate body in the place where it stays.



You can execute the following operation:

- Use mouse to click on the "MOVE" box and "ZMOVE" slider, the robot body will move to the corresponding location.
- Use mouse to click on the "ROTATE" box and "ZROTATE" slider, the robot body will rotate to the corresponding posture.

If there is no action command for about 10 seconds, the robot will switch into sleep mode automatically to save power. Any command can activate the robot again.

Use Android Devices or iPhone

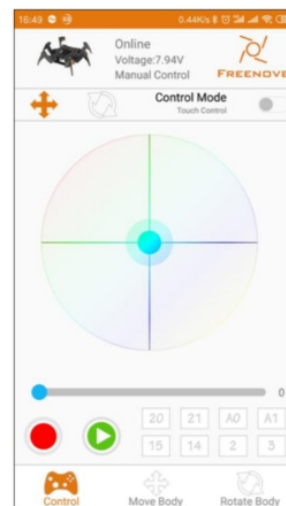
You can use Android phone or tablet or iPhone to control this robot.

First, install Freenove App for your device:

- For Android, search and install "Freenove" on Google Play. You can also download the APK file directly: https://github.com/Freenove/Freenove_App_for_Android/raw/master/freenove.apk
- For iPhone, search and install "Freenove" on App store.

After the installation is completed, connect your device to the Wi-Fi hotspot of the robot.

The name of Wi-Fi hotspot is "Freenove Hexapod Robot" and the password is "Freenove" (case sensitive). Open Freenove App and select "Freenove Hexapod Robot Kit". The following interface will be displayed.



The App will connect the robot automatically. The online state will appear on the top. If the offline state appears, you can touch the robot logo on the top left corner to reconnect.

This APP is similar to the Processing App. You can explore it by yourself. There is also a manual about it: https://github.com/Freenove/Freenove_App_for_Android/raw/master/Tutorial.pdf

Having problems? Contact us for help! Send mail to: support@freenove.com

Notes and references

Si vous avez des difficultés avec le montage des robots ou qu'il vous manque des pièces, vous pouvez aller sur le site <https://freenove.com/>