

2019

Adept Smart Robot Kit For Arduino

QUADRUPED ROBOT

 www.adeept.com
support@adeept.com



Adept

Warning

Please pay attention to the following issues:

- There are small components included in this kit. Make sure it's not reachable for children under 6 years old in case swallowing mistakenly. If accident occurs, please seek medical help immediately.
- Parental guidance recommended for young children.
- Do not place the products or the components near any AC socket or other circuits to avoid electric shock.
- Keep away from any liquid or flame when using the product.
- Store the product in amicable environment, avoid extreme temperature and humidity.
- Turn off the power after use.
- Do not touch the moving part of the product or interfere it with any physical objects or signals in case damages to the product or fire generated by over heat.
- Product may be warm during use.
- Do not reverse the cathode and anode of the power in case damages to the circuit.
- Refer to instructions before use.
- Handle the product gently, avoid vigorous shaking or slamming.

About

Adept is a technical service team of open source software and hardware. Dedicated to applying the Internet and the latest industrial technology in open source area, we strive to provide the best hardware support and software service for general makers and electronic enthusiasts around the world. We aim to create infinite possibilities with sharing. No matter what field you are in, we can lead you into the electronic world and bring your ideas into reality.

The code and manual of our product are open source. You can check on our website:

<http://www.adept.com/>

If you have any problems, feel free to send an email for technical support and assistance:

support@adept.com

On weekdays, we usually will reply within 24 hours. Also welcome to post in our official forum:

<http://www.adept.com/forum/>

Copyright

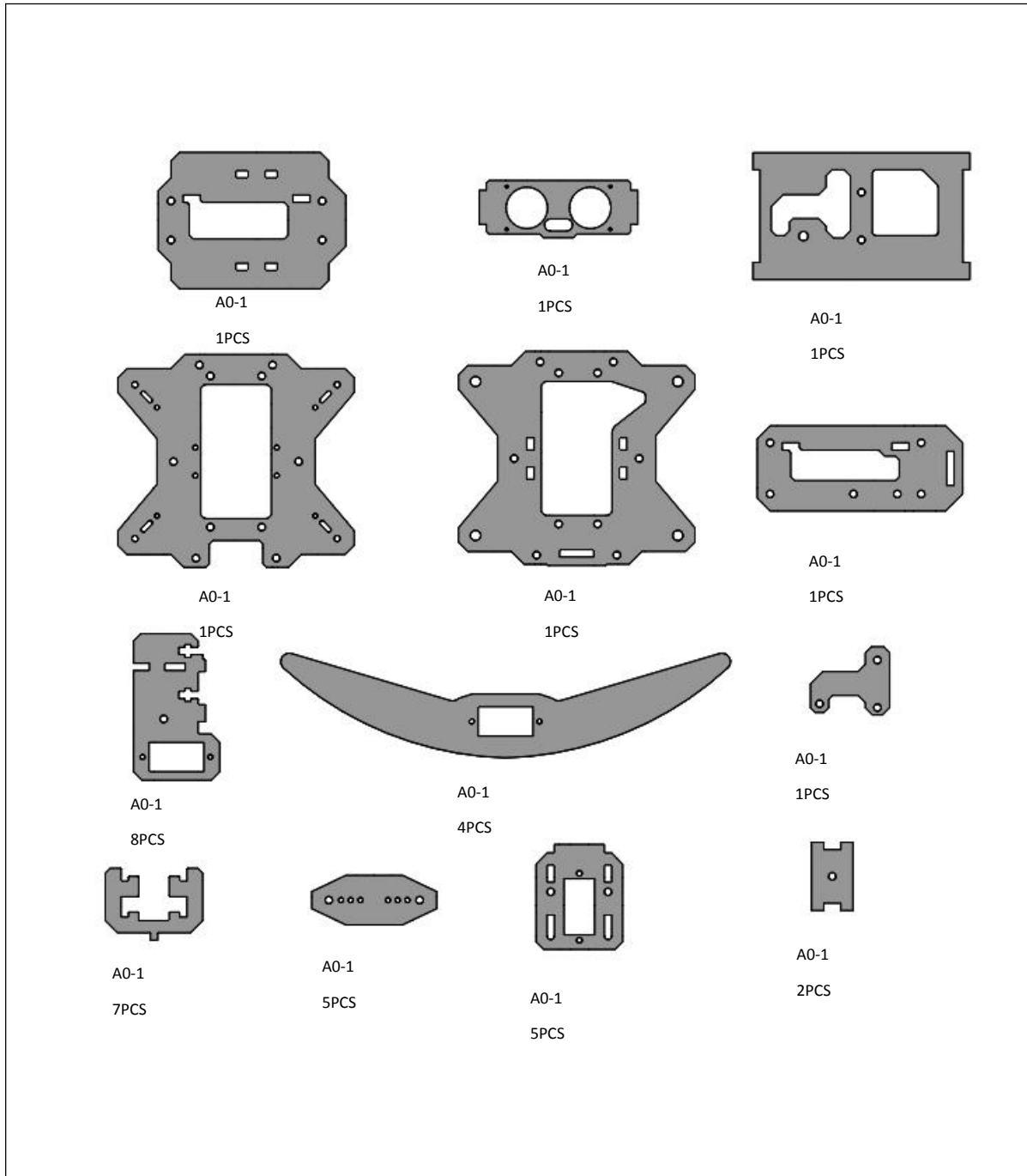
This user manual and code can be used for learning, DIY, refitting, etc., except for commercial purpose. The Adept Company owns all rights of contents in the manual, including but not limited to texts, images, data, etc. Any distribution or printing should be implemented with the permission of the Company, or it will be deemed illegal.

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1.Component List

1.1.Acrylic Plates

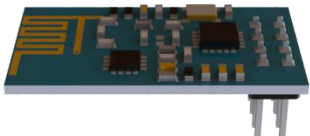
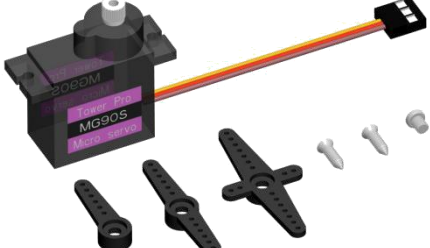



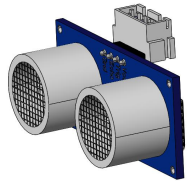
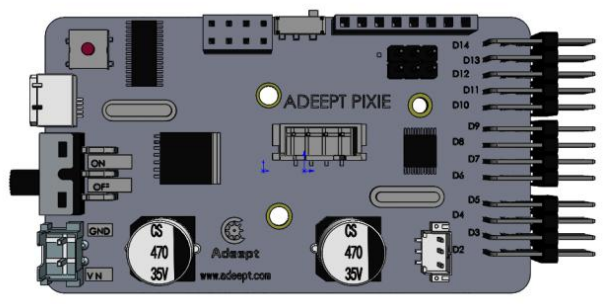
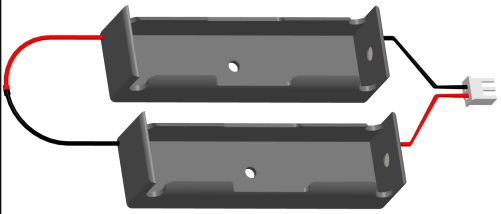




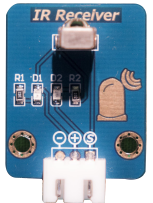


The acrylic plates are fragile, so please be careful when assembling them in case of breaking.
The acrylic plate is covered with a layer of protective film. You need to remove it first. Some holes in the acrylic may have residues, so you need to clean them before use.

1.2.Machinery Parts

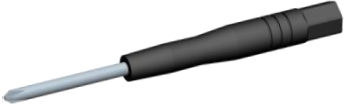
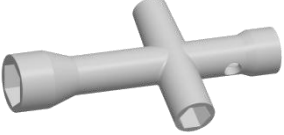




<p>M2 Nut</p> <p>X28</p>  <p>www.adeept.com</p>	<p>M3 Nut</p> <p>X21</p>  <p>www.adeept.com</p>	<p>M2*8 Screw</p> <p>X24</p>  <p>www.adeept.com</p>	<p>M2*14 Screw</p> <p>X4</p>  <p>www.adeept.com</p>	<p>M2.5*8 Screw</p> <p>X14</p>  <p>www.adeept.com</p>
<p>M3*8 Screw</p> <p>X36</p>  <p>www.adeept.com</p>	<p>M3*10 Screw</p> <p>X19</p>  <p>www.adeept.com</p>	<p>M3*15 Nylon Standoff</p> <p>X4</p>  <p>www.adeept.com</p>	<p>M3*20 Nylon Standoff</p> <p>X4</p>  <p>www.adeept.com</p>	<p>M3*22 Nylon Standoff</p> <p>X4</p>  <p>www.adeept.com</p>
<p>M3*40 Nylon Standoff</p> <p>X6</p>  <p>www.adeept.com</p>	<p>M3*8 Countersunk Head Screw</p> <p>X2</p>  <p>www.adeept.com</p>	<p>M2.5*4 Screw</p> <p>X2</p>  <p>www.adeept.com</p>	<p>M1.7*6*6 Self-tapping Screw</p> <p>X12</p>  <p>www.adeept.com</p>	<p>M1.4*6 Self-tapping Screw</p> <p>X4</p>  <p>www.adeept.com</p>
<p>M2*6 Copper Standoff</p> <p>X4</p>  <p>www.adeept.com</p>	<p>M2.5*11 Copper Standoff</p> <p>X2</p>  <p>www.adeept.com</p>			

1.3.Electronic Parts

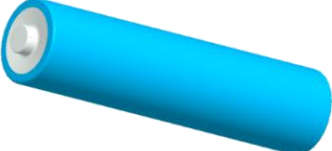
<p>Esp-8266 WiFi Module X 1</p> 	<p>Servo X14</p> 
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<p>MPU-6050 X1</p> 	<p>Adept Ultrasonic Module X1</p> 
<p>AdeptPixie X1</p> 	<p>18650 Battery Holder Set X1</p> 
<p>WS2812 LED Module X2</p> 	<p>3-Pin Wire X2</p> 
<p>4-PIN Wire-1 X1</p> 	
<p>Female to Female Dupont Wire X10</p> 	<p>IR Receiver x1</p> 
<p>Remote Controller x1</p> 	<p>4-Pin Wire-2 X1</p> 

1.4.Tools

<p>Cross Screwdriver X1</p> 	<p>Cross Socket wrench X1</p> 
<p>Large Cross-head Screwdriver X1</p> 	
<p>Flathead Screwdriver X1</p> 	
<p>Winding Pipe X1 300mm*2</p> 	
<p>Ribbon X1</p> 	

1.5.Self-prepared Parts

<p>18650 Battery X2</p> 
--

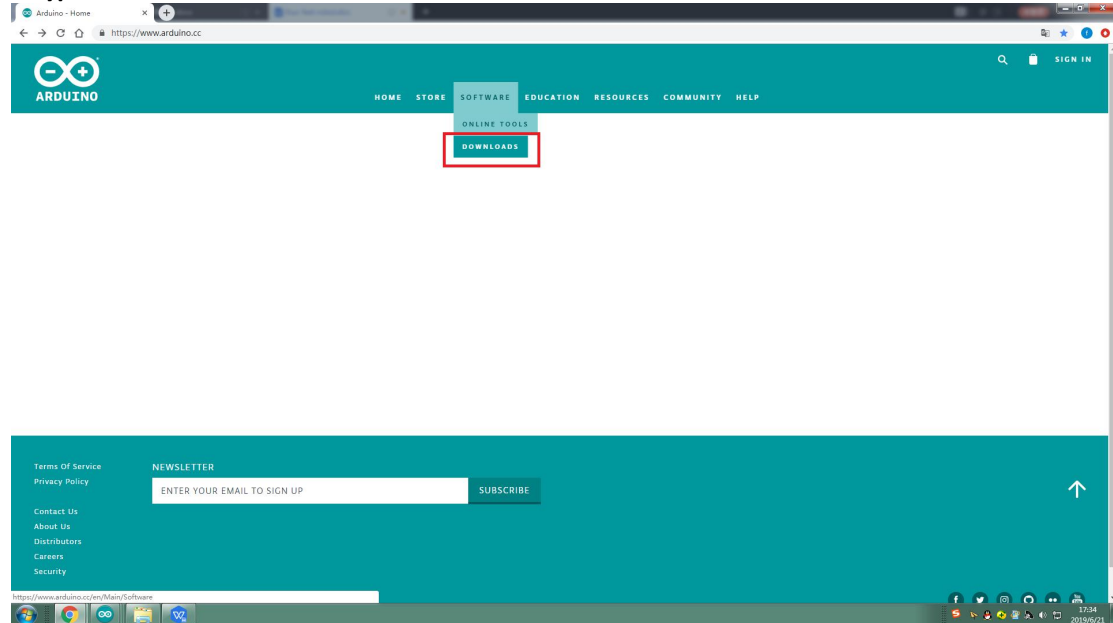
18650 battery specification:

It is recommended to use lithium battery above 3000mAh and without overcurrent protection. The power supply current requirement is above 3A. Using 18650 lithium battery with overcurrent protection function, 18650 battery whose capacity is less than 1700mAh, 18650 battery specially for strong-light flashlight, 18650 battery with power shortage or counterfeit lithium battery produced by informal manufacturers will cause the unstable work of the robot, power cut and even damage to the Raspberry Pi and robot. The robot can be turned on normally, but the robot will automatically restart or shut down after, also because of the problem caused by the 18650 battery.

2. Install the software

2.1. Install the Arduino IDE

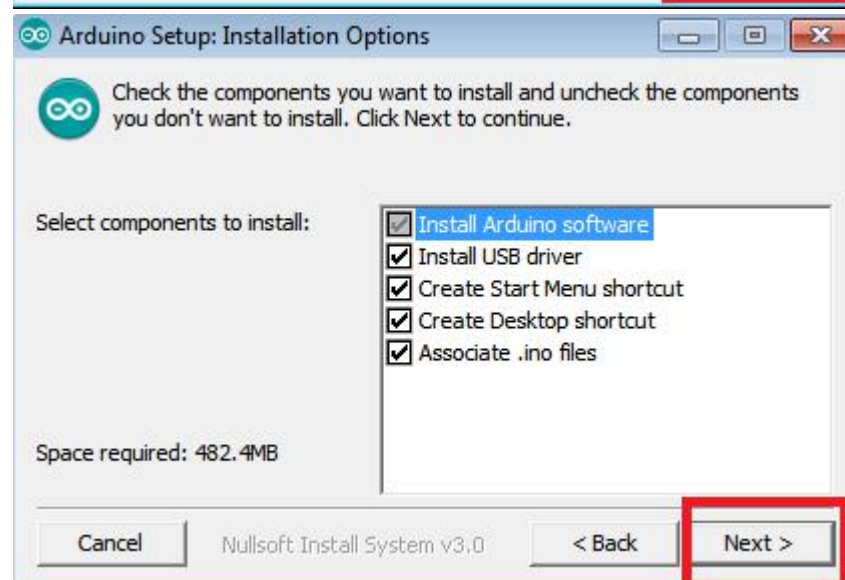
1. Type the arduino.cc in the browser and download the arduino IDE.



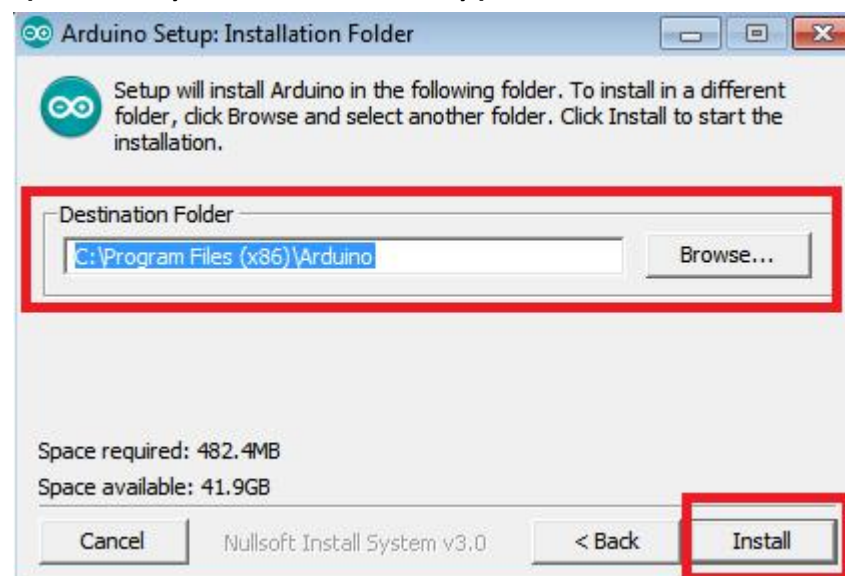
2. Download different versions depending on the operating system.

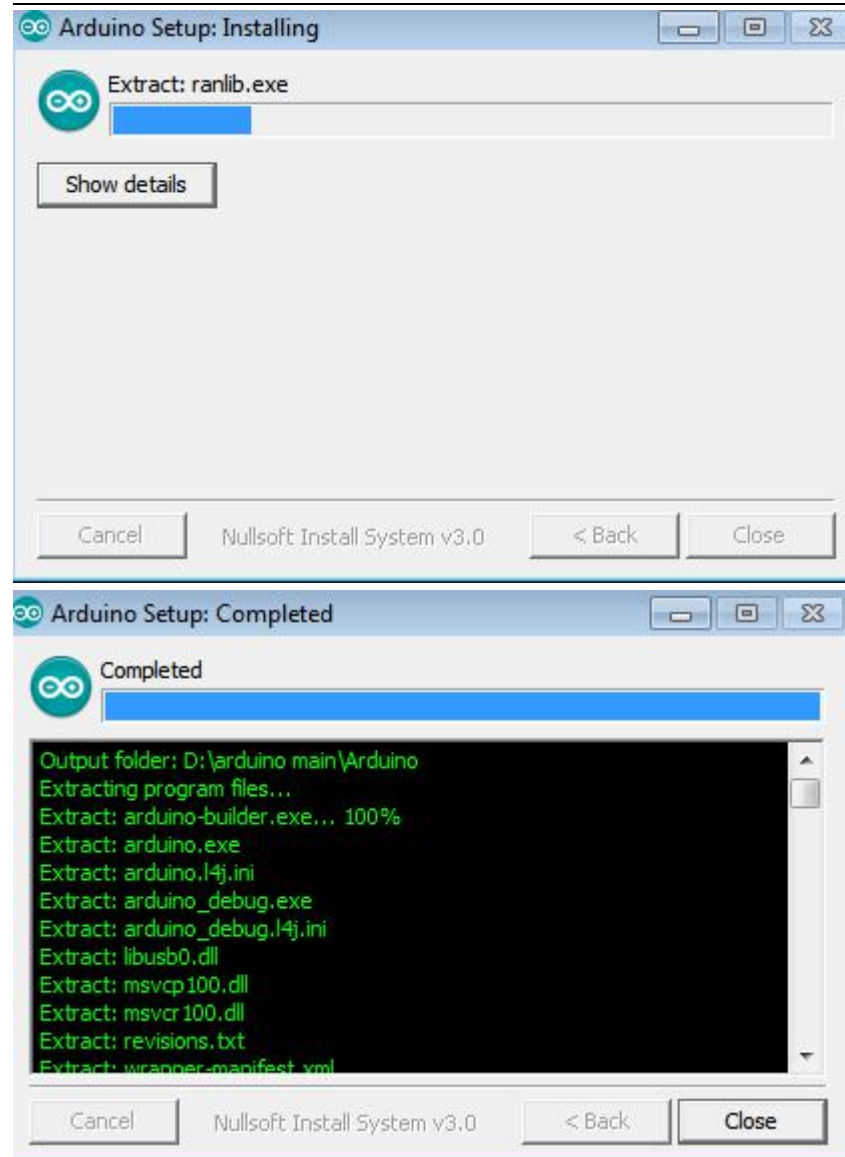


3.Install , remember your installation directory.



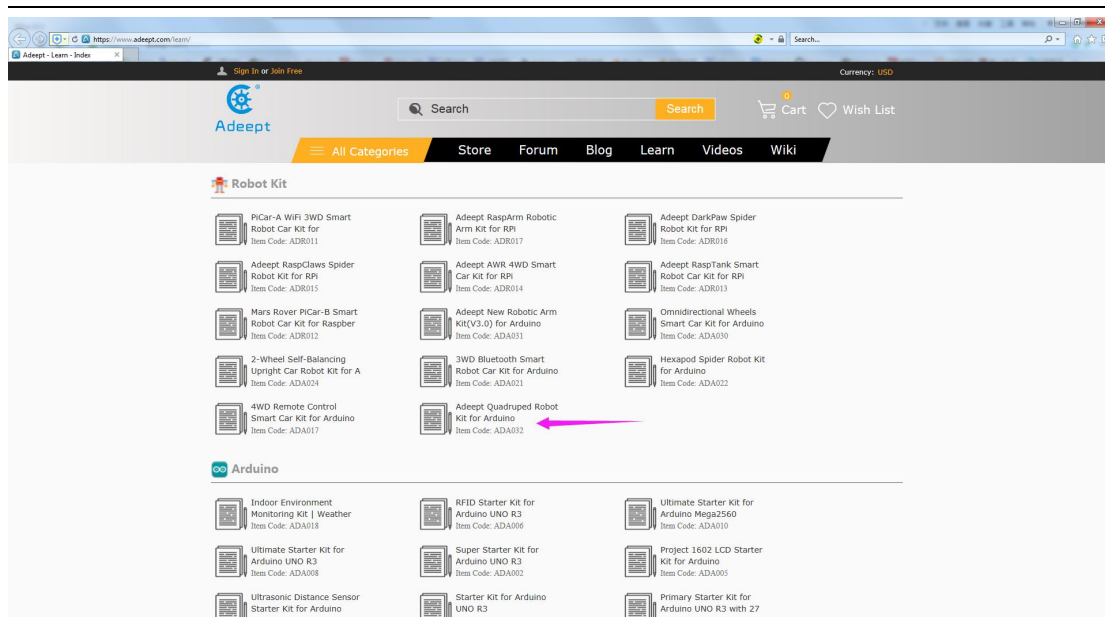
(remember your installation directory)



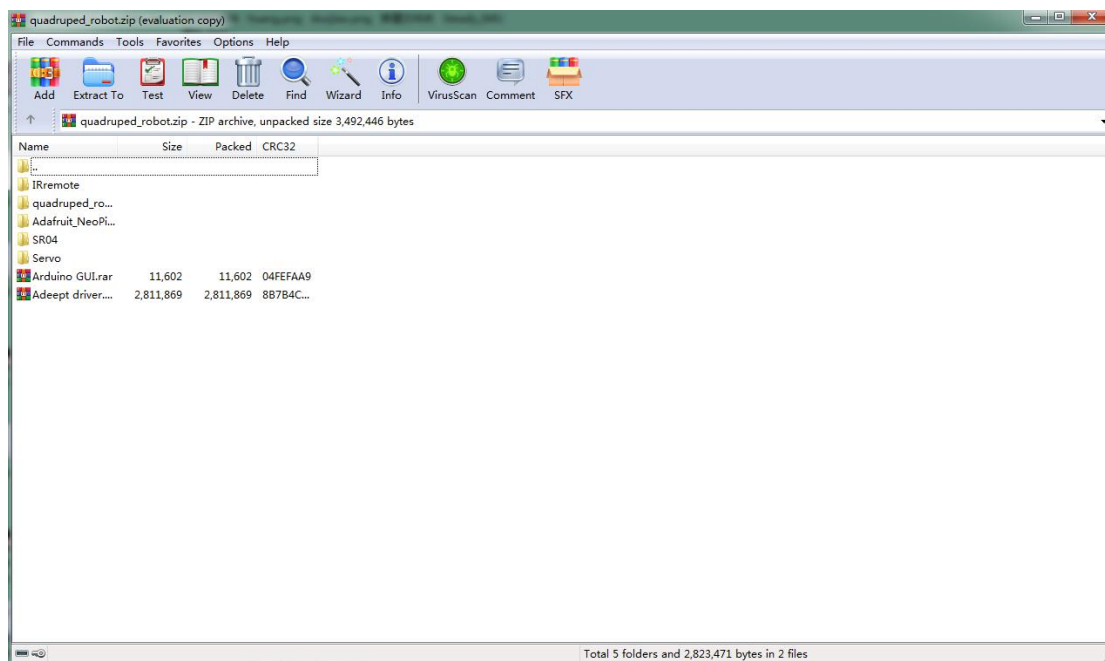


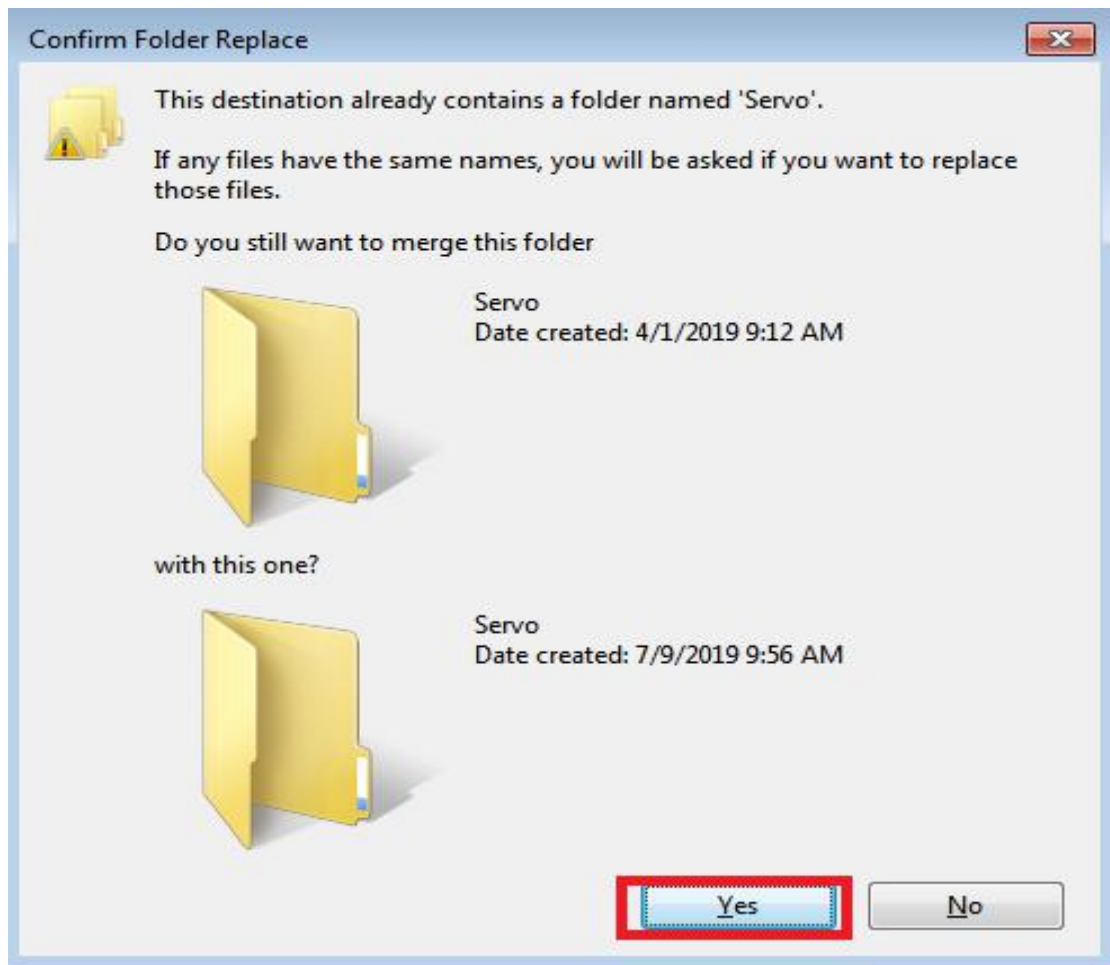
2.2. Install the library files

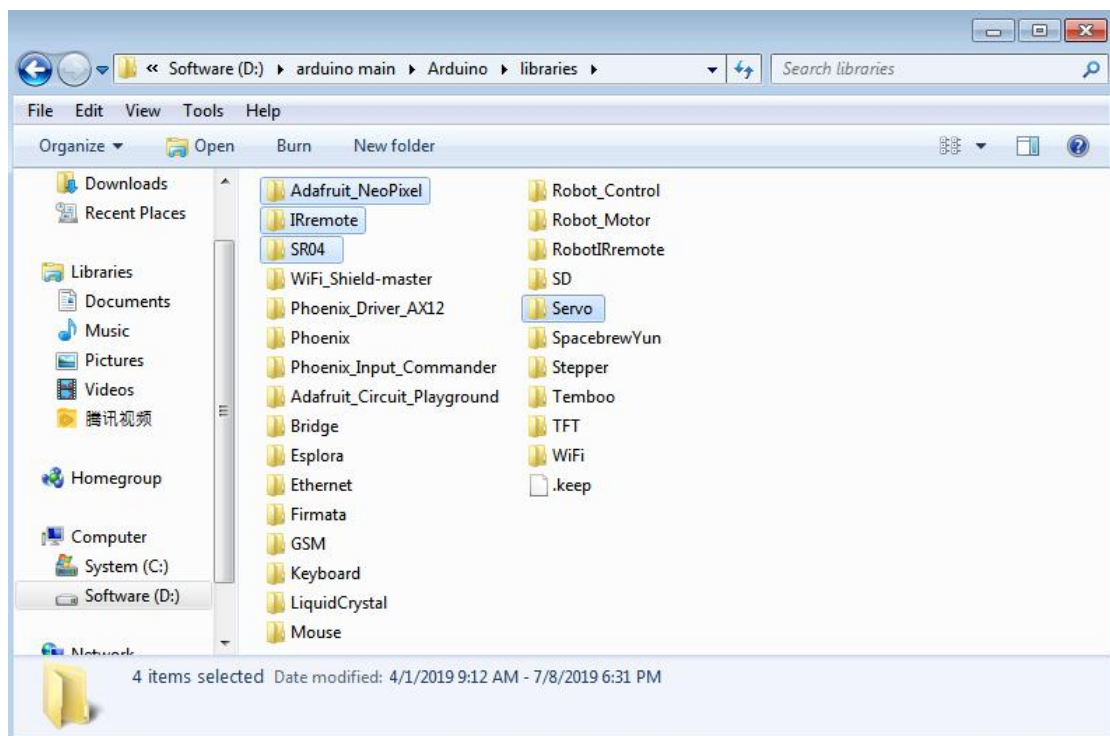
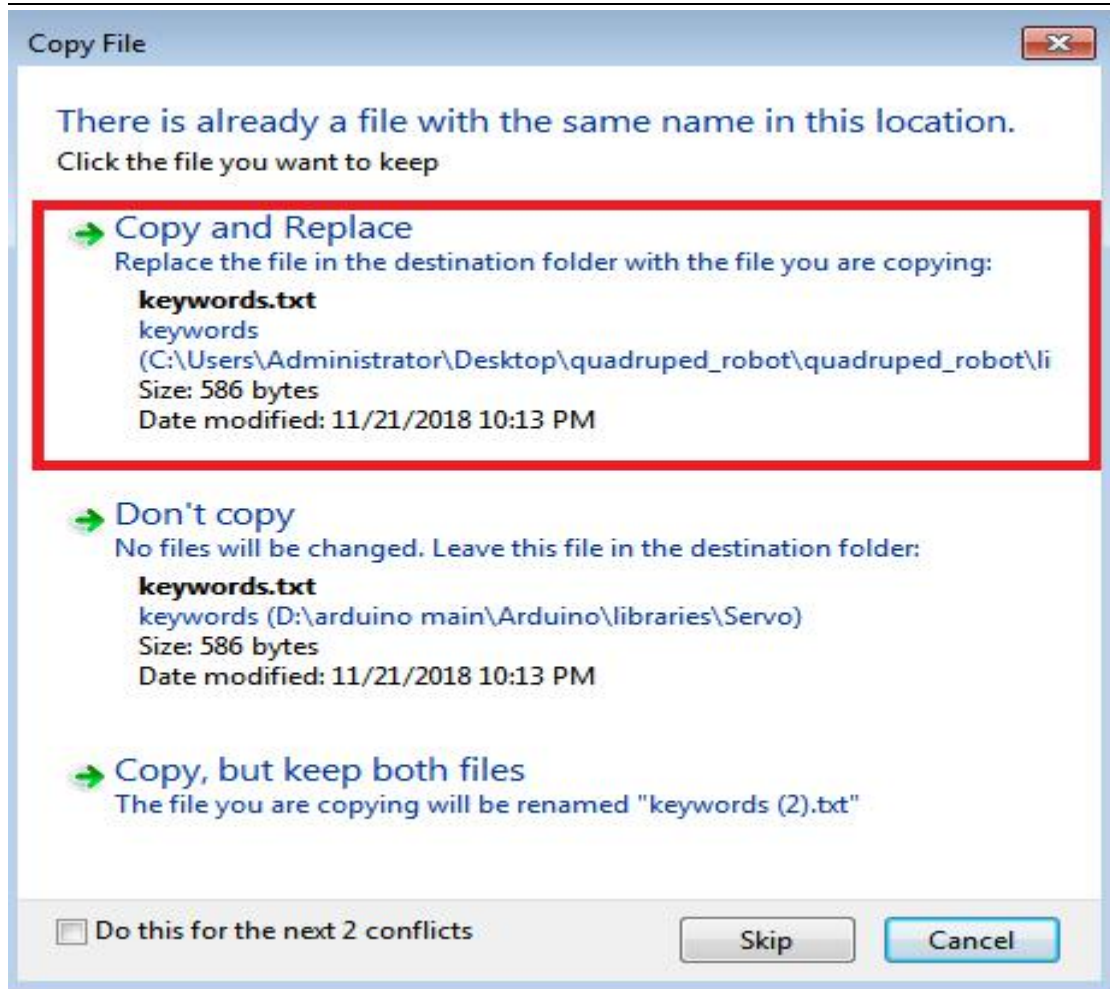
Enter <https://www.adept.com/learn/> on browser, and download the code, library files and driver file.



Copy the four library files Adafruit_NeoPixel, Servo, IRremote and SR04 to the libraries file in the installation directory of Arduino IDE.

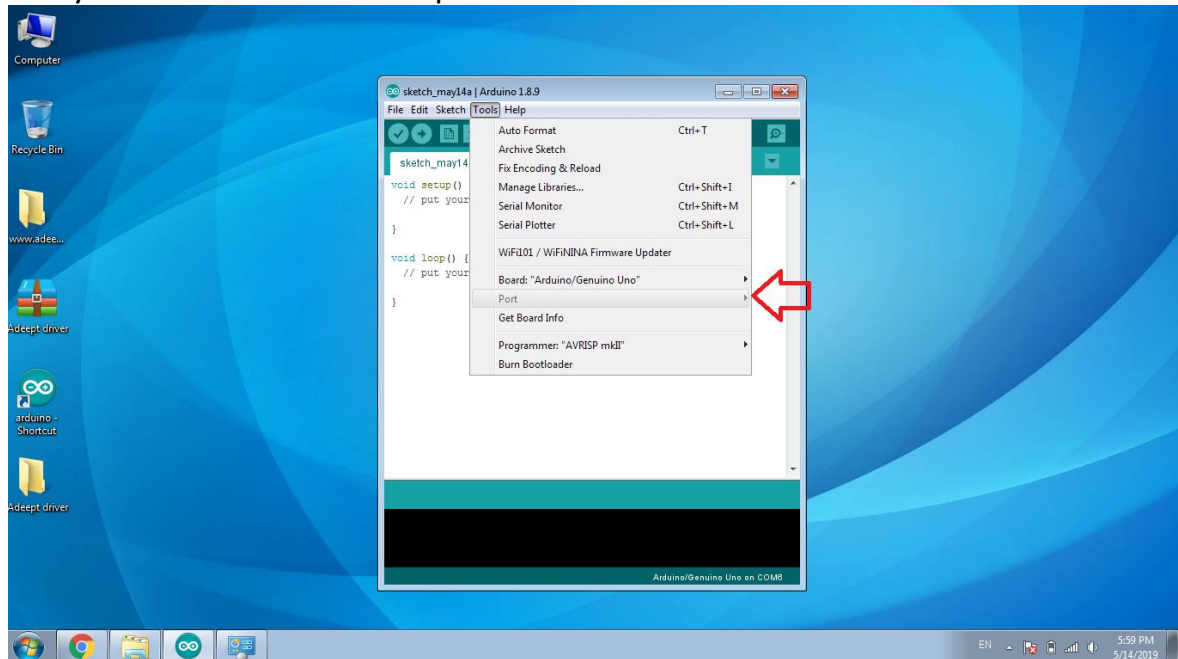




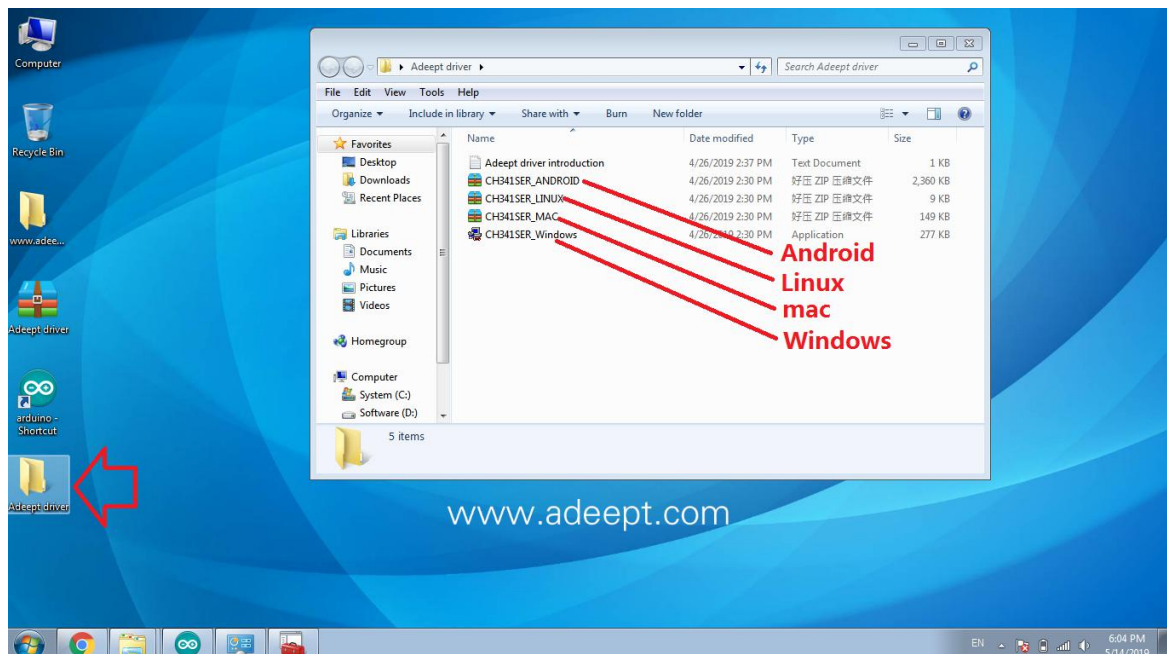


2.3. Install the driver

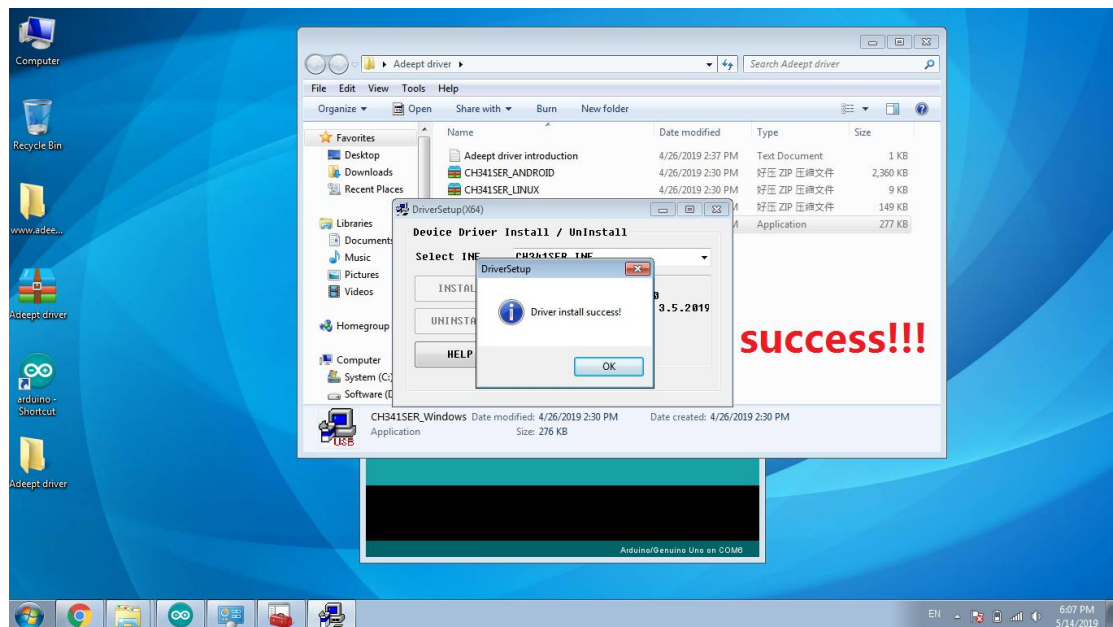
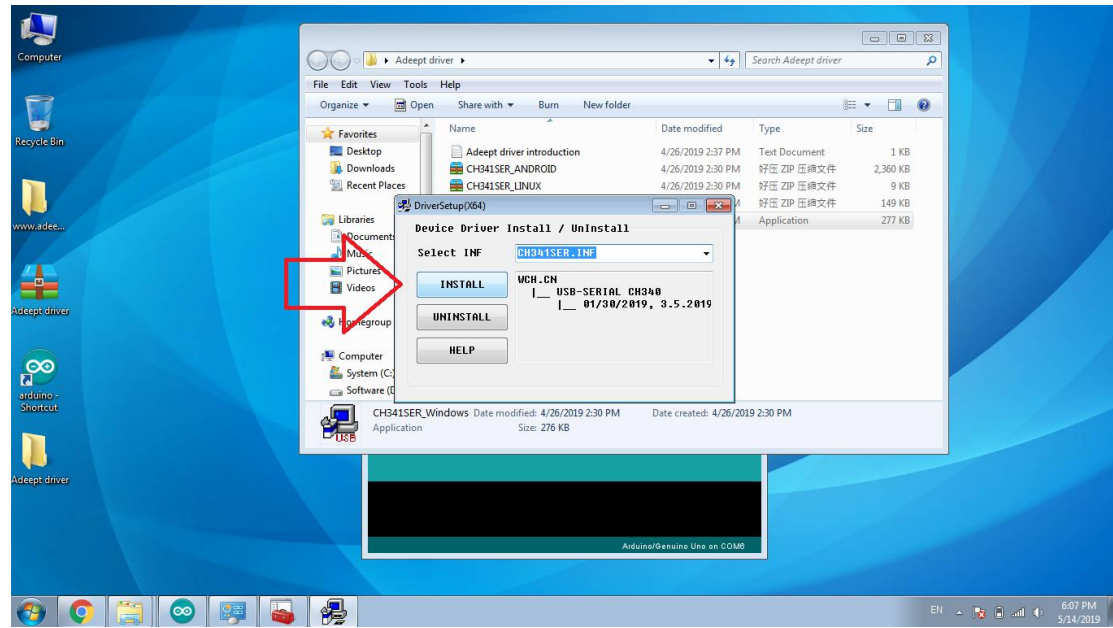
1. Connect the control board and open Arduino, you will see the serial port is not accessible, meaning that you have not installed the serial port driver.



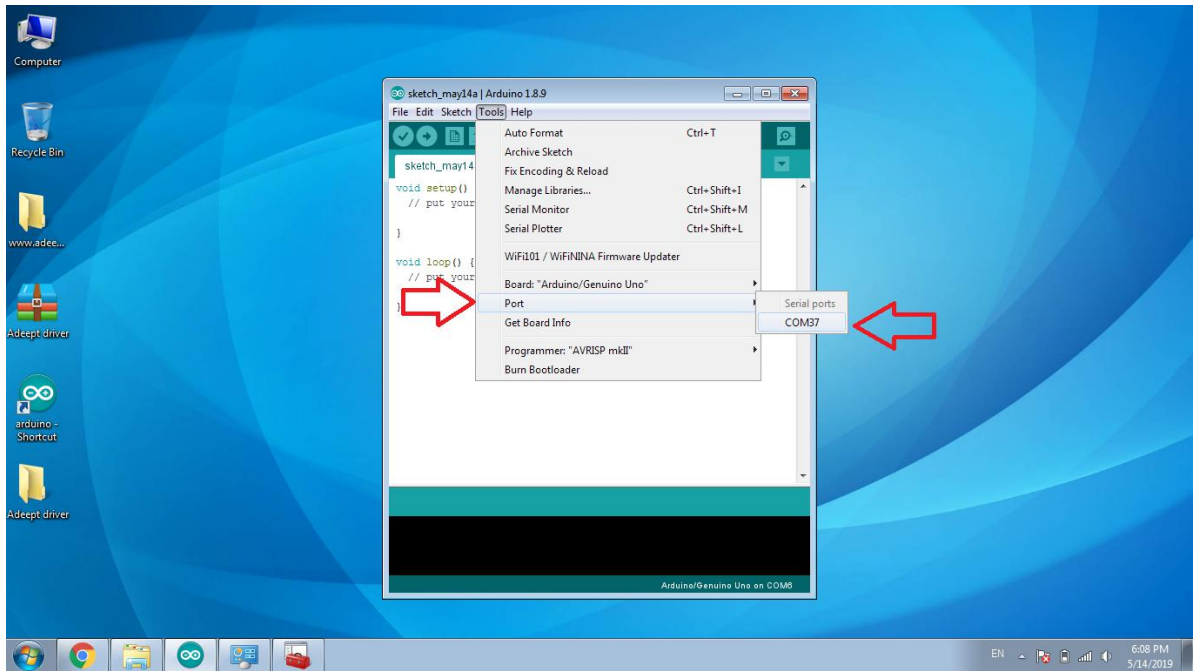
2. Open the driver program, install corresponding driver according to the computer operating system.



3. Click to install.



4. Now you will find the Arduino serial port is accessible (different computer configuration has different serial port).

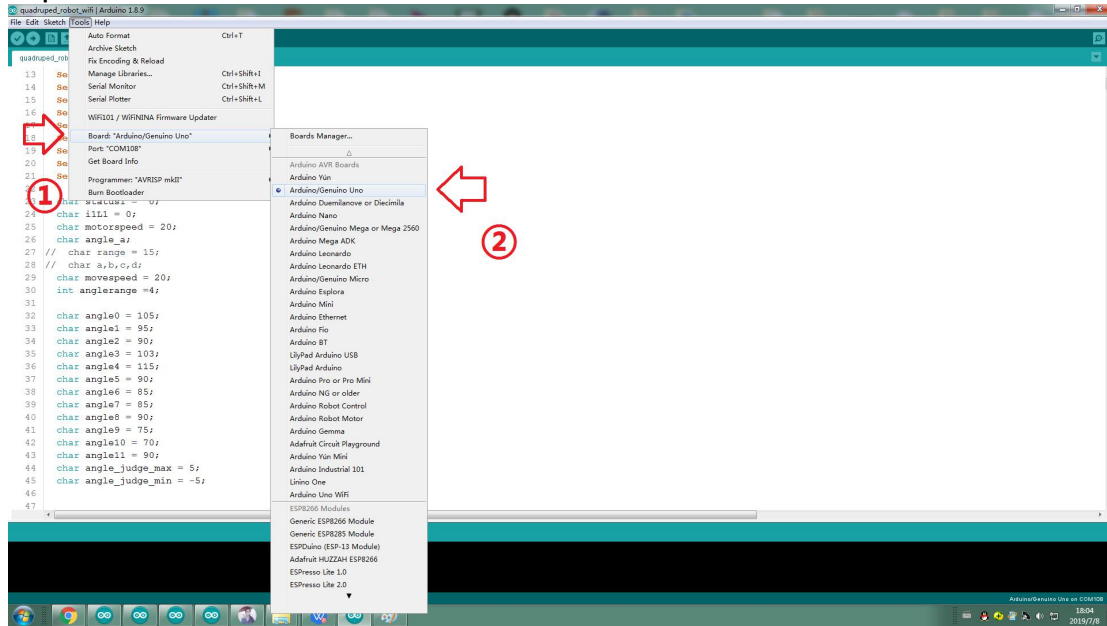


2.4. Upload program.

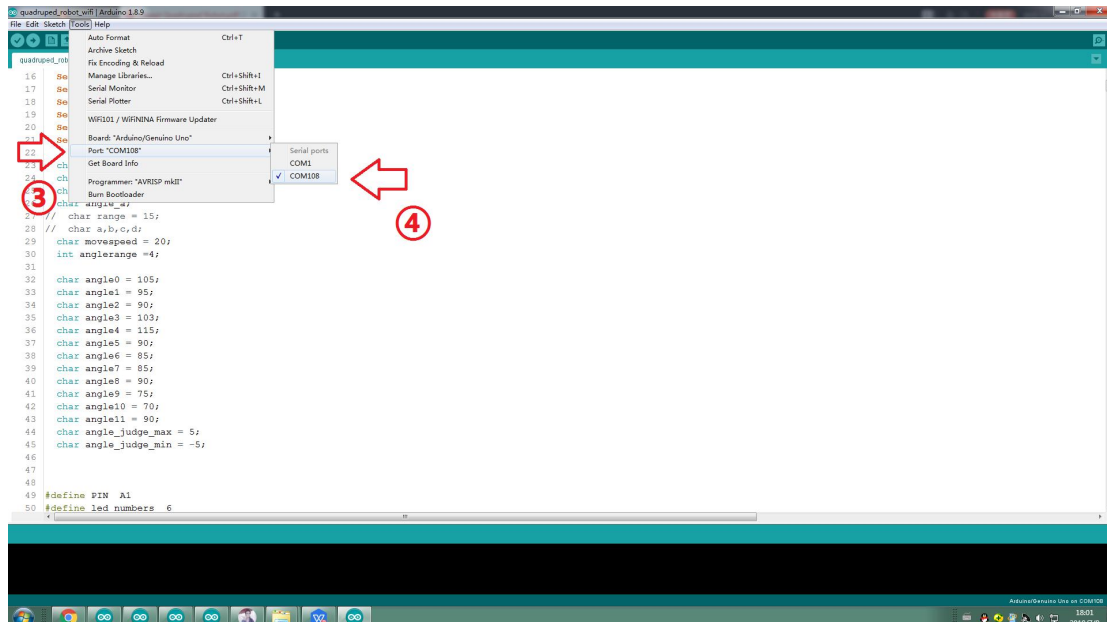
1. Turn on the power and switch program upload to 0.



2. Open Arduino software and select the control board.

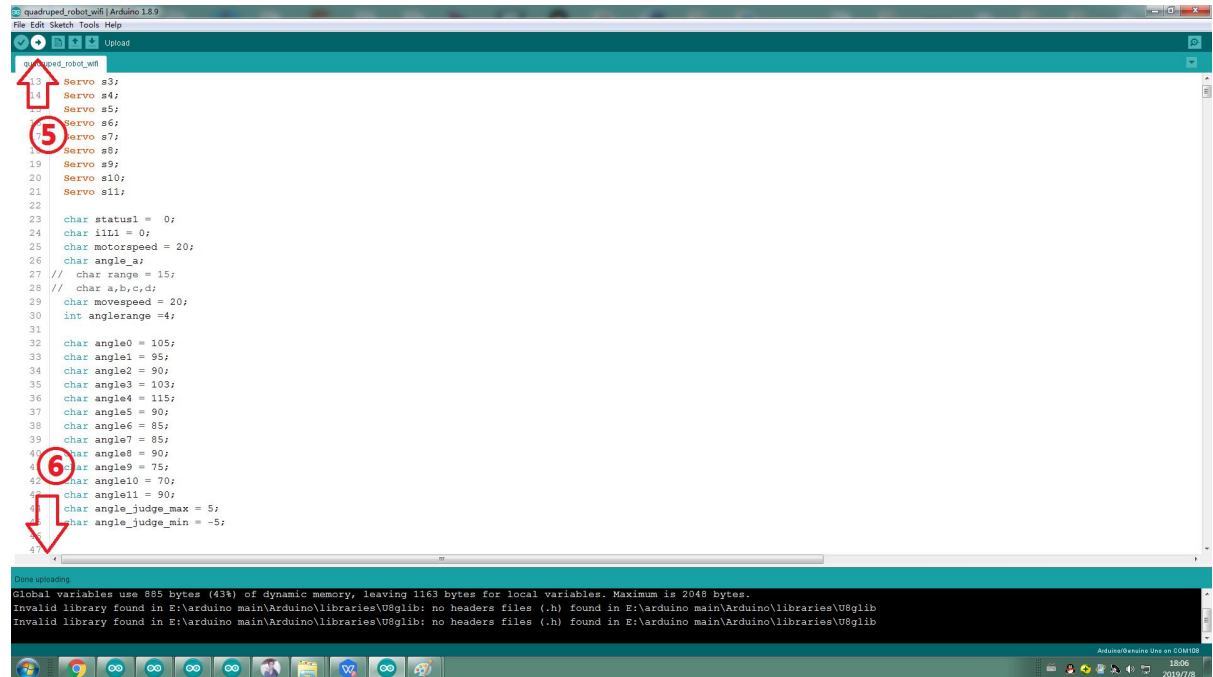


3. Select serial port (different computer configuration has different serial port)



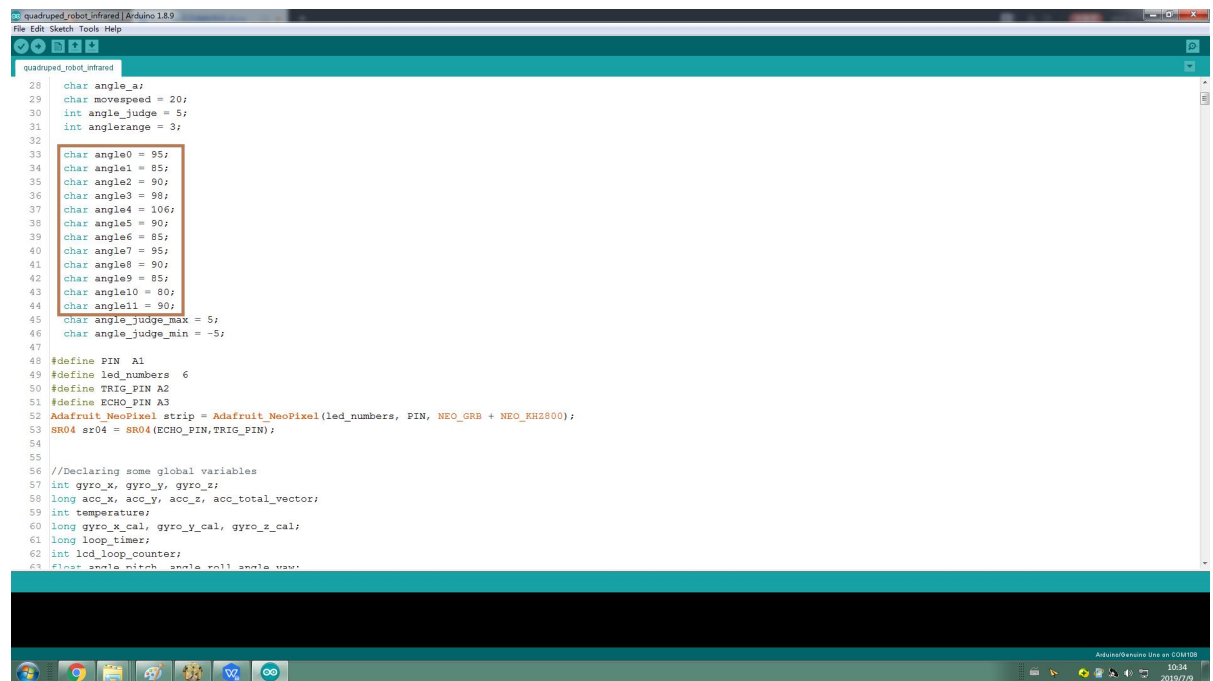
5.Upload program.

Two sets of code are provided, the infrared remote control (four_feet_robot_wifi) and wifi control (four_feet_robot_infrared). Upload the code according to your need.



```
15 Servo s3;
16 Servo s4;
17 Servo s5;
18 Servo s6;
19 Servo s7;
20 Servo s8;
21 Servo s9;
22 Servo s10;
23 Servo s11;
24
25 char status1 = 0;
26 char ill1 = 0;
27 char motorspeed = 20;
28 char angle_a;
29 // char range = 15;
30 // char a,b,c,d;
31 char movespeed = 20;
32 int anglerrange =4;
33
34 char angle0 = 105;
35 char angle1 = 95;
36 char angle2 = 90;
37 char angle3 = 103;
38 char angle4 = 115;
39 char angle5 = 90;
40 char angle6 = 85;
41 char angle7 = 85;
42 char angle8 = 90;
43 char angle9 = 75;
44 char angle10 = 70;
45 char angle11 = 90;
46 char angle_judge_max = 5;
47 char angle_judge_min = -5;
```

Because the servo has a certain angle error, when you finish installing the servo, you may find that the four legs of the robot cannot stand on the same level, and you need to fine-tune the angle through the program. (The variable angle0-angle11 corresponds to 12 servos respectively)

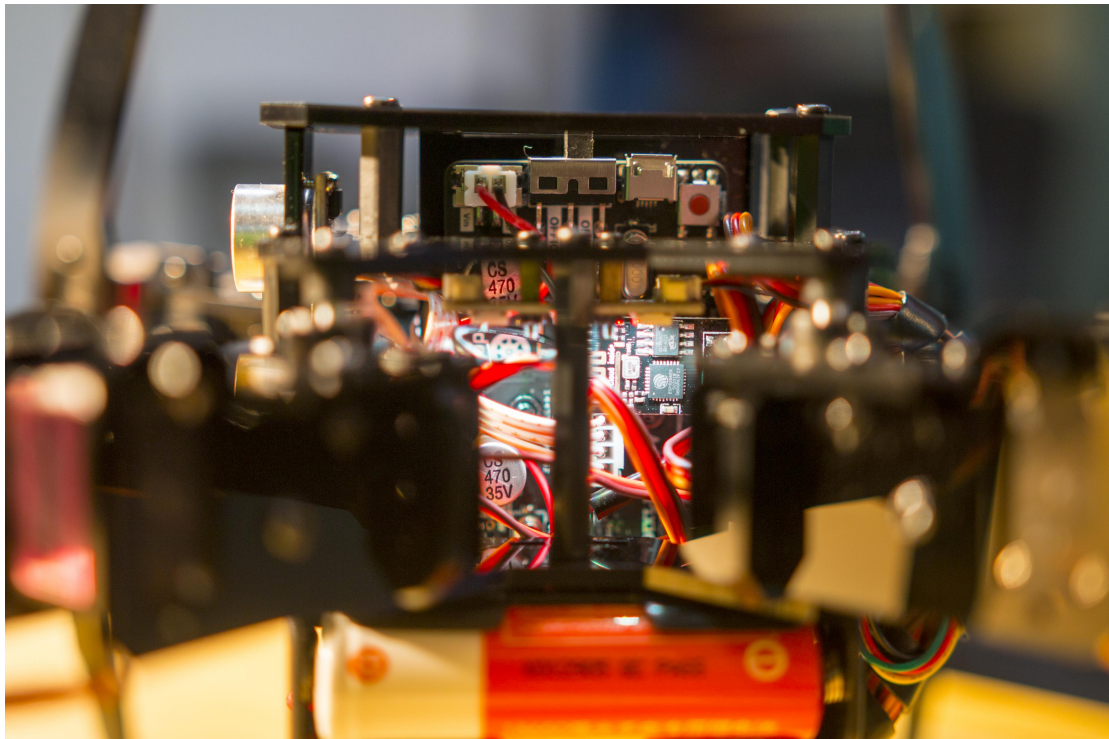


```
28 char angle_a;
29 char movespeed = 20;
30 int angle_judge = 5;
31 int anglerrange = 3;
32
33 char angle0 = 95;
34 char angle1 = 85;
35 char angle2 = 90;
36 char angle3 = 98;
37 char angle4 = 106;
38 char angle5 = 90;
39 char angle6 = 85;
40 char angle7 = 95;
41 char angle8 = 90;
42 char angle9 = 85;
43 char angle10 = 80;
44 char angle11 = 90;
45 char angle_judge_max = 5;
46 char angle_judge_min = -5;
47
48 #define PIN A1
49 #define led_numbers 6
50 #define TRIG_PIN A2
51 #define ECHO_PIN A3
52 Adafruit_NeoPixel strip = Adafruit_NeoPixel(led_numbers, PIN, NEO_GRB + NEO_KHZ800);
53 SR04 sr04 = SR04(ECHO_PIN, TRIG_PIN);
54
55
56 //Declaring some global variables
57 int gyro_x, gyro_y, gyro_z;
58 long acc_x, acc_y, acc_z, acc_total_vector;
59 int temperature;
60 long gyro_x_cal, gyro_y_cal, gyro_z_cal;
61 long loop_timer;
62 int led_loop_counter;
63 float angle_pitch, angle_roll, angle_yaw;
```

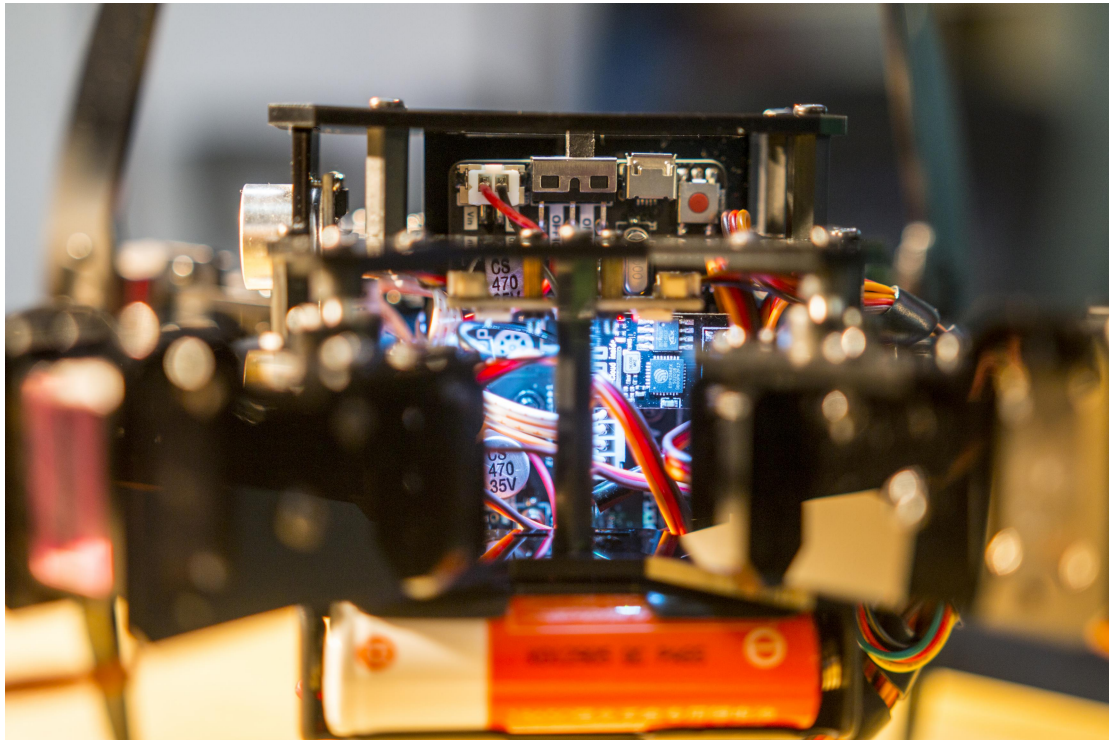
6. After uploading, turn off the power and switch to 1, and then turn it on.



Run the program: LED is yellow when turned on.



After the Wi-Fi and attitude sensor are debugged (about 30 second), LED changes to blue.



Now you can start to control the robot. (Note: After turning on the power, lay flat the robot when the LED does not turn to blue yet. Do not move the robot during the process because the attitude sensor is calibrating and reading the data.)

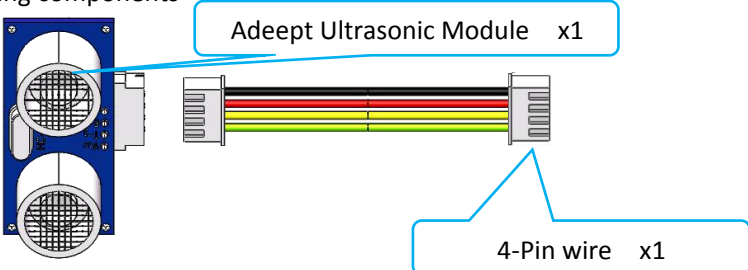
Install the servo: When the LED turns blue, install the servo (do not turn off the power).

3.Assembly

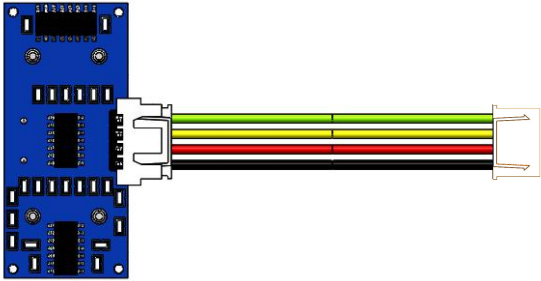
3.1.Preparations before Assembly

1.Connect the Adept Ultrasonic Module with 4-Pin wire.

Assemble the following components



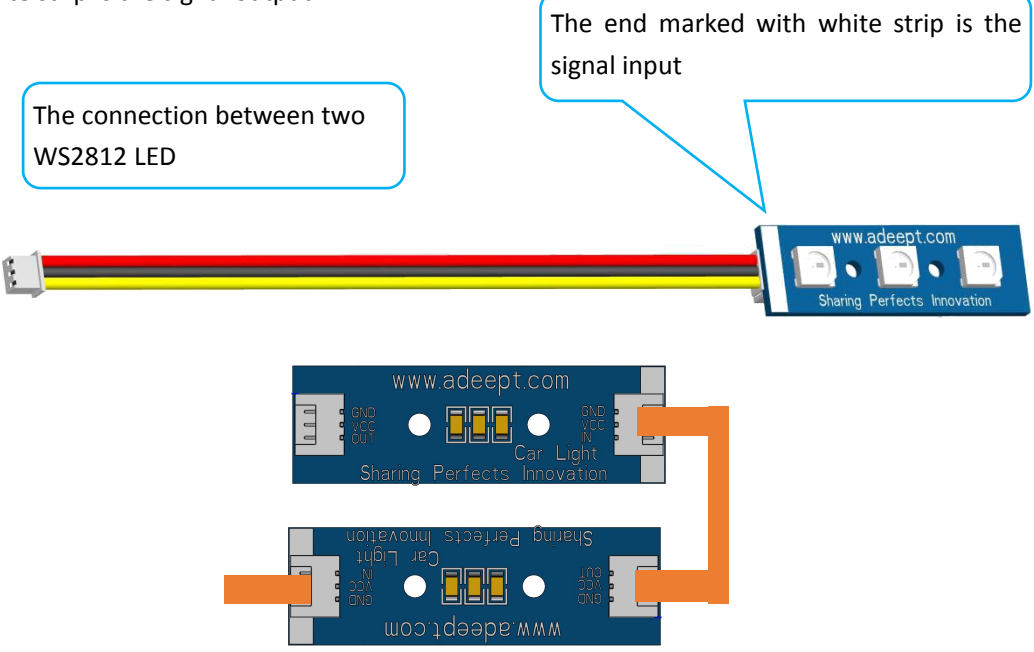
Effect diagram after assembling



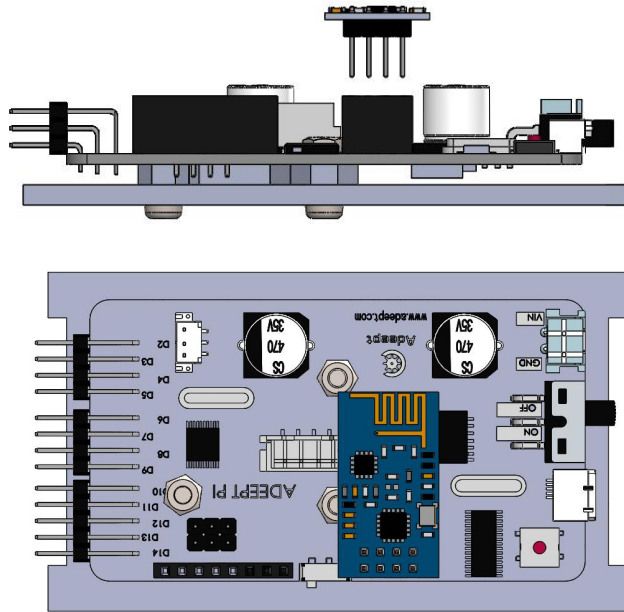
Connect the WS2812 LED Module
Please note that the end marked with white strip is the signal input, and the end without white strip is the signal output.

The connection between two WS2812 LED

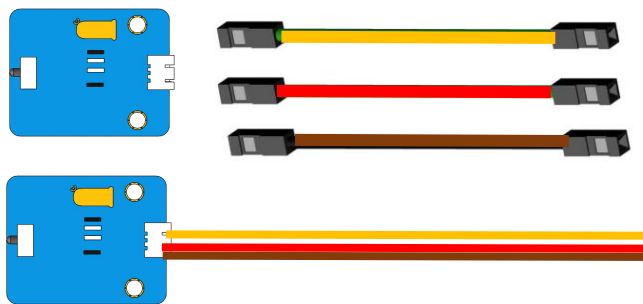
The end marked with white strip is the signal input



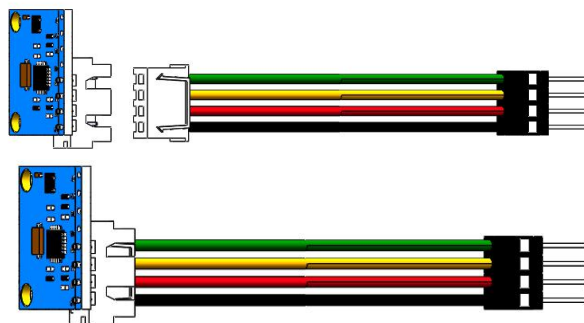
Connect Esp-8266 WiFi Module



Connect Female to Female Dupont Wire and IR Reciver x1

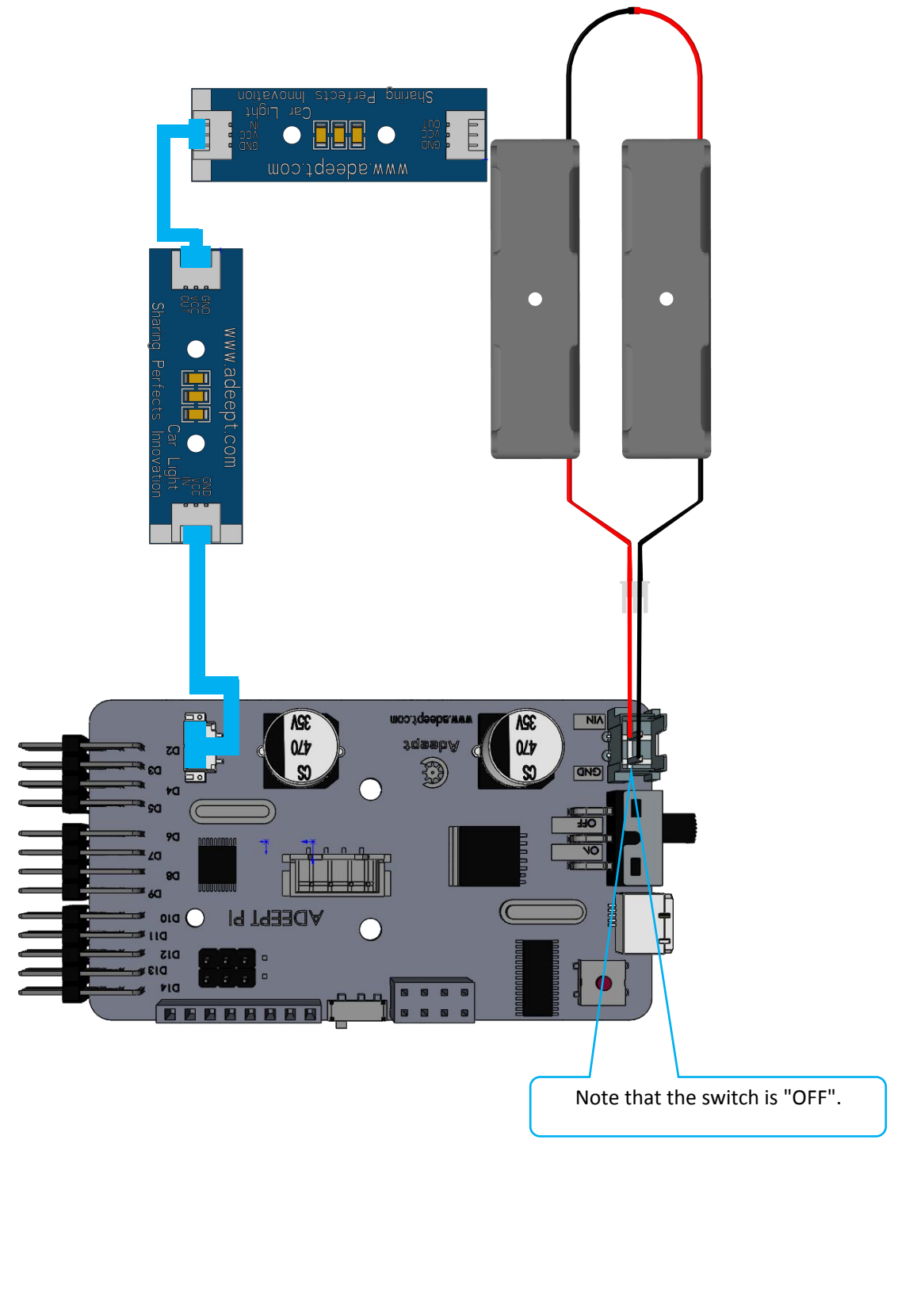


Connect 4PIN-2 and MPU-6050r x1



3.2. Servo debugging

Connect 18650 Battery Holder Set and Arduino HAT.



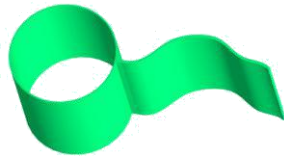
3.3 Install and Remove Batteries

1. Put two 18650 batteries in 18650 Battery Holder Set according to the following method.

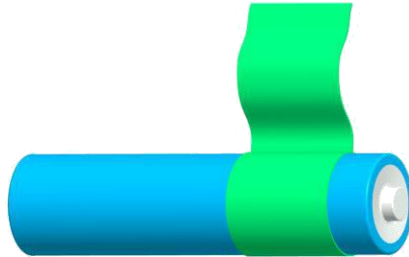
Take out 1 ribbons and 1 batteries.



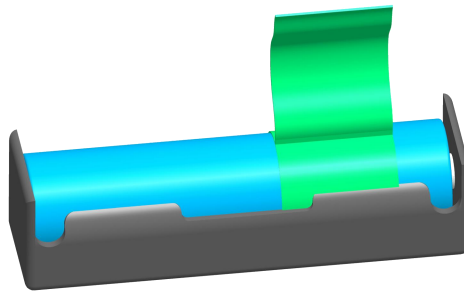
Roll one end of the ribbon to let through a battery and fix.



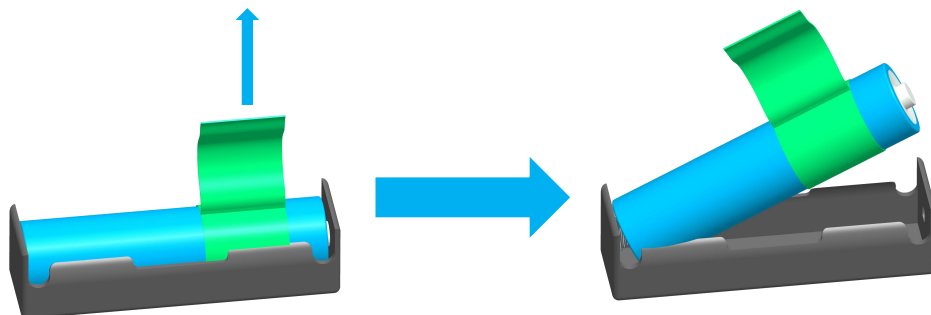
Insert the batteries into the rings - ribbon closer to the anode.



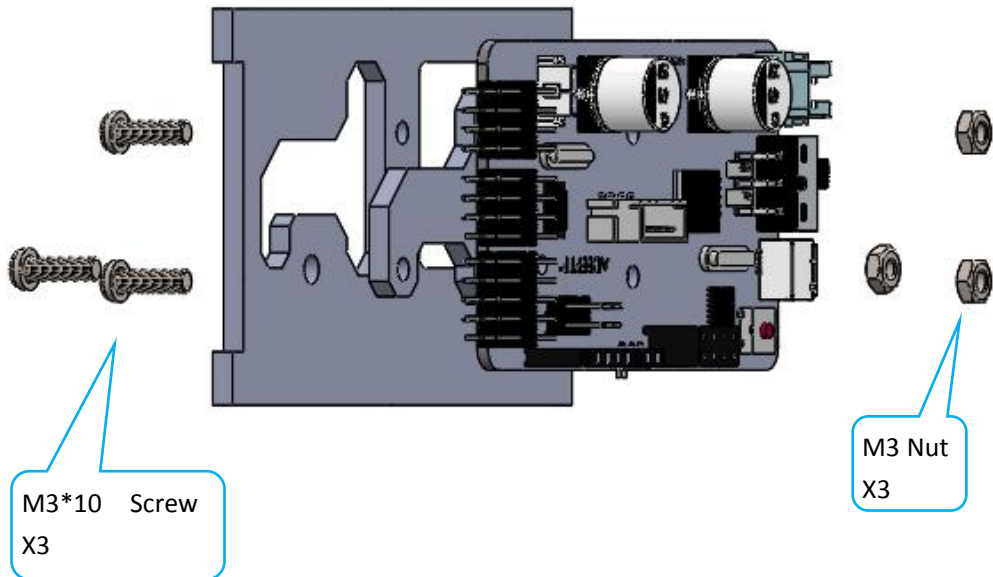
Install the batteries into the holder based on the pole.



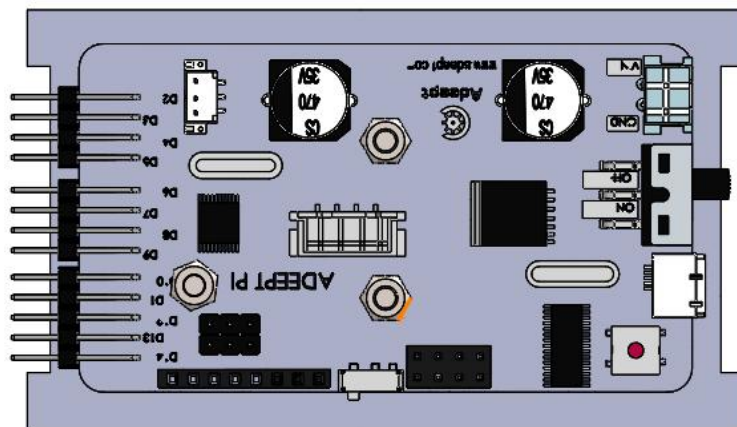
To remove the batteries, just pull the ribbon and take them out.



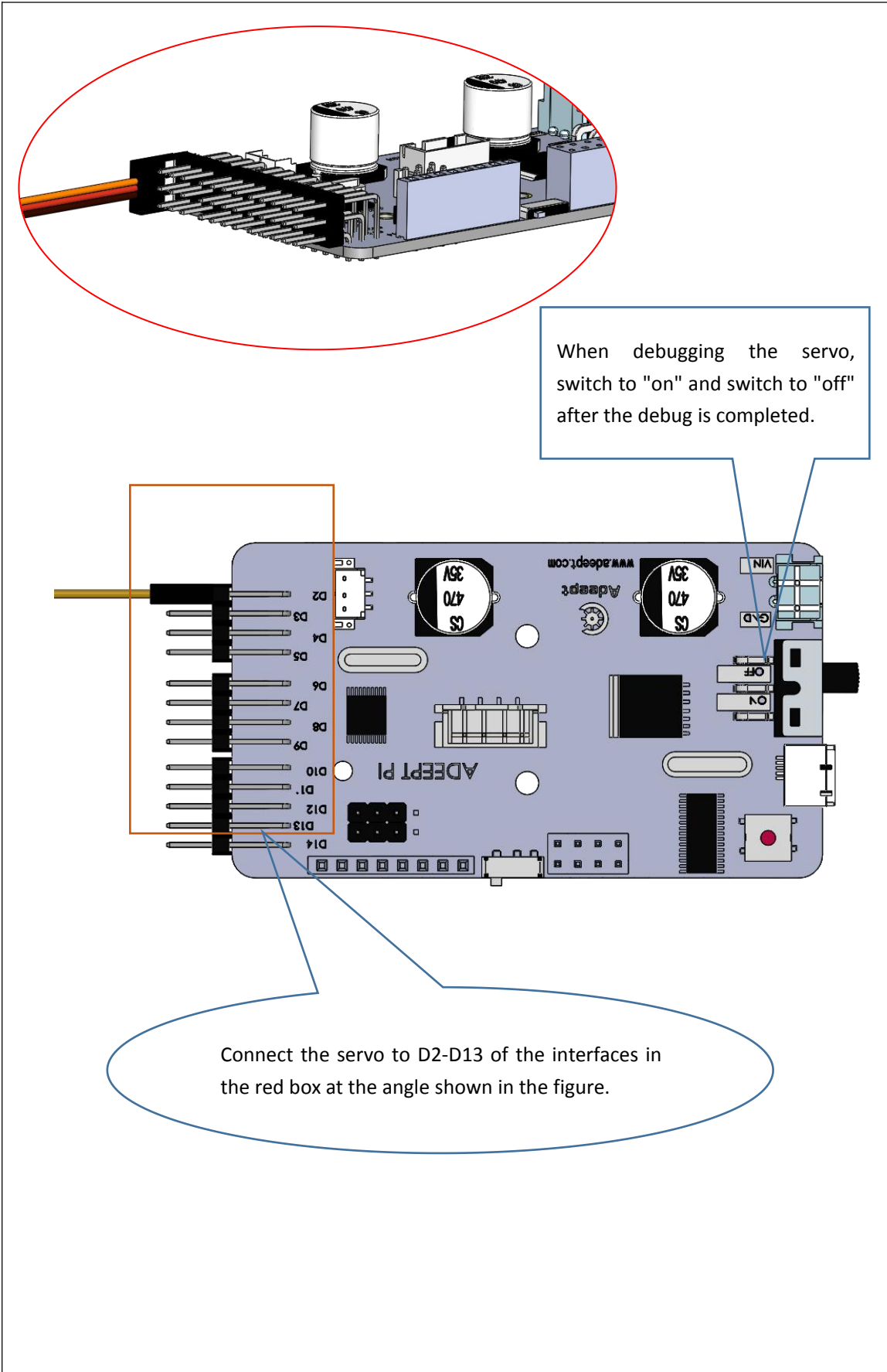
Assemble the following components.



Effect diagram after assembling.



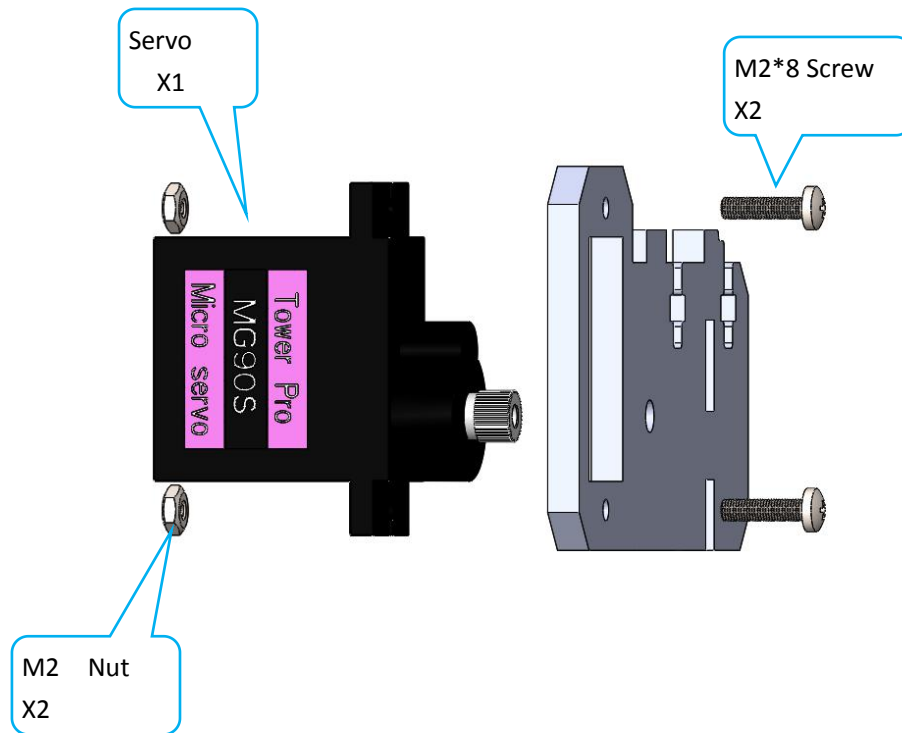
In the following installation process, it is required to connect the servos to the AdeptPixie. The AdeptPixie will automatically check the servo angle and rotate it to the appropriate position.



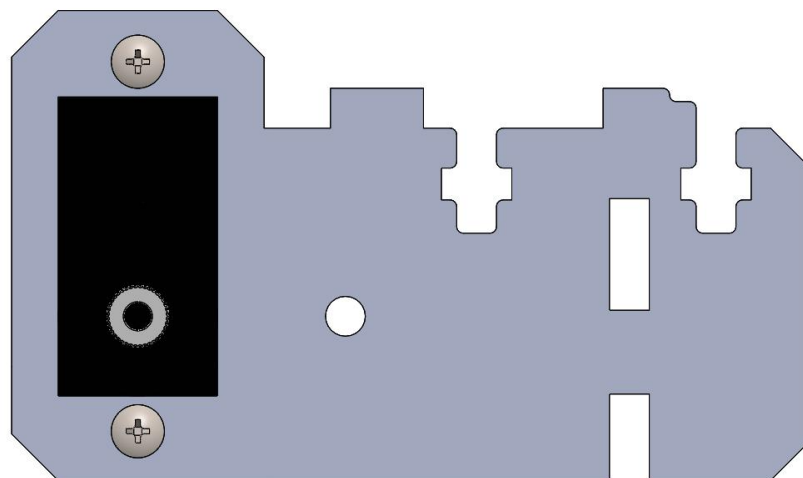
3.4 Assemble the legs

The following is the installation of one of the legs. For the other three legs, please refer to the following installation.

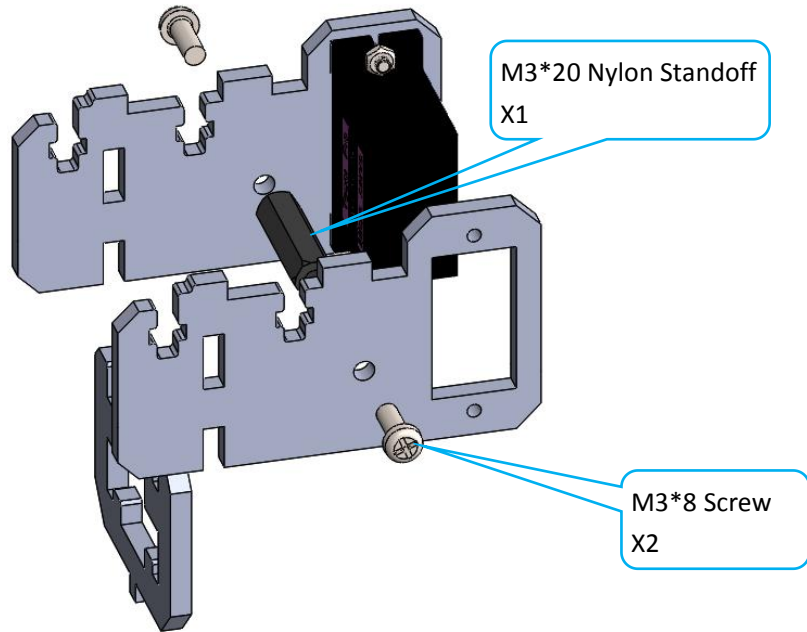
Assemble the following components.



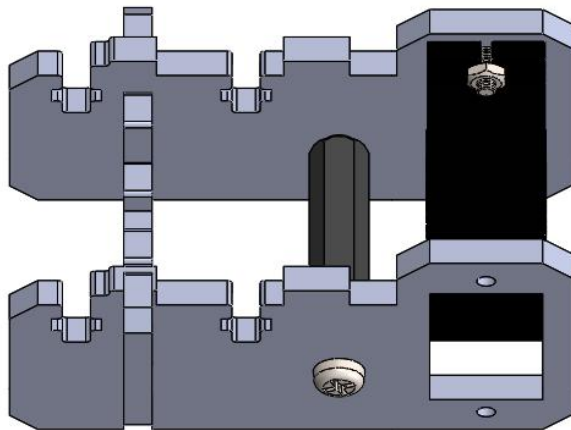
Effect diagram after assembling.



Assemble the following components.

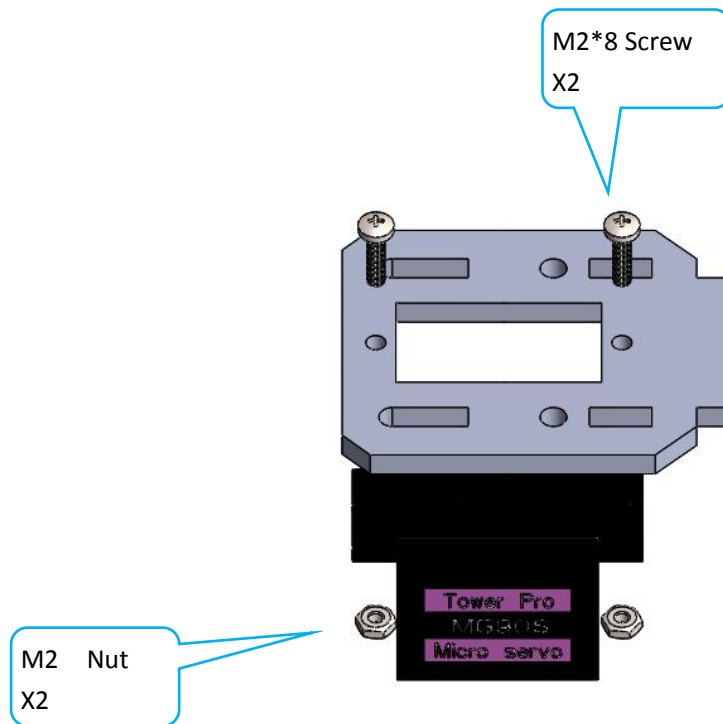


Effect diagram after assembling.



Assemble the servo.

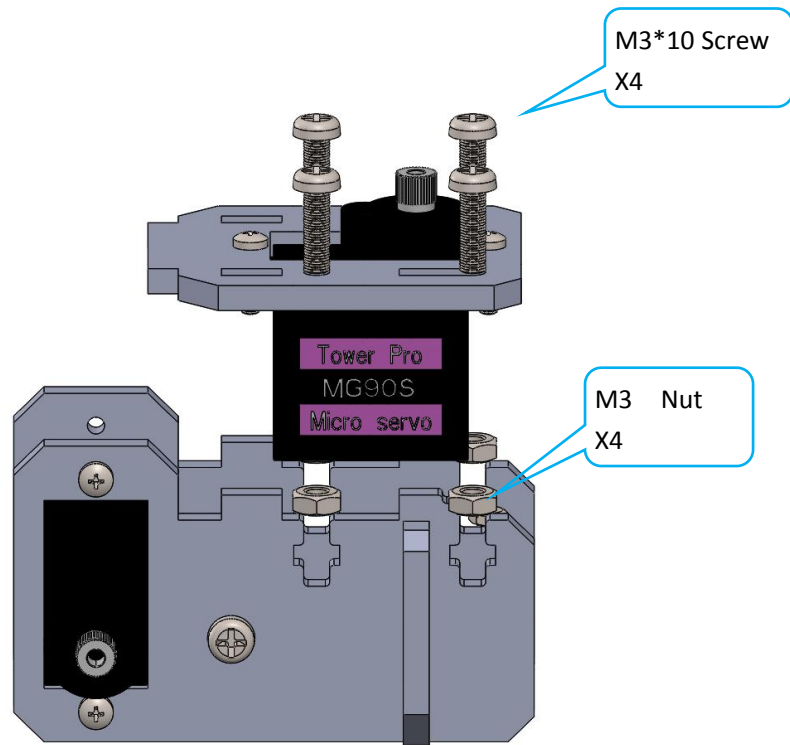
Assemble the following components.



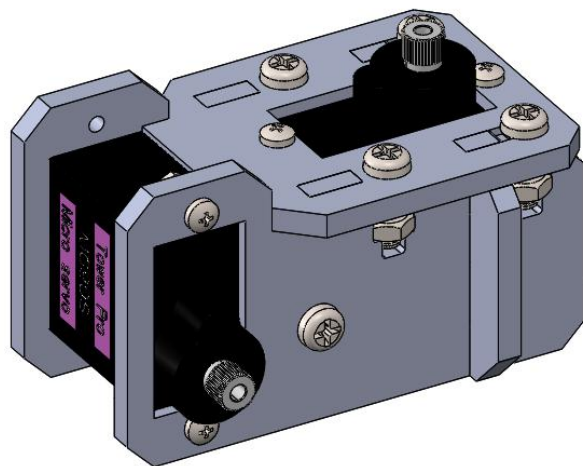
Effect diagram after assembling.



Assemble the following components.



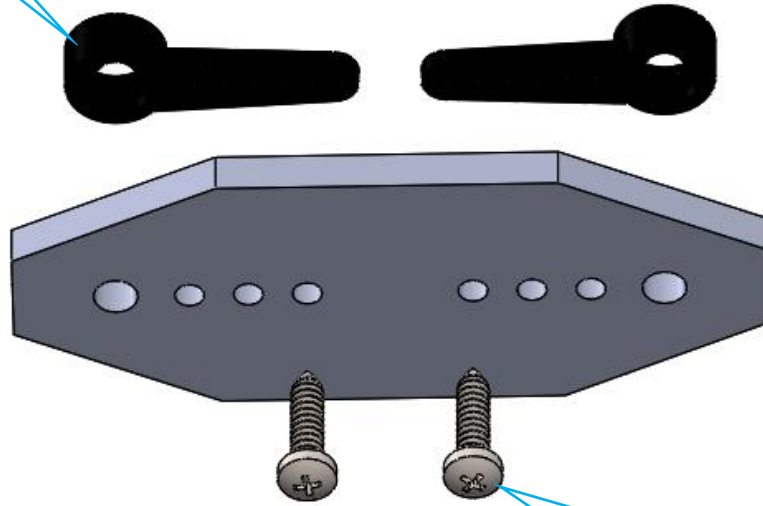
Effect diagram after assembling.



Assemble the rocker arm.

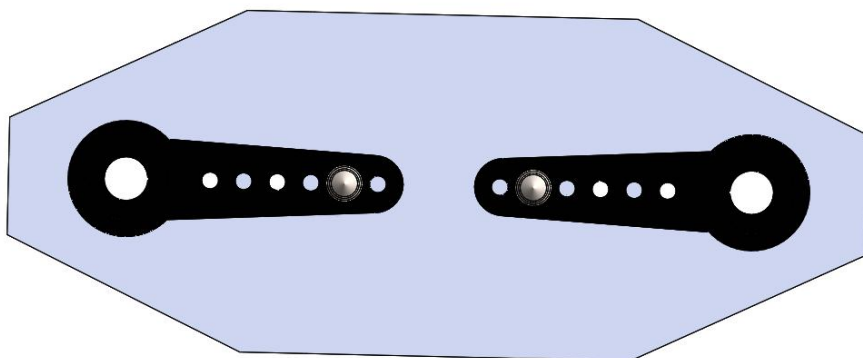
Assemble the following components.

Servo rocker
Arm X2

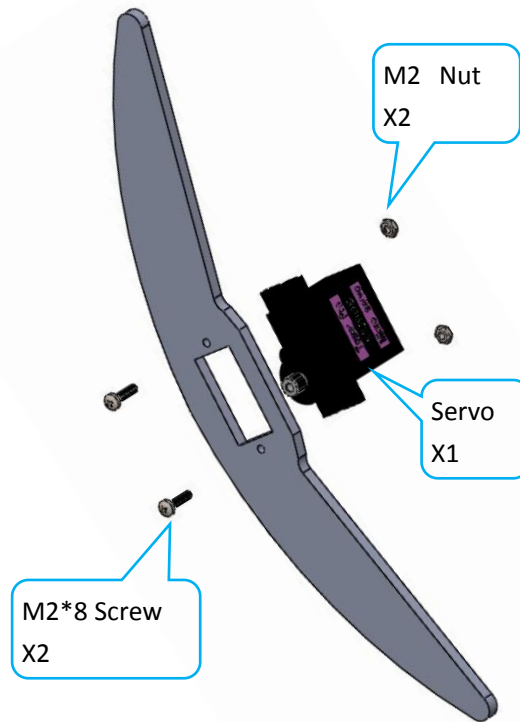


M1.7*6*6
self-tapping Screw
X2

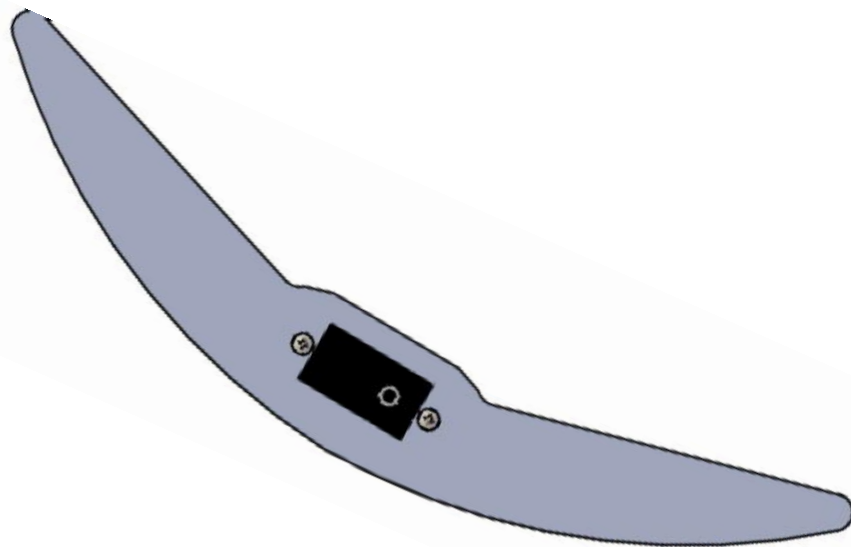
Effect diagram after assembling.



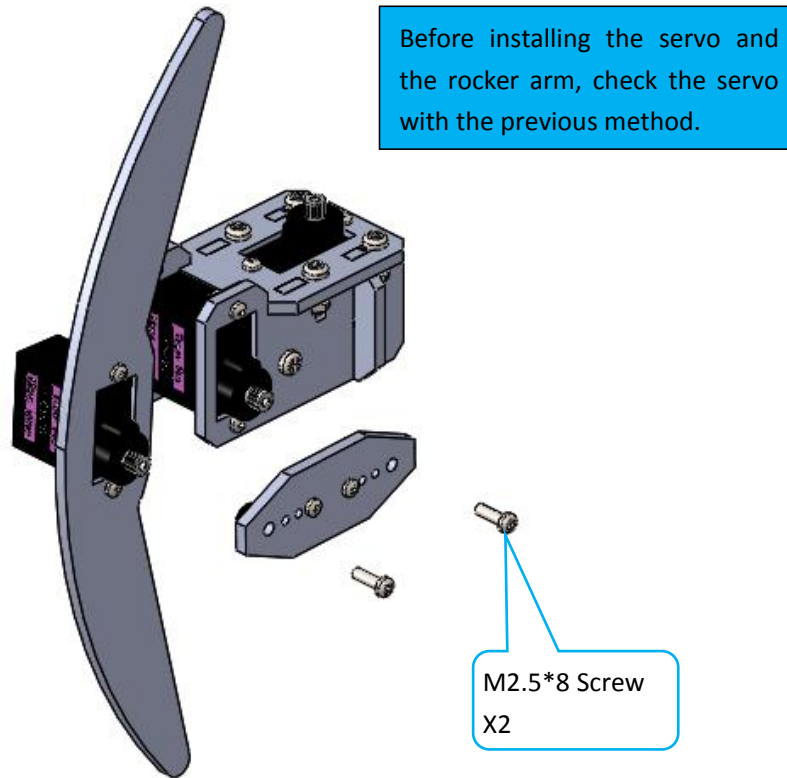
Assemble the following components.



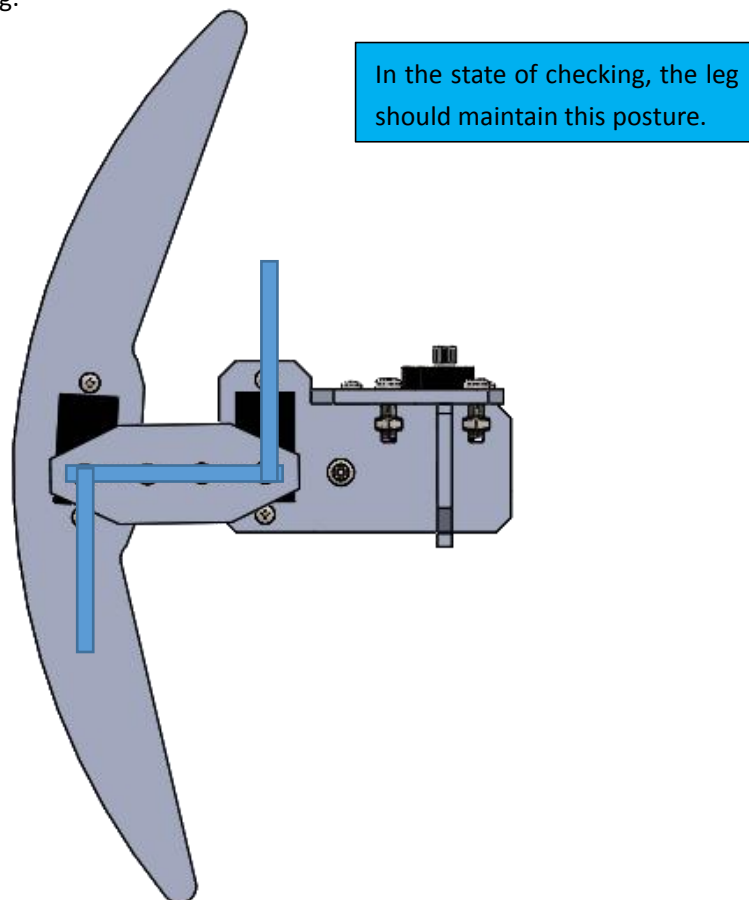
Effect diagram after assembling.



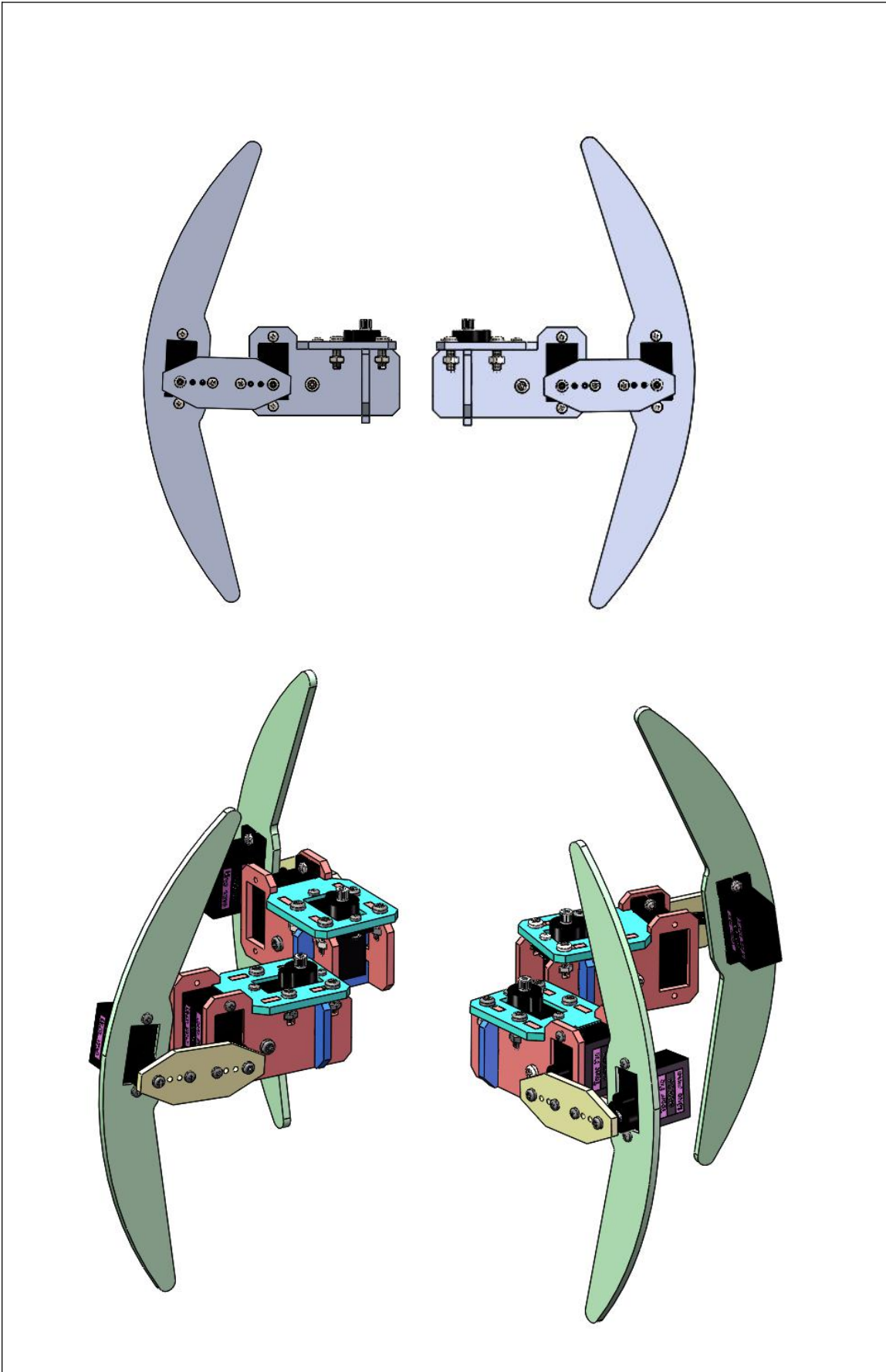
Assemble the following components.



Effect diagram after assembling.



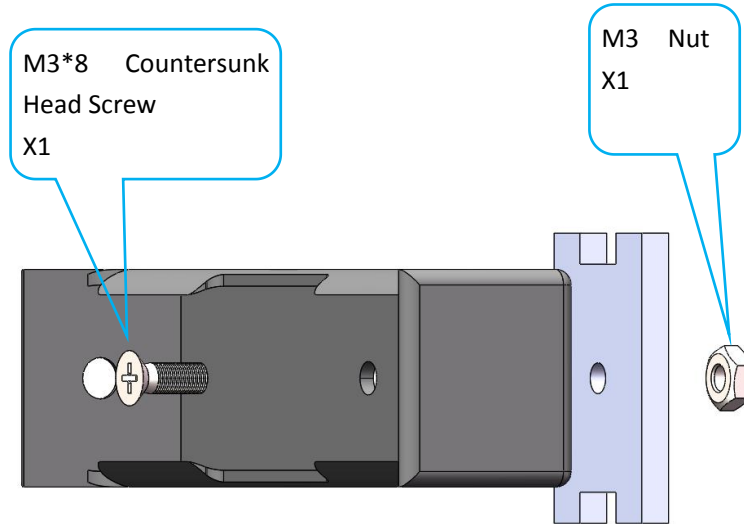
The above is the installation of the leg on one side of the robot. For the installation of the other side of the leg, refer to the picture below (the legs on both sides are symmetrical).



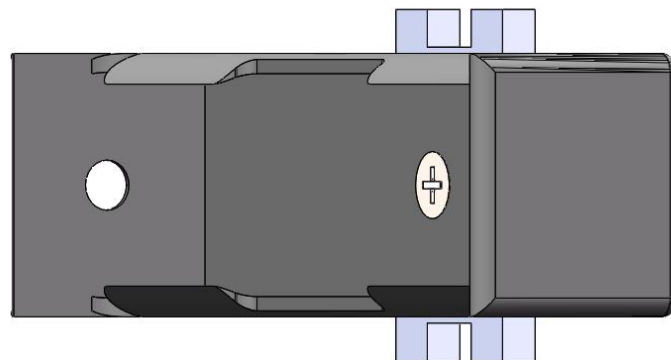
3.5 Assemble the other parts of the robot

1. Assemble the battery holder.

Assemble the following components.

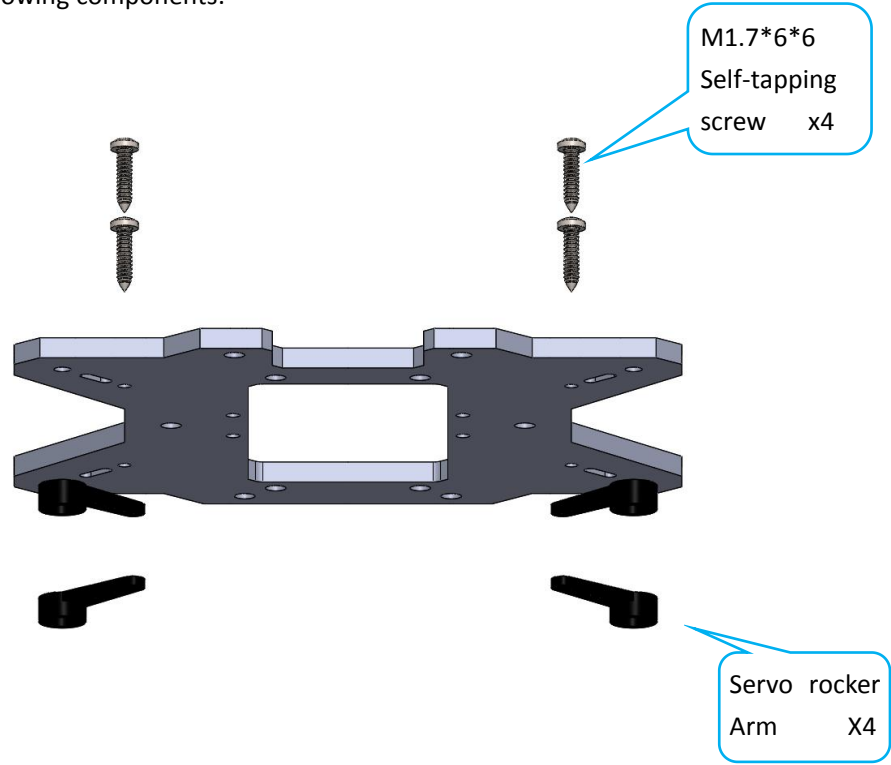


Effect diagram after assembling.

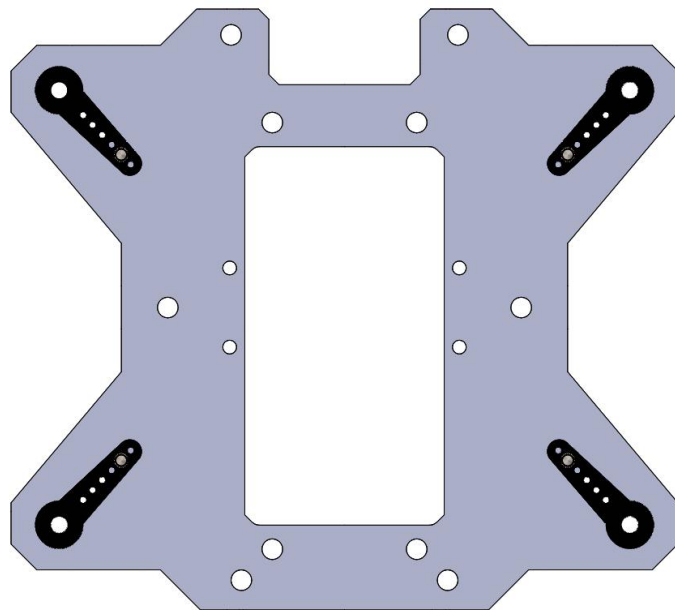


Install the rocker arm.

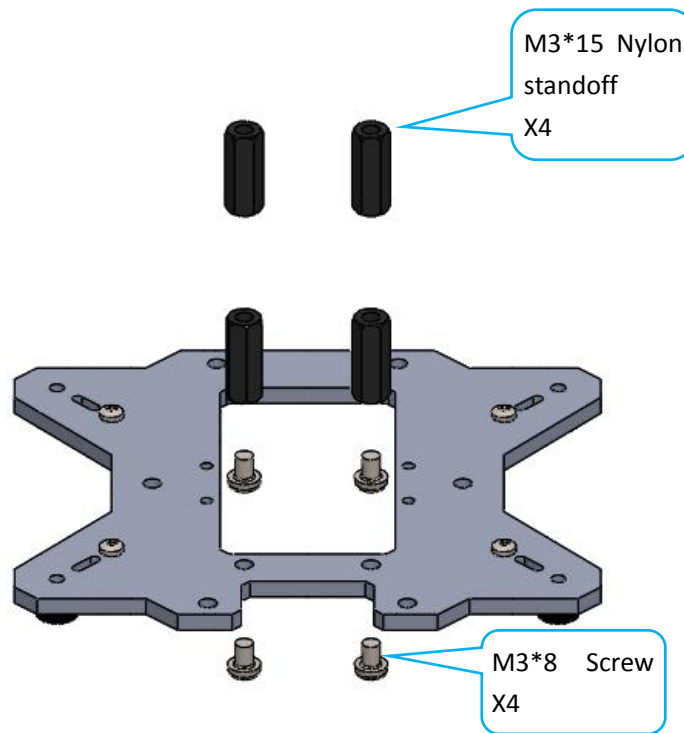
Assemble the following components.



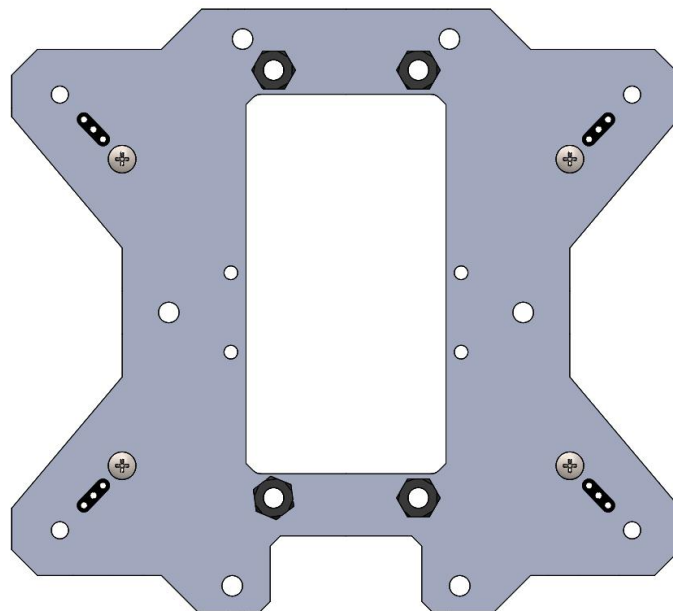
Effect diagram after assembling.



Assemble the following components.

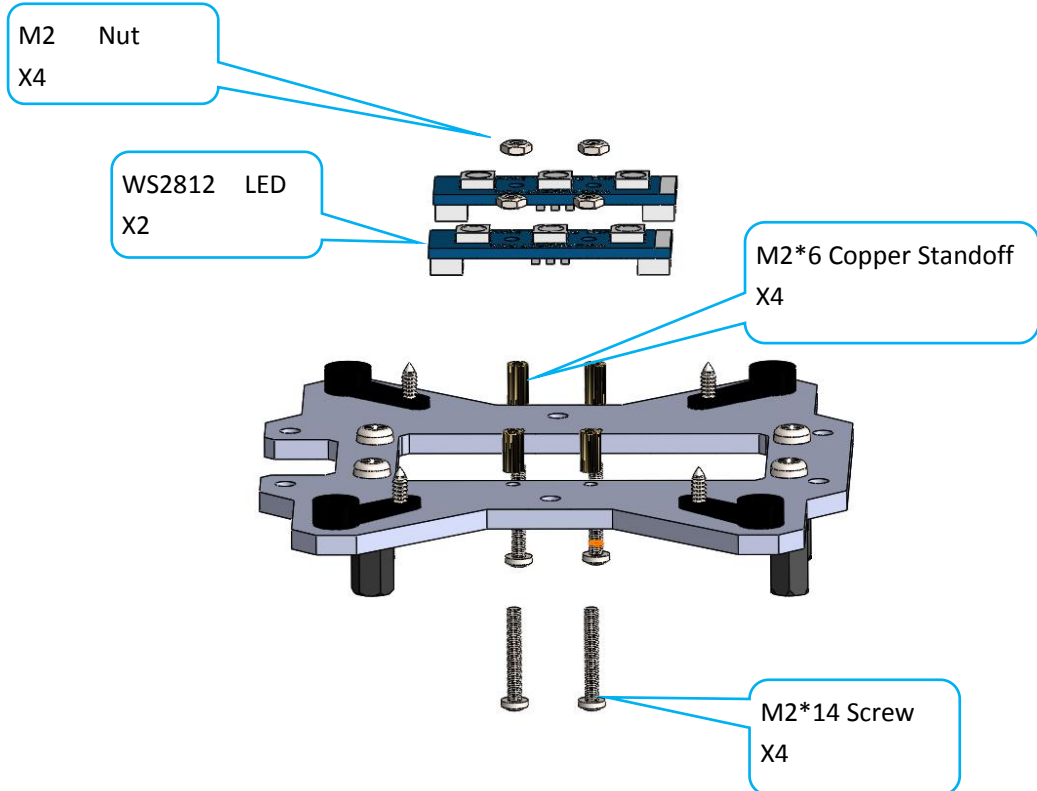


Effect diagram after assembling.

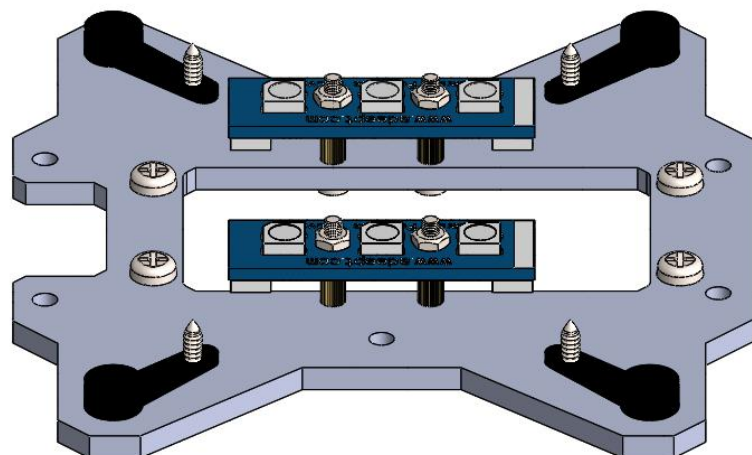


Install the lights.

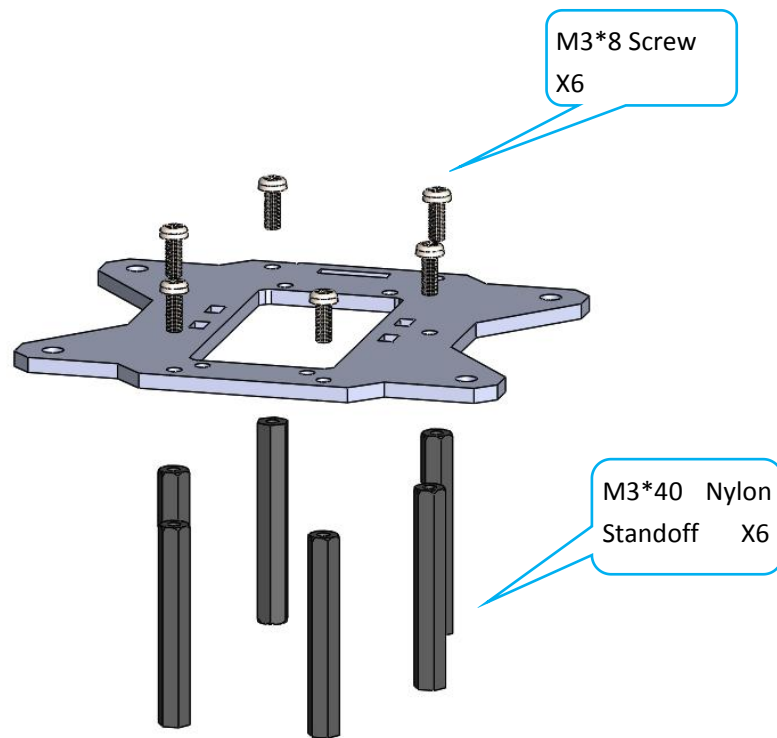
Assemble the following components.



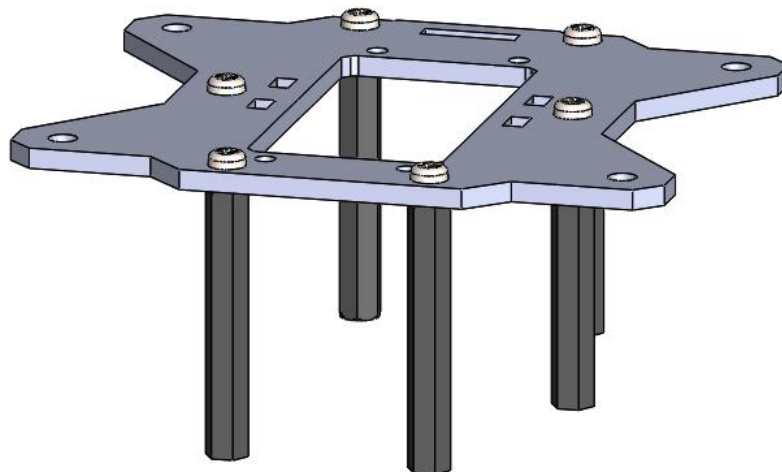
Effect diagram after assembling.



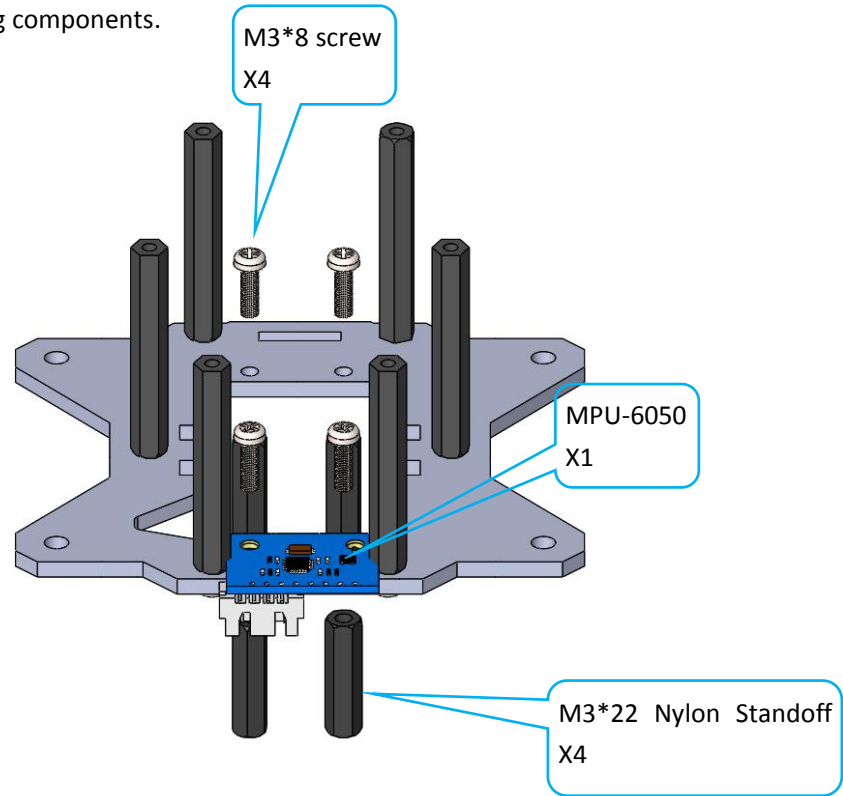
Assemble the following components.



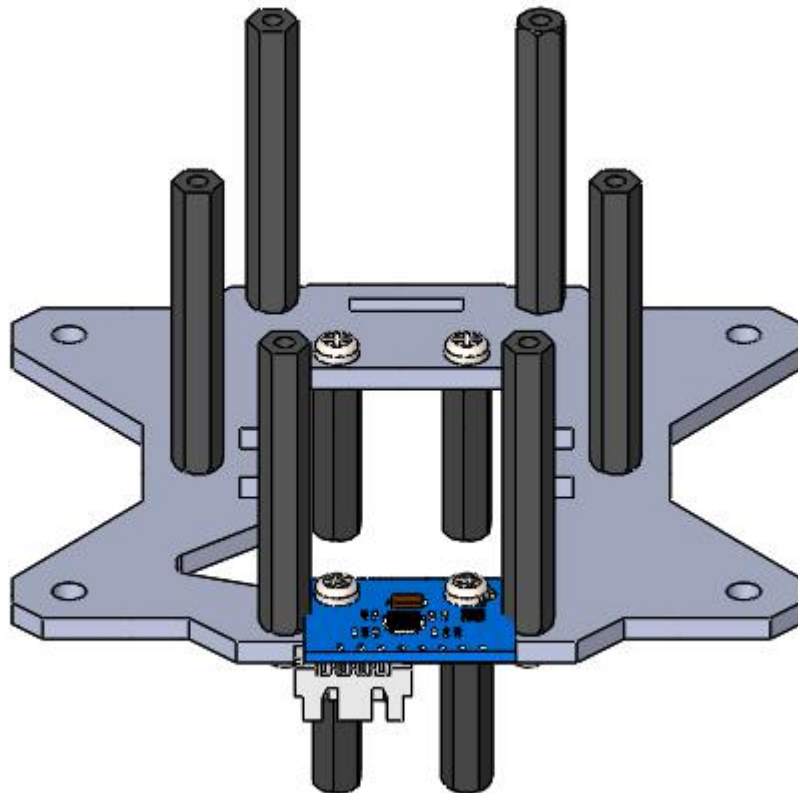
Effect diagram after assembling.



Assemble the following components.

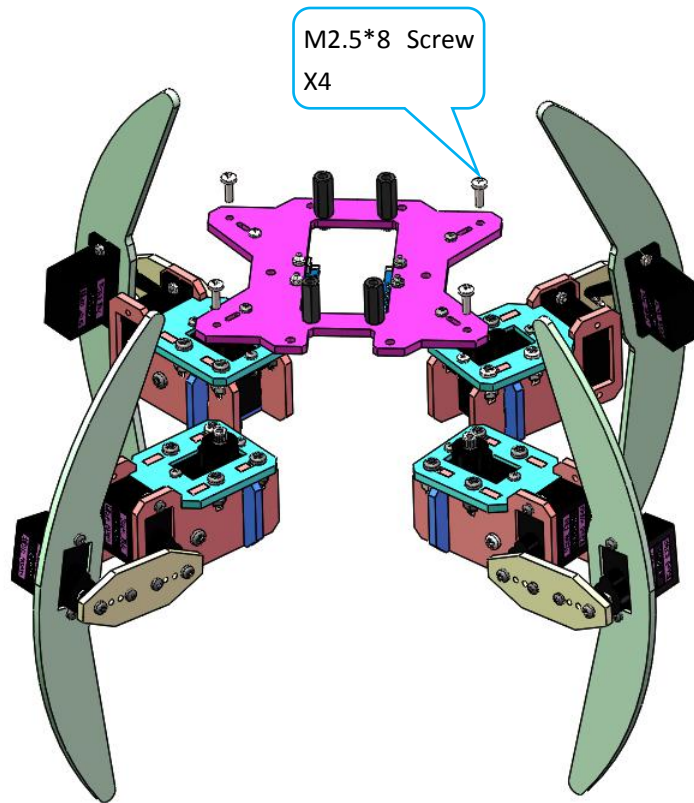


Effect diagram after assembling.



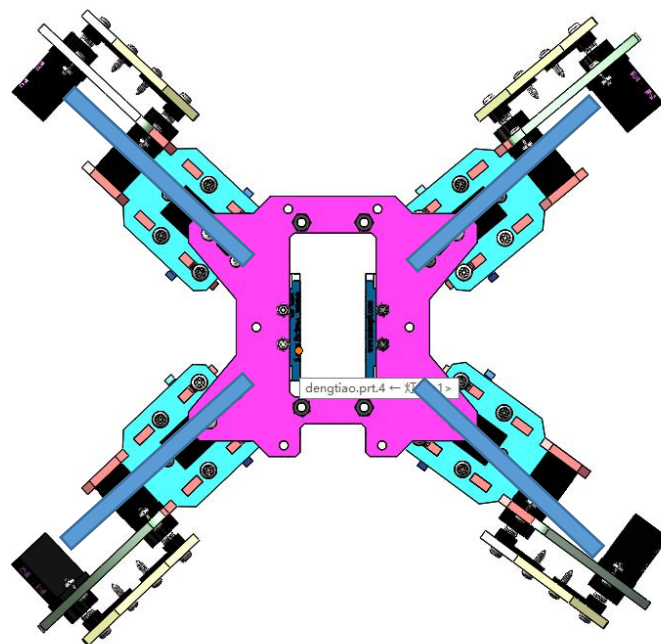
Assemble the legs with the acrylic plate with the rocker arm installed (the servo needs to be in the state of debugging)

Assemble the following components



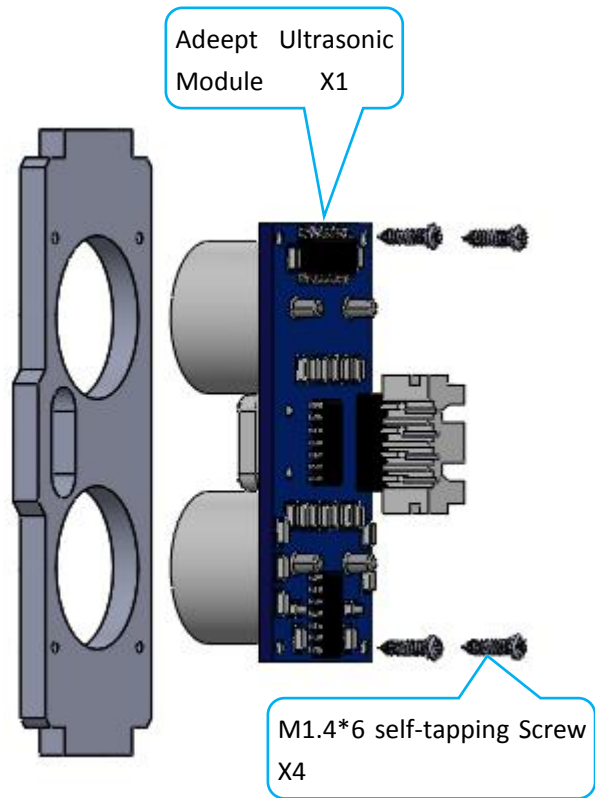
Effect diagram after assembling.

The posture when the servo is in the state of debugging.

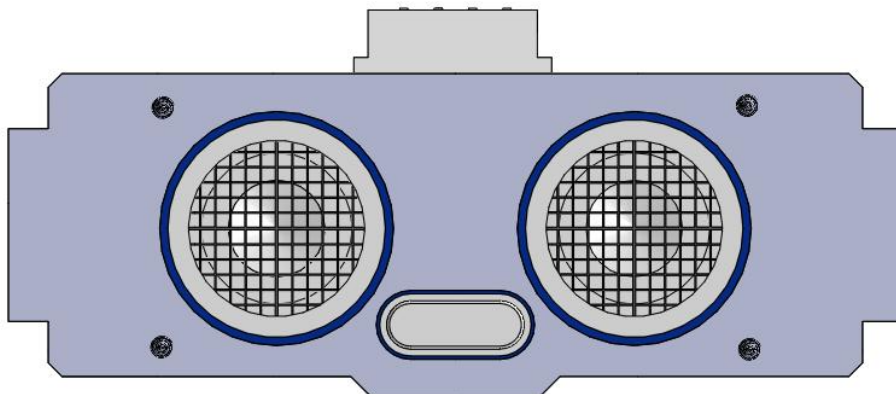


Assemble Adept Ultrasonic Module.

Assemble the following components.

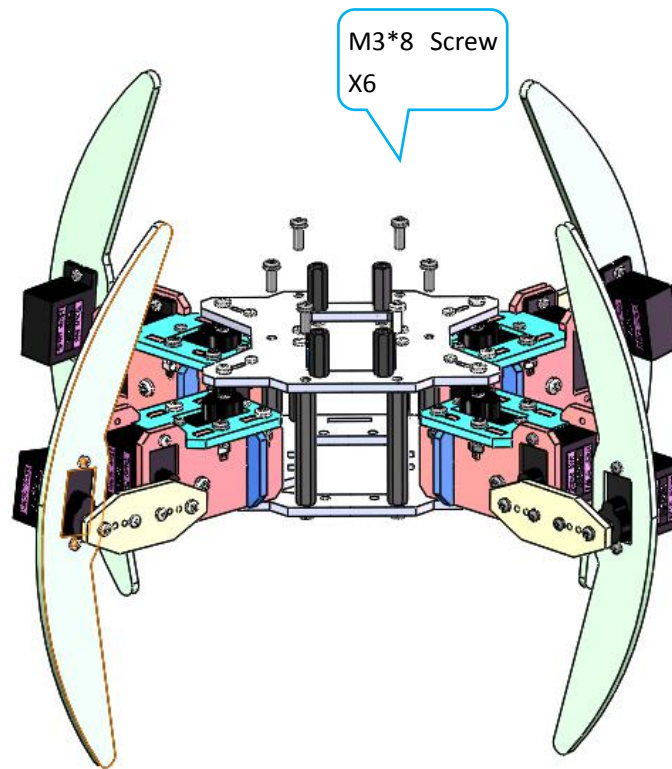


Effect diagram after assembling.

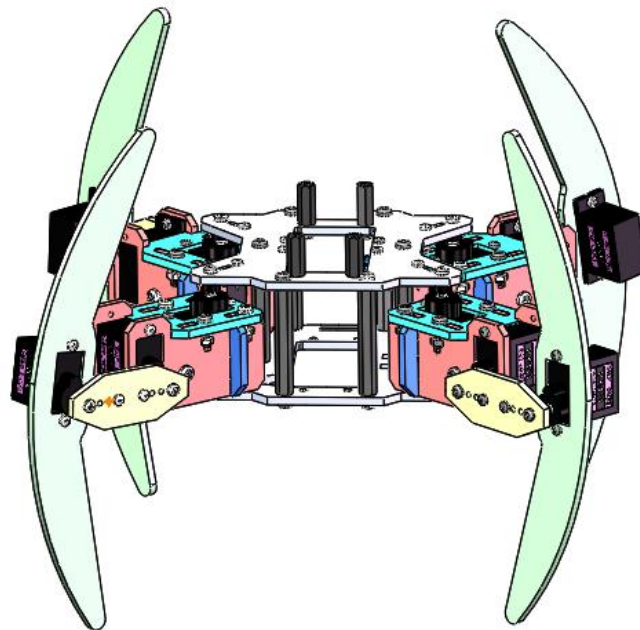


Assemble the whole part.

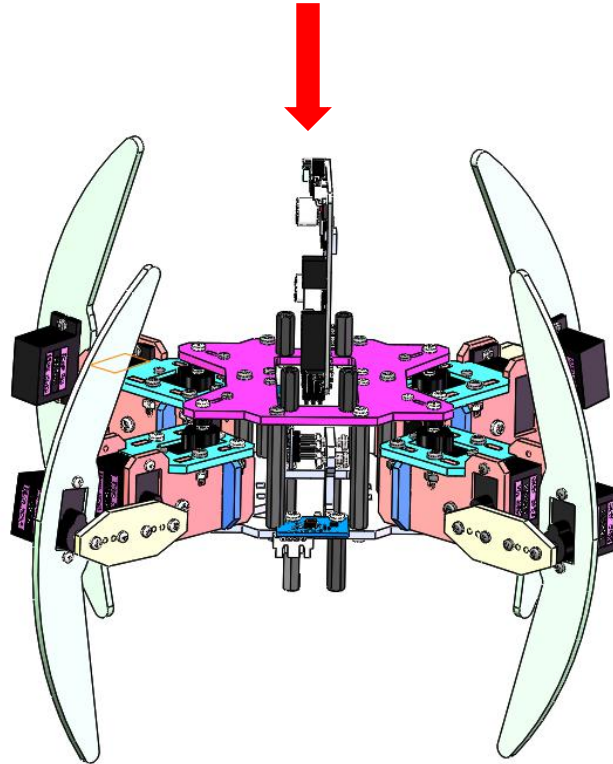
Assemble the following components.



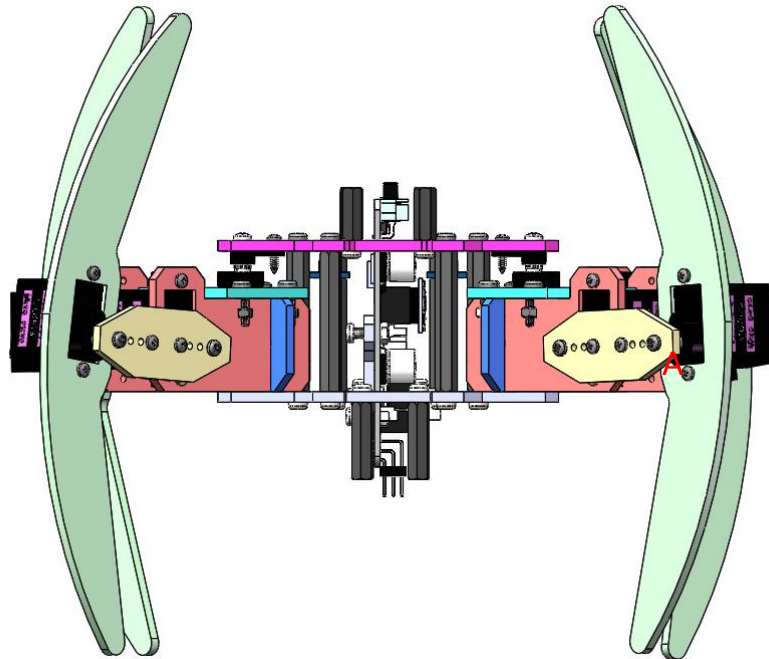
Effect diagram after assembling.



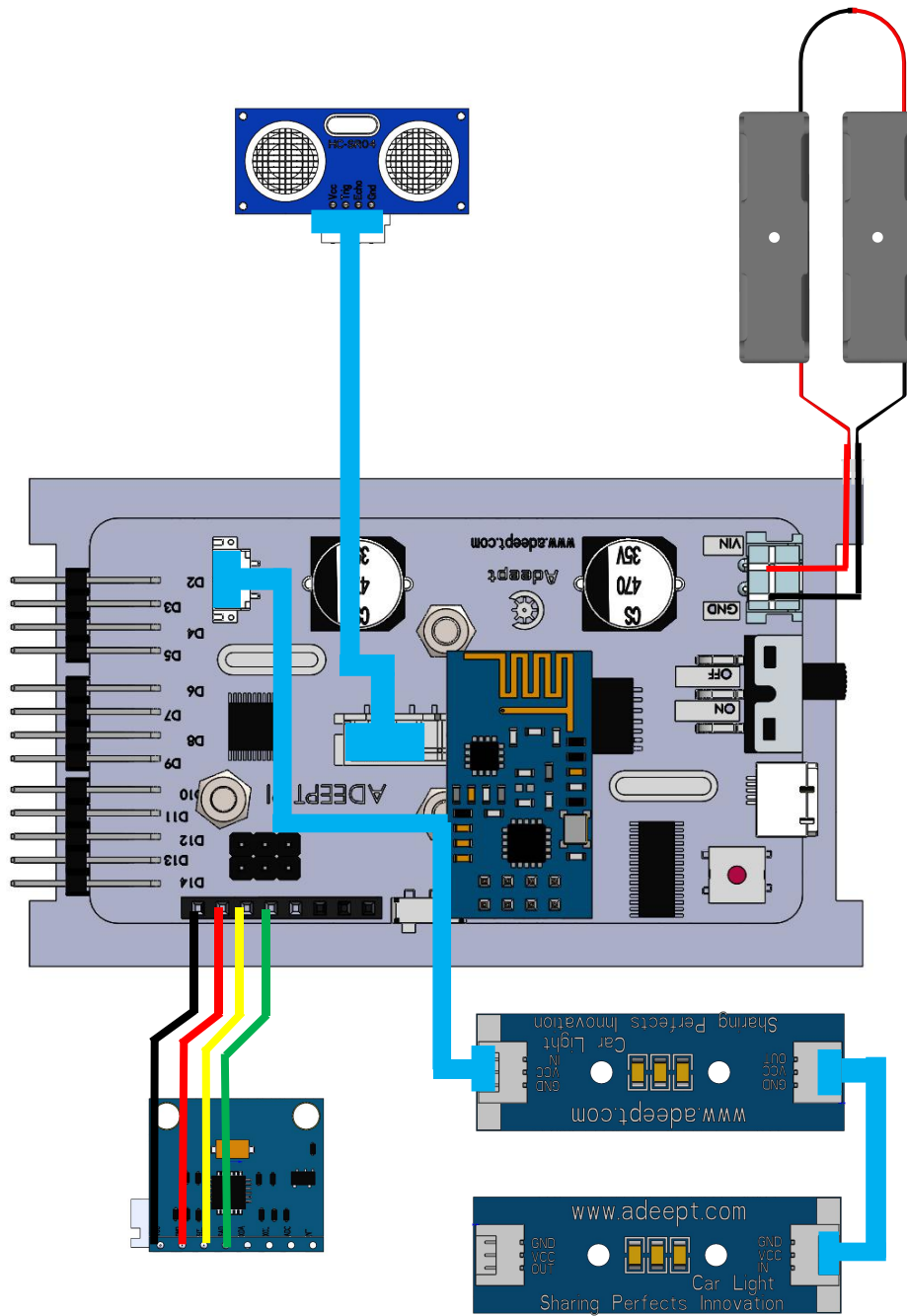
Assemble the following components.



Effect diagram after assembling.

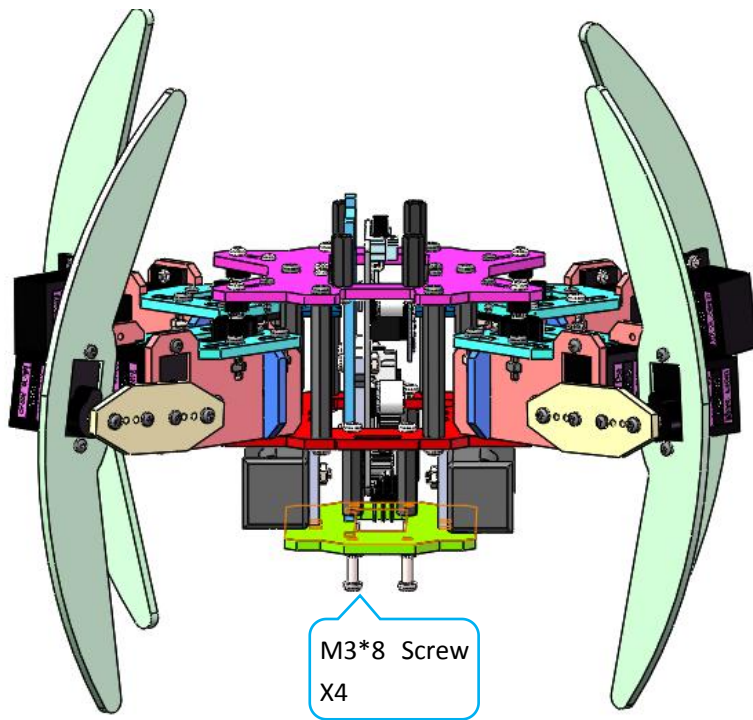


Connect the robot according to the diagram.

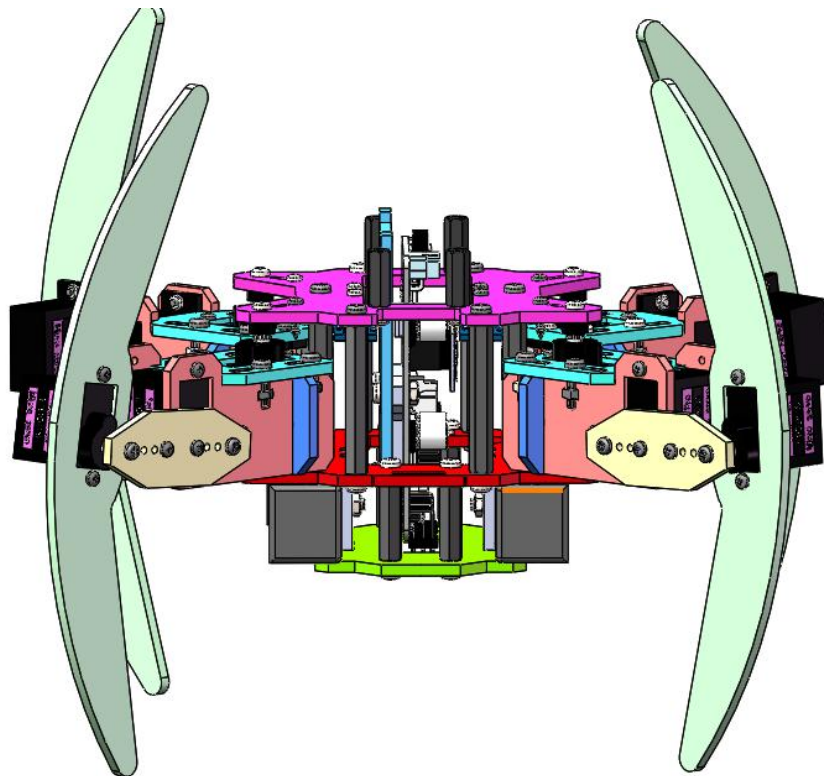


When connecting the MPU-6050 with 4-pin wire-2, please connect different interfaces of AdeptPixie according to the figure.

Assemble the following components.

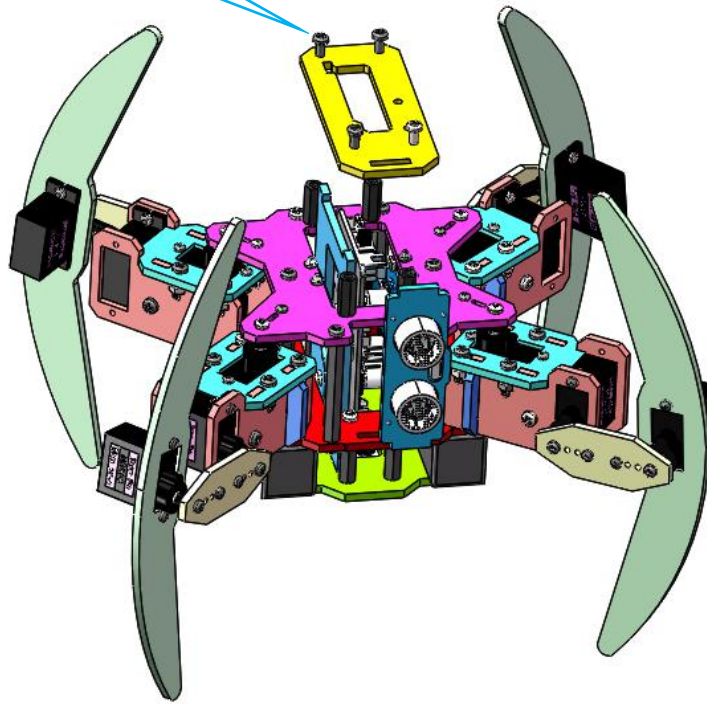


Effect diagram after assembling.

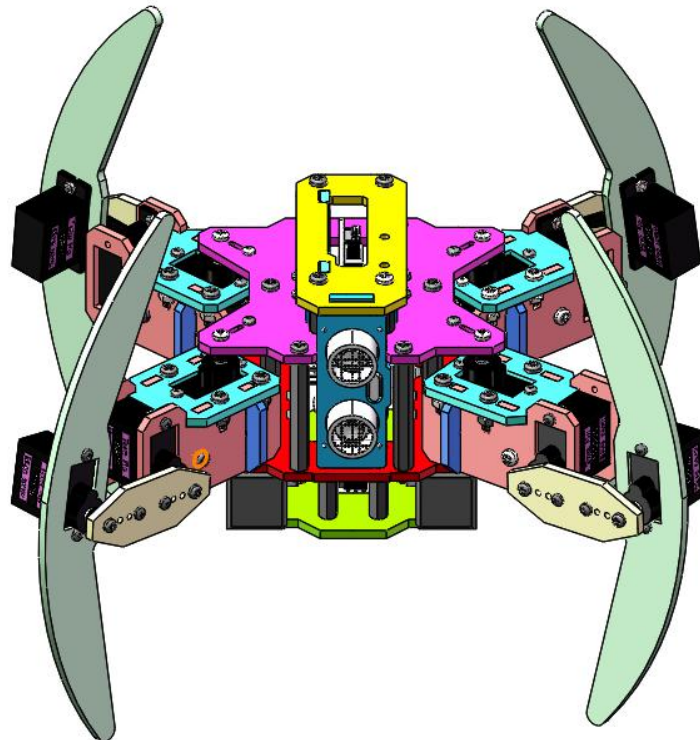


Assemble the following components.

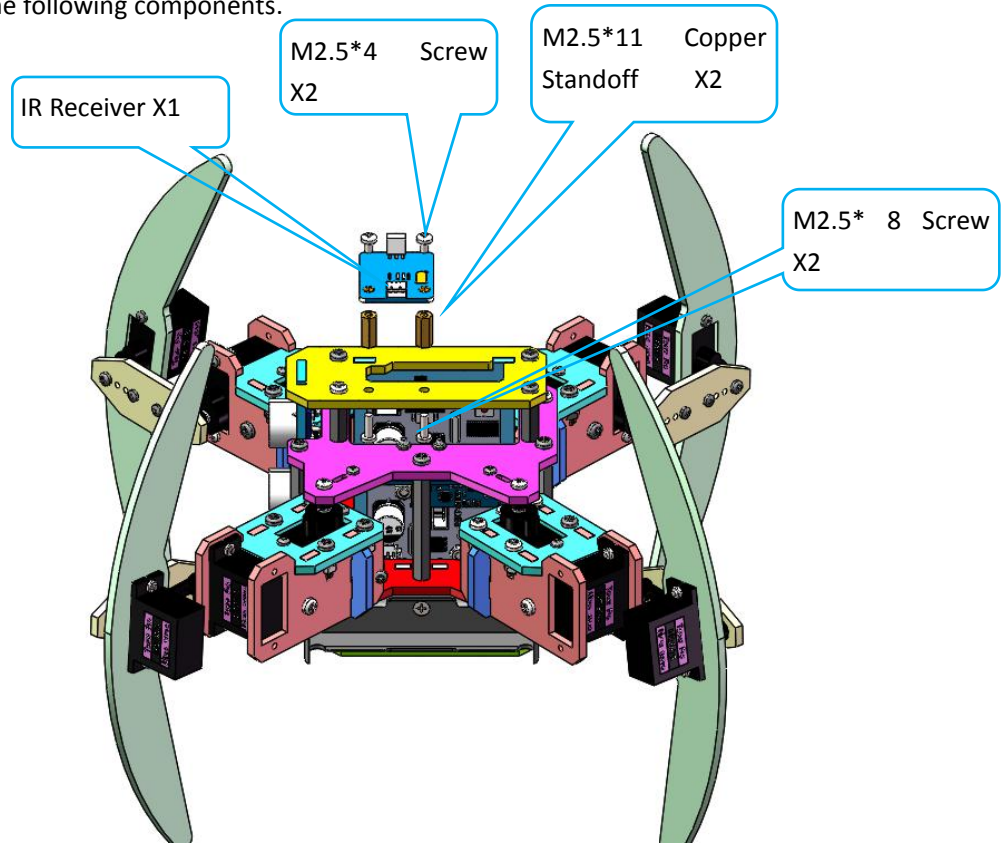
M3*8 Screw X4



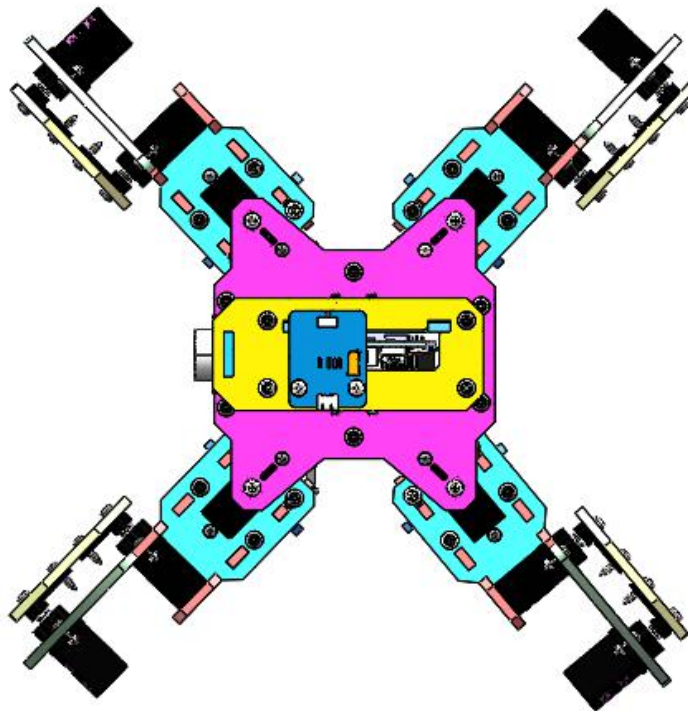
Effect diagram after assembling.

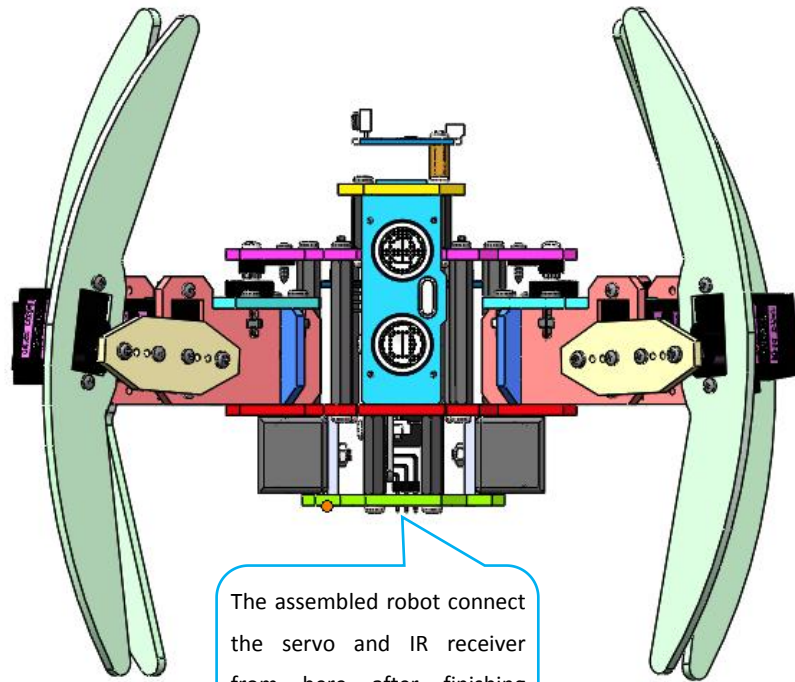


Assemble the following components.

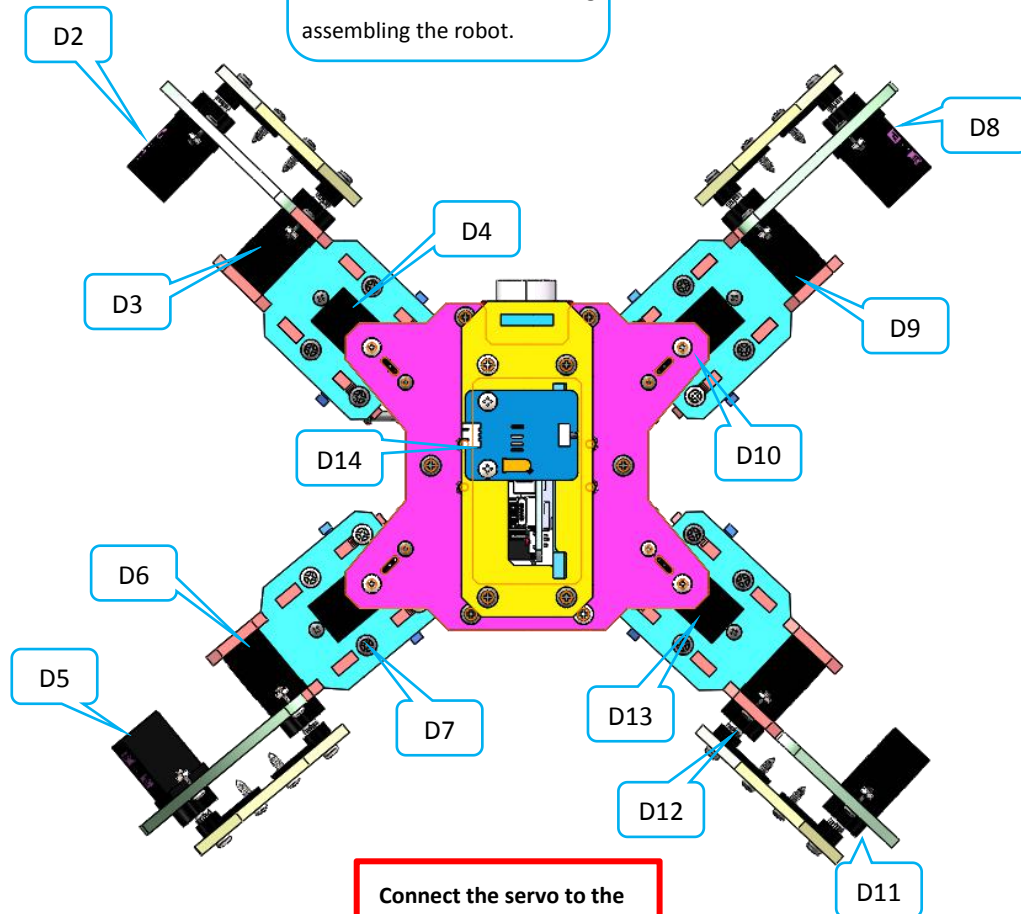


Effect diagram after assembling.

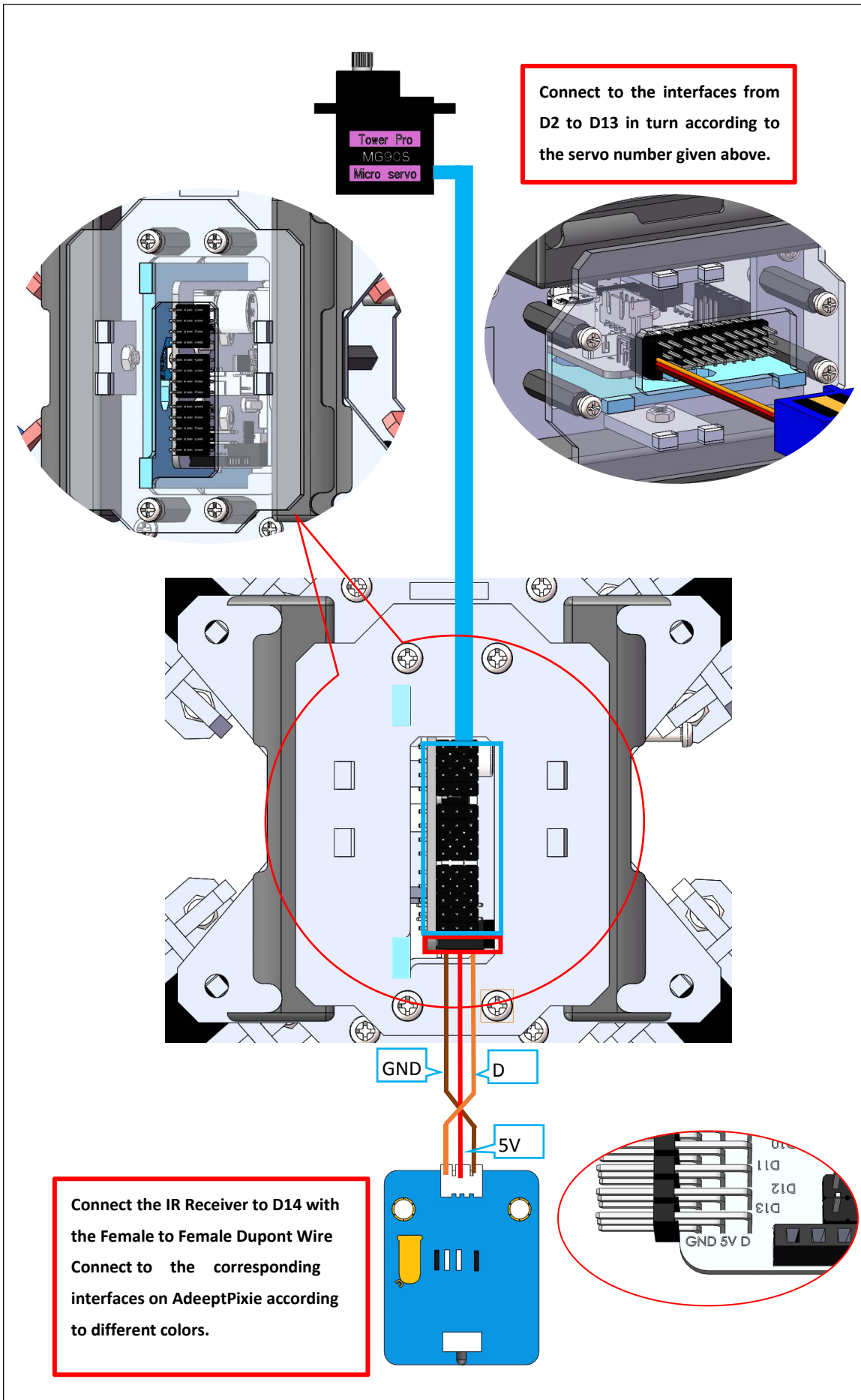




The assembled robot connect the servo and IR receiver from here after finishing assembling the robot.



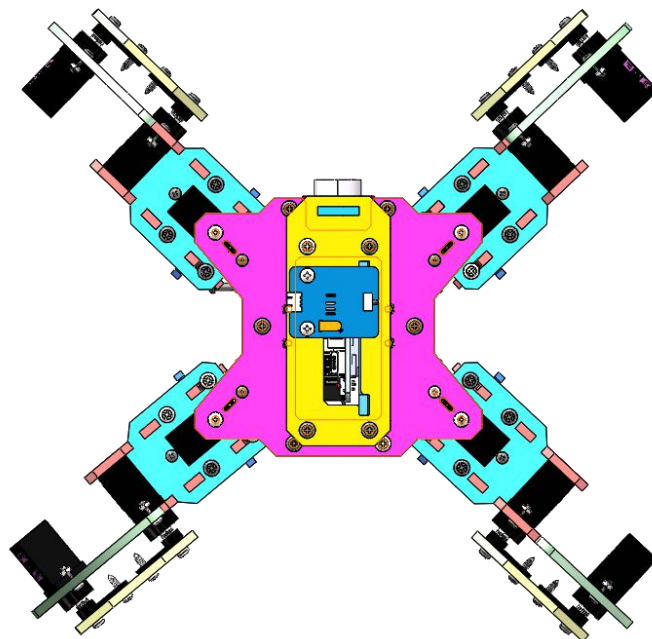
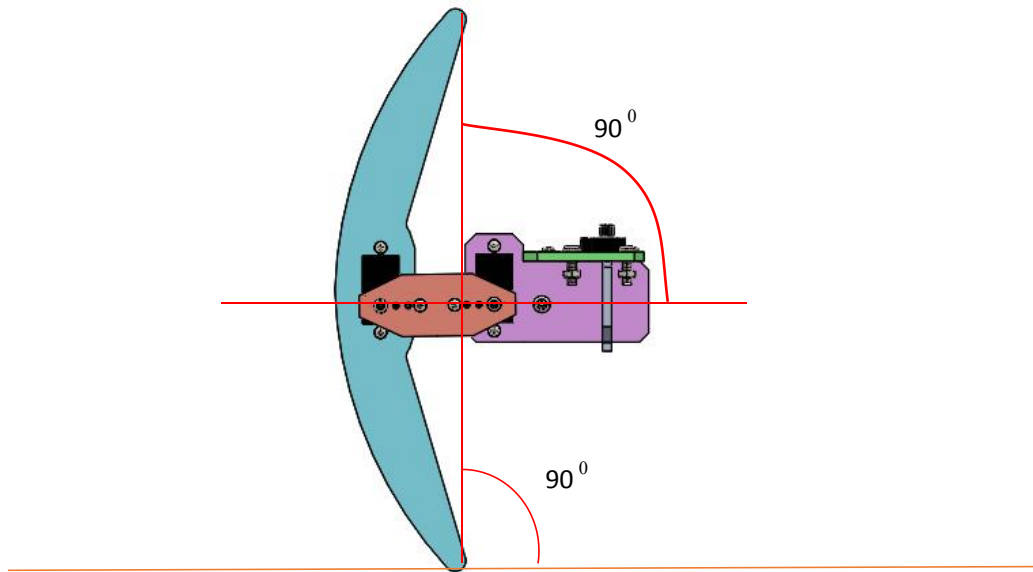
Connect the servo to the corresponding interface according to the numbers below.



4. Program debugging

After the assembly is completed, the error of the servo itself will cause an angle deviation of the robot's foot. At this time, each leg of the robot needs to be adjusted to the correct angle as shown in the following figure by modifying the program.

Only then the robot can work normally. Refer to the following link for video tutorial: <https://www.adept.com/video/detail-68.html>

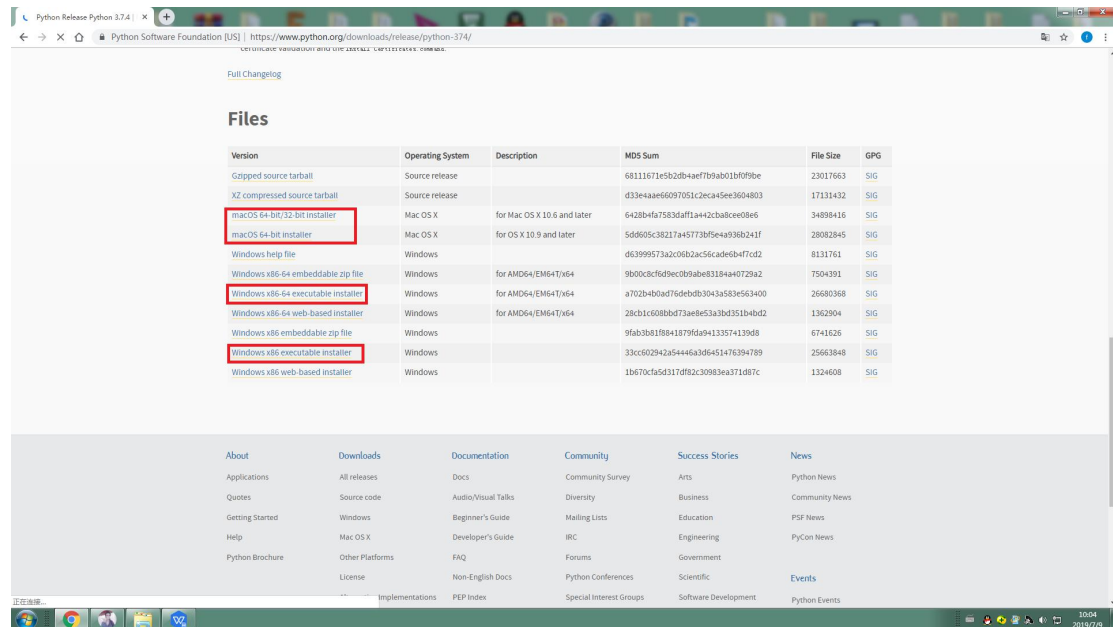
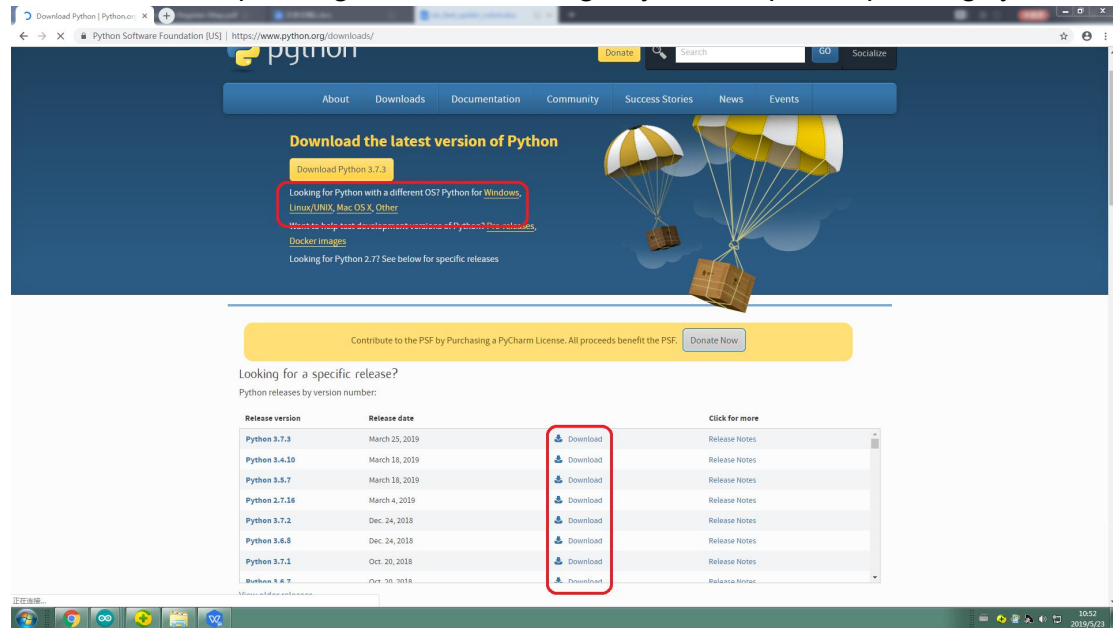


5. Install the upper computer control software Python

5.1. Download software

1. Open the URL in your browser: <https://www.python.org/downloads/>

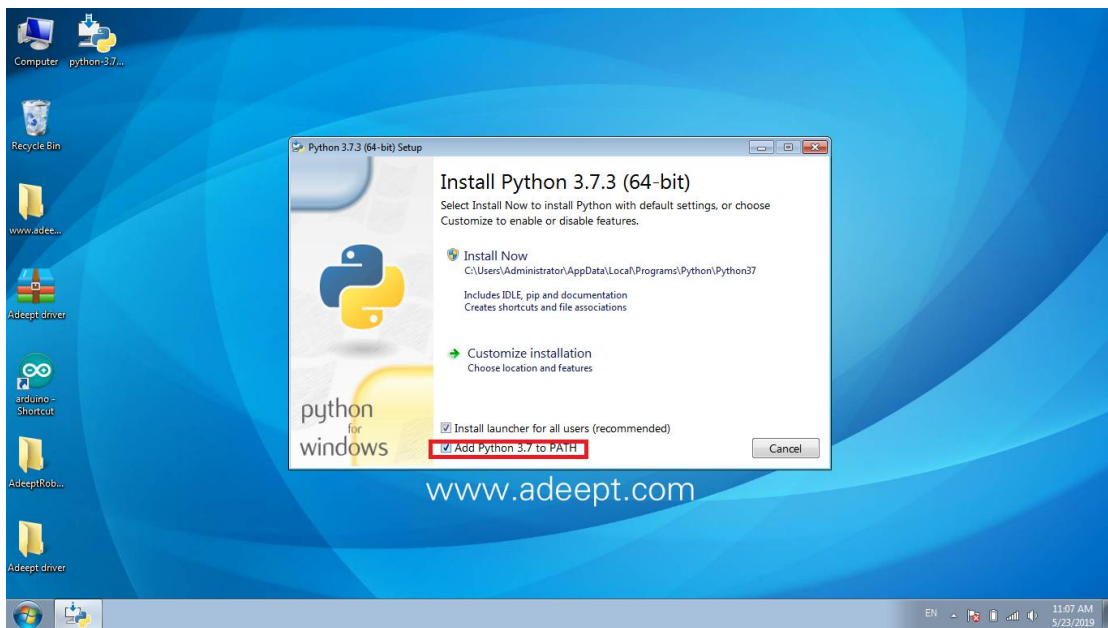
Download corresponding version according to your computer operating system:



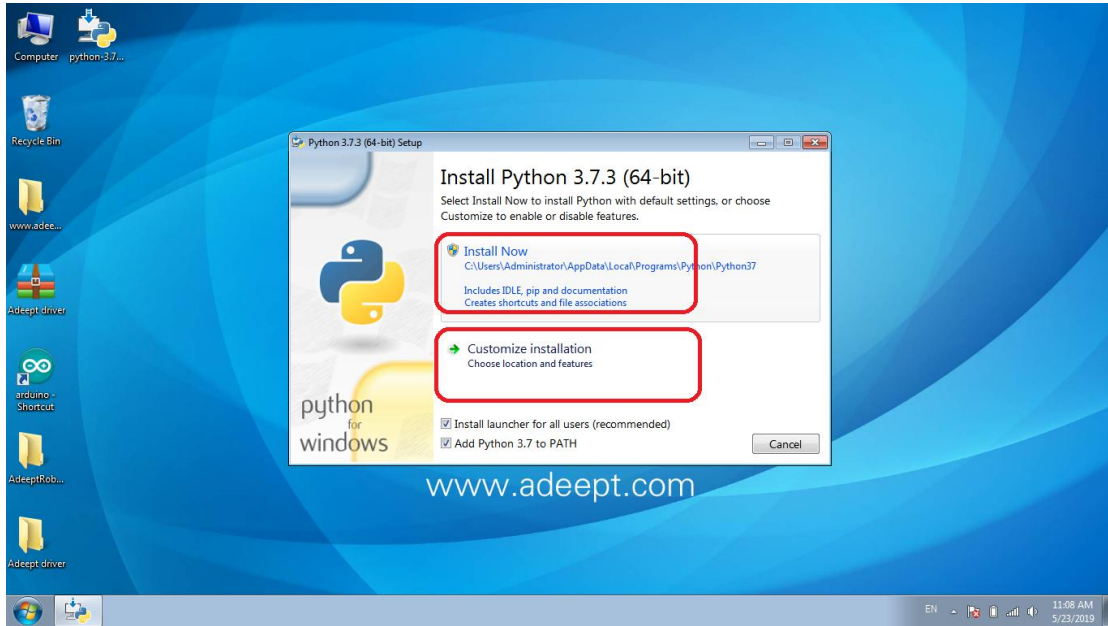
2.Download completed, open the program and install Python.



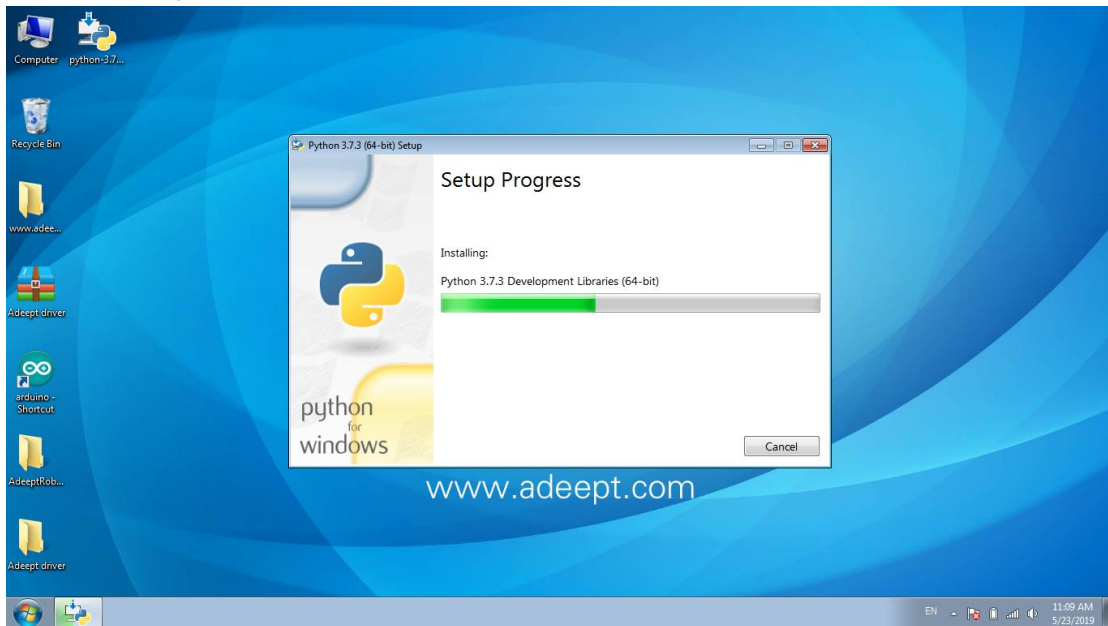
3.Select the option or you can't be able to control the robot.

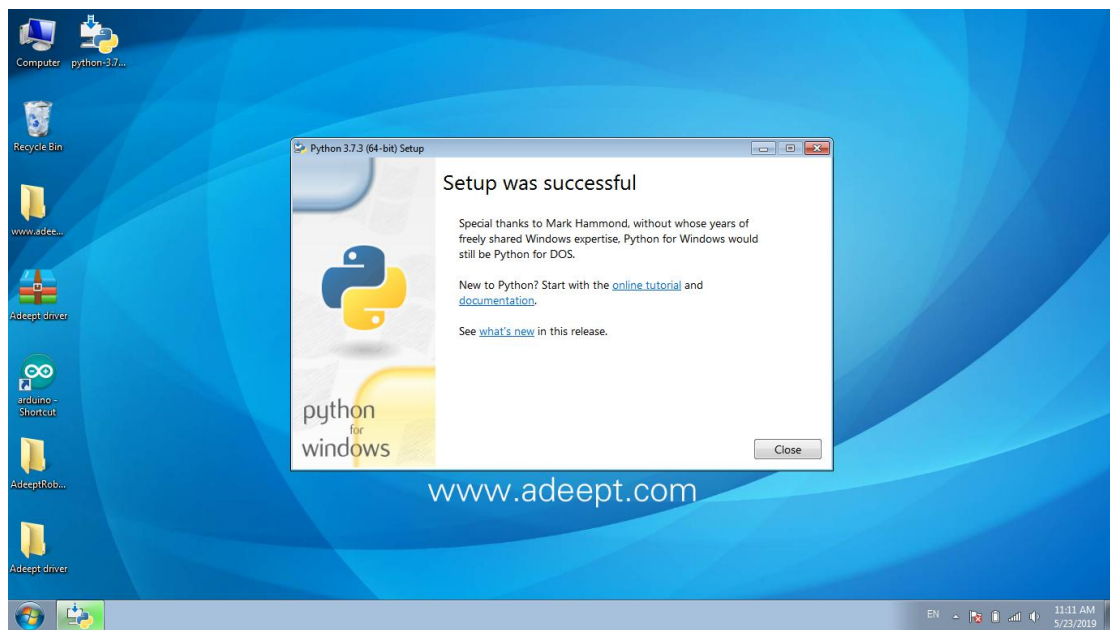


4. Choose different installation path base on your needs.

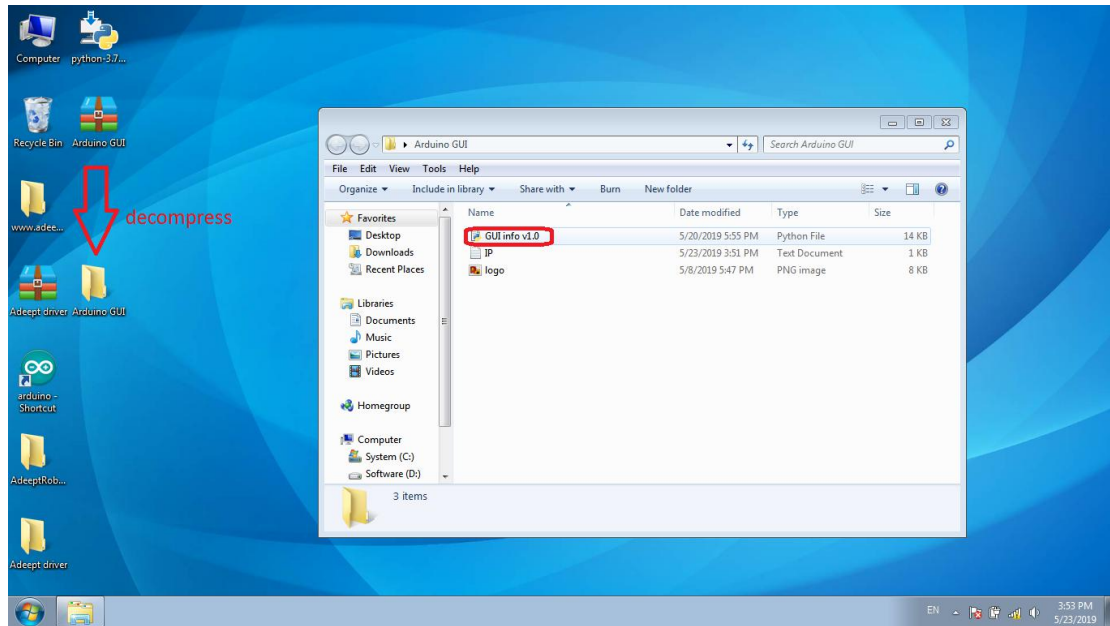


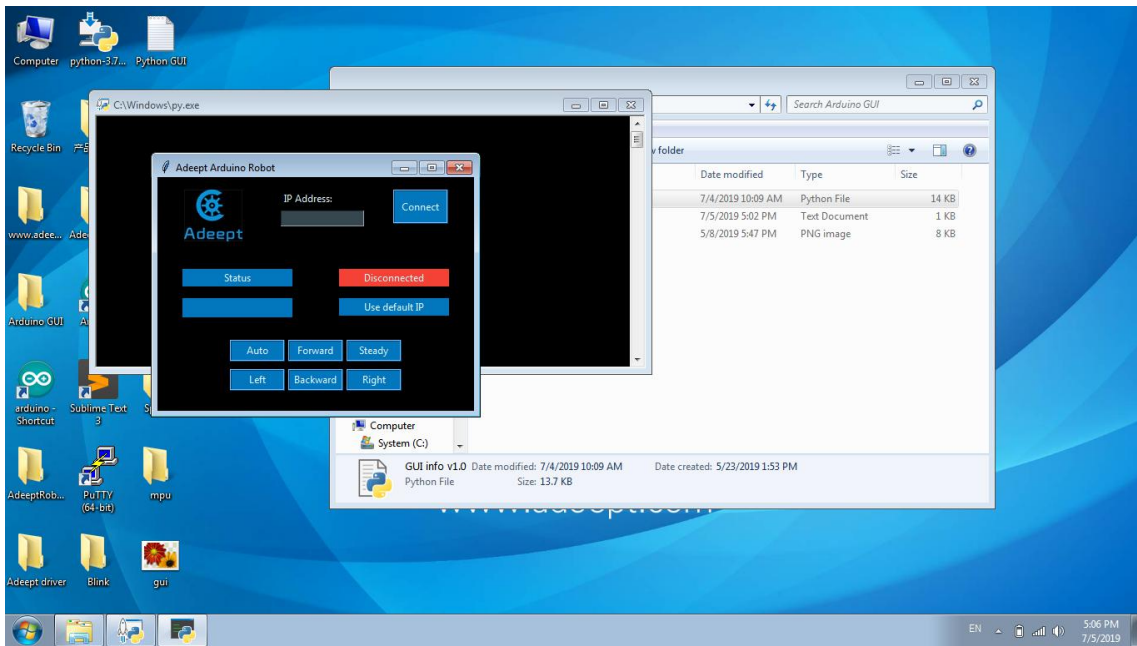
5. Wait to complete.





6. Open the software and you can control.

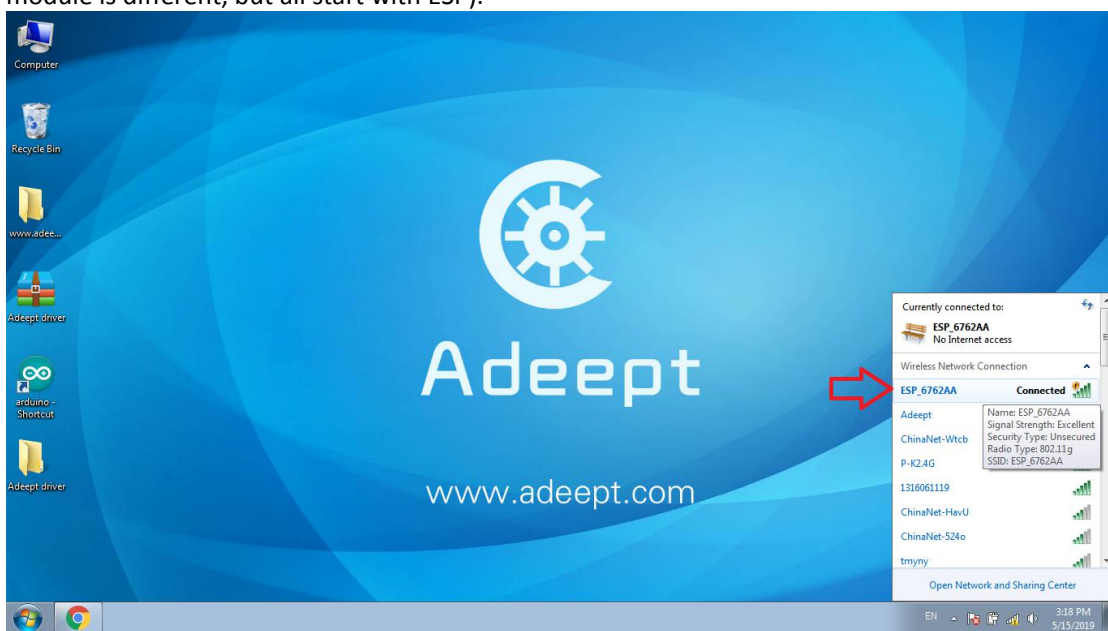




5.2. Control the robot.

1. Method of Wi-Fi control is as follows:

(1)After the LED changes to blue, connect the WIFI of ESP8266 (the name of each ESP8266WIFI module is different, but all start with ESP).



(2) Open the control software, the interface is as shown.

(3) Enter the default IP address 192.168.4.1 of the ESP8266 in the IP input box, click the connect button and you can control.

(4) You can see that there are buttons for functions of auto-stability, forward and backward, left and right turn, attack, radar scanning and automatic obstacles avoiding. Press different buttons can achieve different functions.

(5) Battery bar shows the battery level. Charge the battery when it shows red.

2.Method of infrared remote control is as follows:

Functions of buttons "2" , "4" , "6" , "8" , "5" and "1" respectively are forward, left turn, backward, right turn, self-stable, automatic obstacle avoidance.

(1) Note that when in self-stabilizing state, large range of motions is not recommended, and the angle of inclination is best not to exceed 30 degrees. Otherwise the processor will misjudge, resulting in incorrect data, if the processor misjudge, don't worry about it , the processor can correct itself and return to normal

(2) During the self-stabilization, if too large motion is exerted or it meets unexpected conditions, restart the robot.

(3) Operation method: Press and hold W, S, A, D on the keyboard to forward, backward, turn left and turn right. Release to stop. Click Q to enter attack mode(no need to hold it). Click E to obstacles avoiding mode. Click F to self-stabilization mode. Click X to radar scanning mode. If double click WSAD with mouse, the robot will be on constant motion.

(4) Sometimes the Wi-Fi communication button may not respond, it is because that data loss may occur during Wi-Fi transmission. You can try to press other buttons, or restart the robot.

(5) The infrared remote control should be aligned with the infrared receiver. Otherwise, the data received may be incomplete, which may lead to misjudgment.

(6) When using the infrared remote control, if the LED light turns red and the color remains unchanged for a while, that means the battery voltage is too low; And it's normal if the LED color changes from blue to red, and then changes back to blue. Because when all the motors move together, the output voltage is too large, in that case, the remaining battery power detected by the chip is too low.

6.Afterword

Thanks for purchasing our product and reading the manual! If you spot any errors or have any ideas or questions for the product and this guide, welcome to contact us! We will correct them if any as quickly as possible.

After completing all projects in the guide, you should have some knowledge of the Raspberry Pi and Robot, thus you can try to change the robot into other projects by adding more Adept modules or changing the code for extended functions.

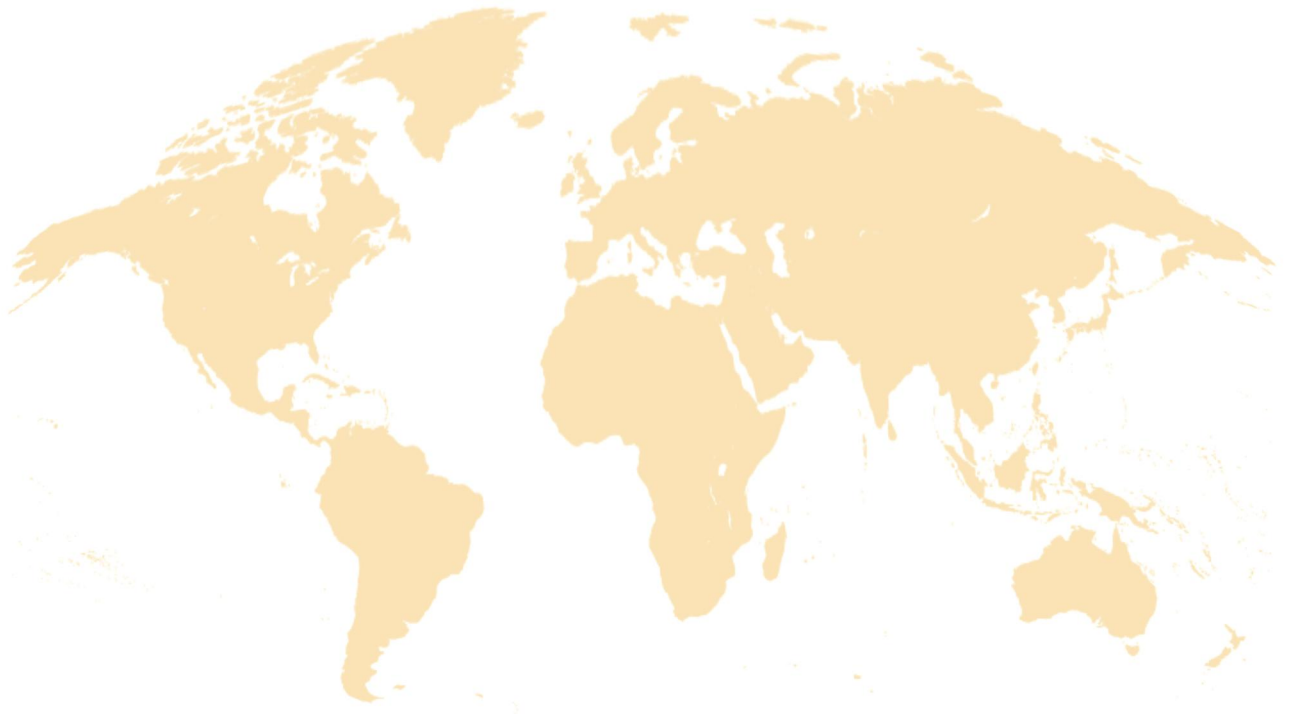
For more information about Arduino, Raspberry Pi, Smart car robot, or robotics, etc., please follow our website www.adept.com. We will introduce more cost-effective, innovative and intriguing products!

Thanks again for choosing Adept product and service!



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