Adeept

Adeept Robot Smart Car Kit for Raspberry Pi

PiCar-A

Warning

Please pay attention to the following issues when purchasing or using the product:

- There are small components included in this kit. Swallowing mistakenlyor misoperation can cause serious infection and be even fatal. When an accident occurs, please seek medical assistance immediately.
- Please place the product in a safe place where an under-6-year-old cannot touch, who should not use or approach the product.
- Juveniles should use the product with their parents.
- Do not place the product or the components near any AC socket or other circuitsto avoid electric shock.
- Do not use the product near any liquid or flame.
- Do not use or store the product in an extreme environment such as in extremely low or high temperature and heavy humidness.
- Please remember to power off when the product is not in use.
- Do not touch the moving or rotating part of the product.
- The product may get heat at some part, which is just normal. But misoperation may cause overheat.
- Misoperation may cause damage to the product. Please take care.
- Do not connect the positive and negative poles of the power inversely, or the devices in the circuit may be damaged.
- Please place and put the product gently. Do not smash or shock it.

About

Adeept 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.adeept.com/

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

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

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1.Introduction

1.1.Product Introduction

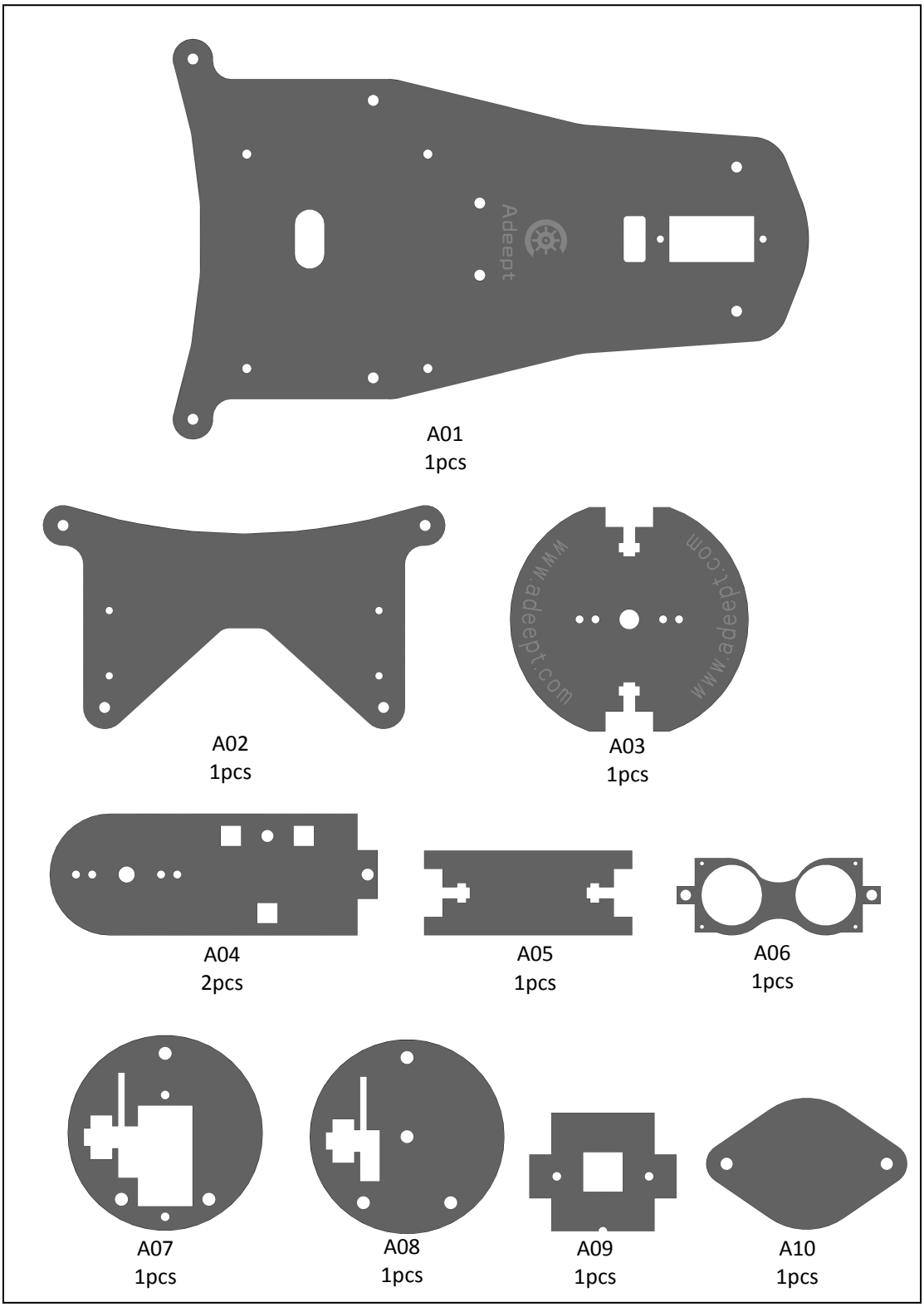
The 3WD Smart Car Kit – PiCar-A is designed for Raspberry Pi enthusiasts to learn about the platform and development of related control program and graphic user interface(GUI). The program code of both the client APP(GUI) and the server(PiCar-A) is written in Python, a Programming language friendly to new programmers. Therefore, this product is suitable for novice and supports various expansions at the same time.

1.2.Basic Principle

The system is based on the C-S architecture. The server program runs on the Raspberry Pi, and can accept the commands sent by the client to control the smart car. The client program runs on the PC, and the car can be remotely controlled by clicking a virtual button on the GUI APP or a button on the keyboard.

2.Components List

2.1.Acrylic Plates



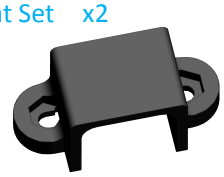
The acrylic plates are fragile, so please be careful when assembling them in case of breaking.
The acrylic plate is covered with a layer of protective film. You need to remove it first.
Some holes in the acrylic may have residues, so you need to clean them before the use.

2.2.Machinery Parts

M2 Nut  X6 www.adeept.com	M3 Nut  X7 www.adeept.com	M2*10 Screw  X6 www.adeept.com	M2.5*8 Screw  X8 www.adeept.com	M3*8 Screw  X18 www.adeept.com
M3*12 Screw  X5 www.adeept.com	M3*10 Countersunk Head  X2 www.adeept.com	M1.4*6 Self-tapping Screw  X4 www.adeept.com	M2.5*6+6 Copper Standoff  X4 www.adeept.com	M2.5*14 Copper Standoff  X4 www.adeept.com
M3*12 Copper Standoff  X4 www.adeept.com	M3*18 Copper Standoff  X2 www.adeept.com	M3*24 Copper Standoff  X3 www.adeept.com		

2.3.Transmission Parts

Motor Seat Set x2

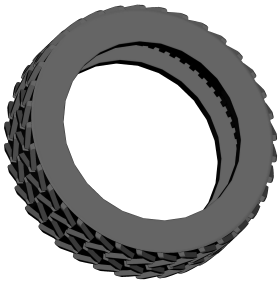


N20 Motor Seat
X 2

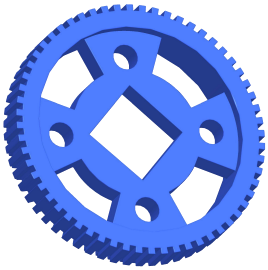
M2*10 Screw-B
X 4

M2 Nut-B
X 4

Rear Wheel x2



Rubber Tire
X 2



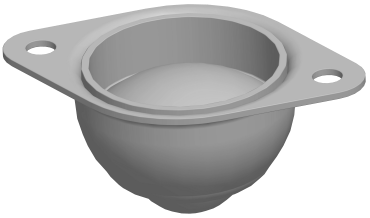
Wheel Hub
X2

Mounting-D3
X 2

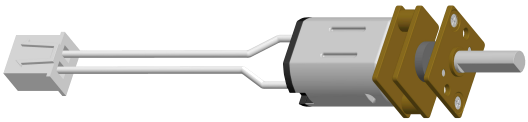
M4*14 Countersunk Head Screw
X4

M4 Nut
X4

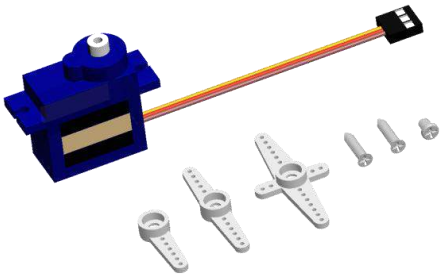
Universal Wheel x1



GA12-N20 Gear Motor x2

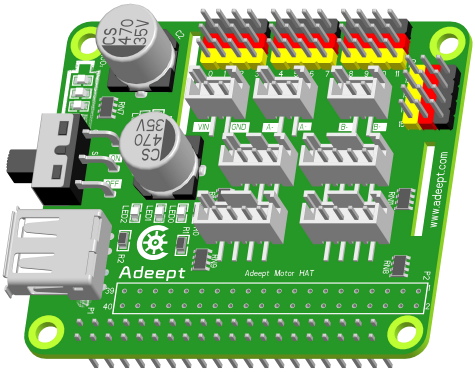


Servo x2

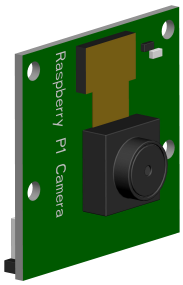


2.4.Electronic Parts

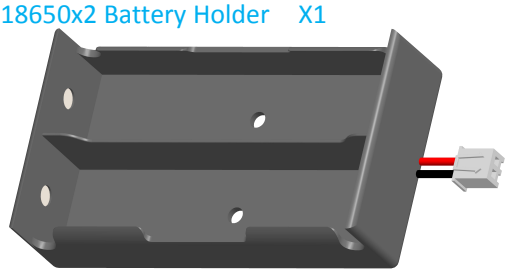
Adeept Motor HAT X1



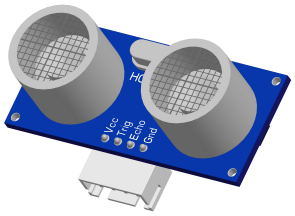
Raspberry Pi Camera X1



18650x2 Battery Holder X1

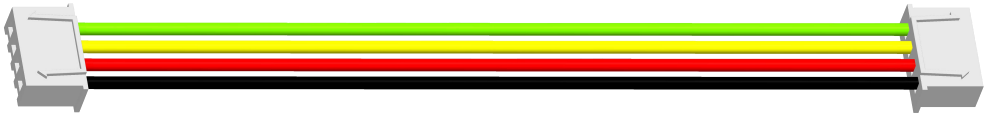


Adeept Ultrasonic Module X1



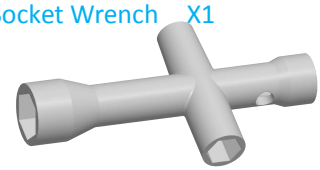
Raspberry P1 Camera Ribbon X1

4-Pin Wires X1



2.5.Tools

Cross Socket Wrench X1



Cross Screwdriver X1

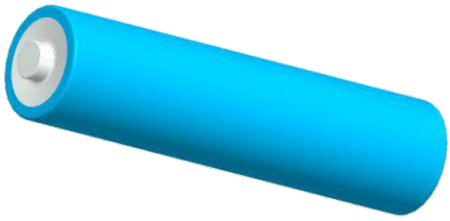
Large Cross-head Screwdriver X1

Winding Pipe X1

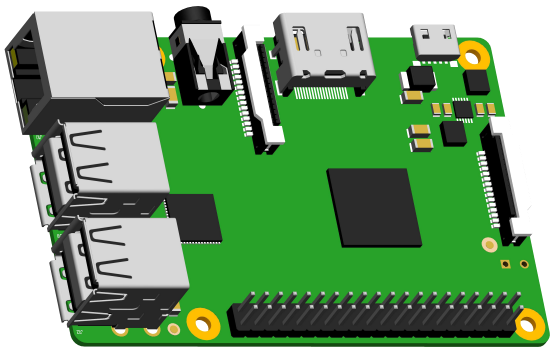
Ribbon X1

2.6.Self-Prepared Parts

18650 Battery X2



Raspberry Pi X1

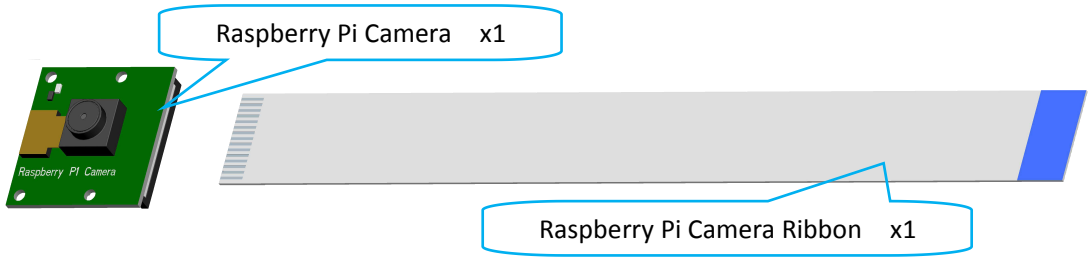


3. Assembly

3.1.Preparations

A. Connect the Raspberry Pi Camera and the ribbon.

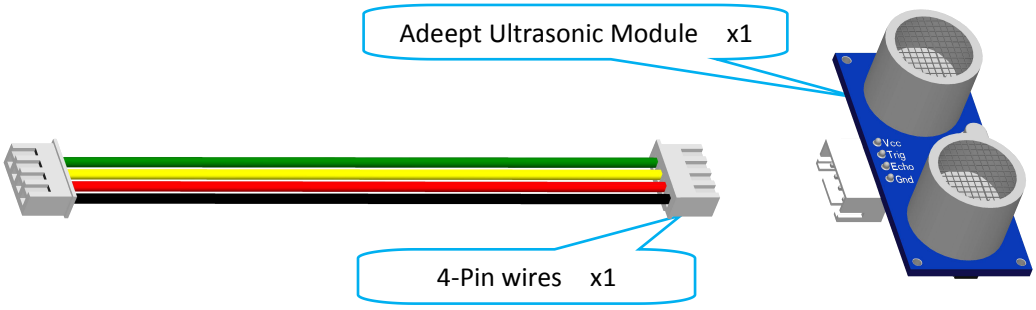
Assemble the following components



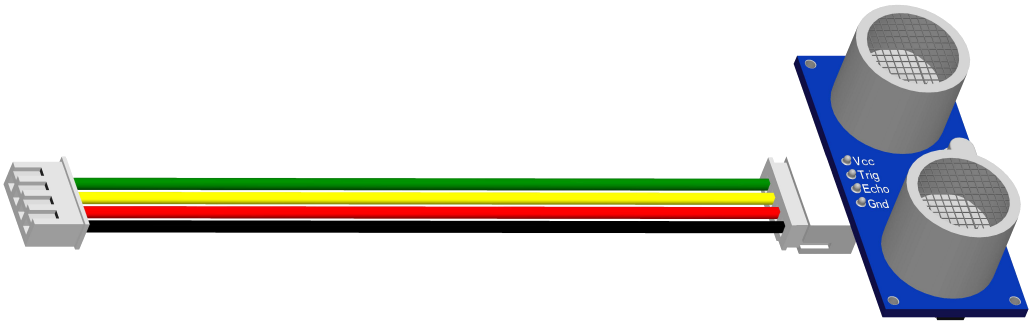
Effect diagram after assembling

B. Connect the Adeept Ultrasonic Module with 4-Pin wires.

Assemble the following components



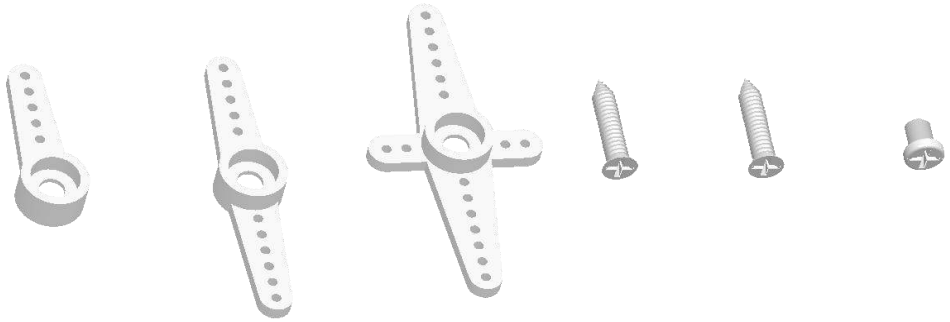
Effect diagram after assembling



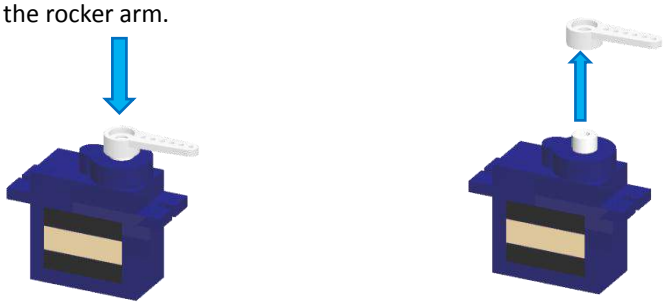
3.2.Head Assembly

A. Calibrate the servos.

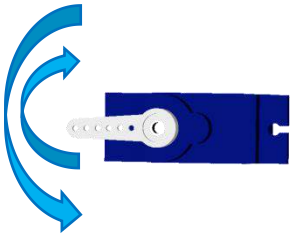
First, learn the structure. The servo can connect the rocker arm and spin to drive components bound with the arm. There are 3 types of rocker arms and 3 screws in the package. The smallest one is to fix the arm onto the servo.



Mount and remove the rocker arm.

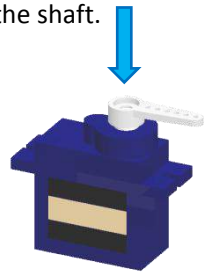


Rotate the rocker arm between 0 and 180 degrees.

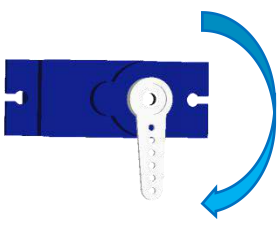


Adjust the servo and make it rotate to the initial position.

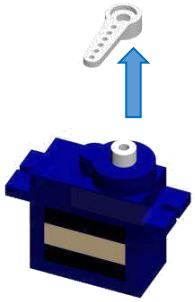
Take out a rocker arm and install it to the shaft.



Rotate the arm clockwise to the end.



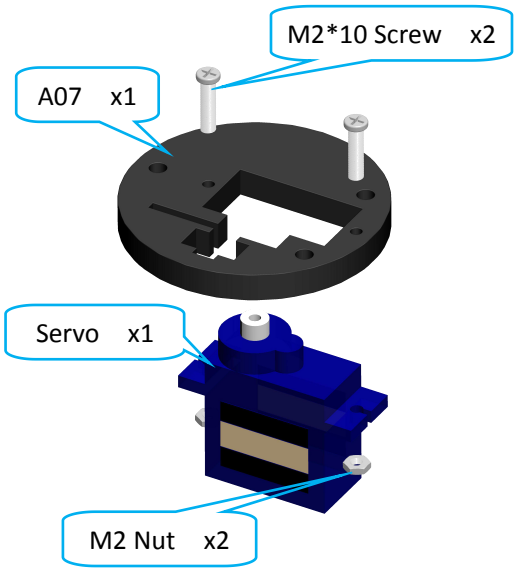
Remove the rocker arm straight upward. Be careful not to move the shaft.



Note: Before installing the servo and the arm, you should keep the servo shaft unmoved. Otherwise, you need to redo the steps to make it restore to the original position.

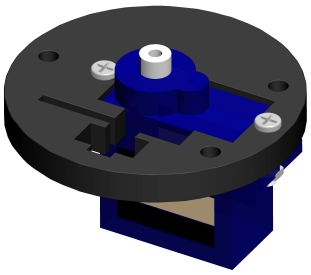
B. Connect the adjusted servo onto the A07 plate.

Assemble the following components



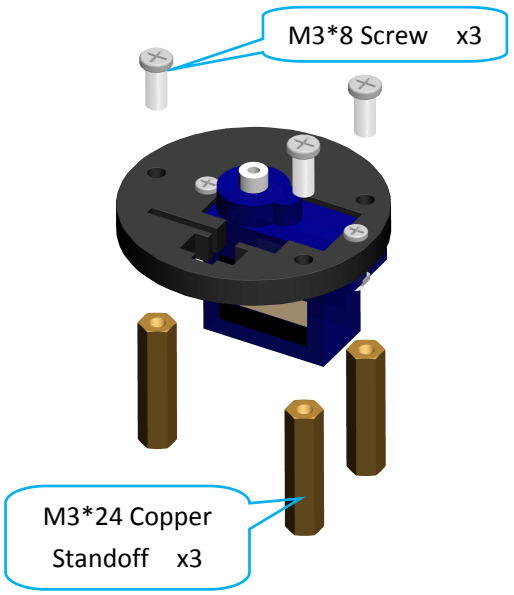
Effect diagram after assembling

Observe the position of servo and A07 and do not install them inversely.

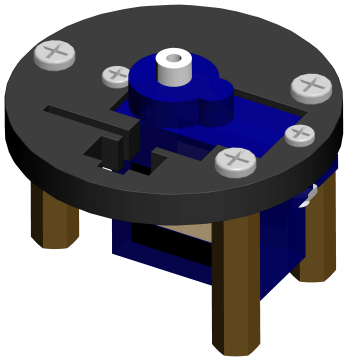


C. Install three M3*24 Copper Standoffs to A07.

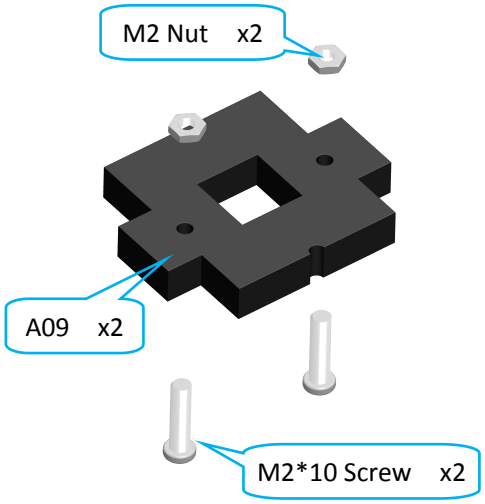
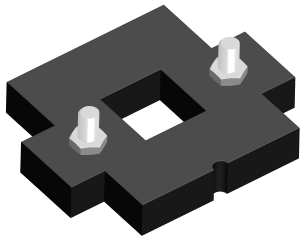
Assemble the following components



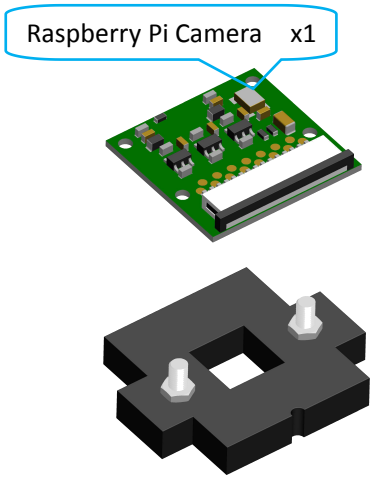
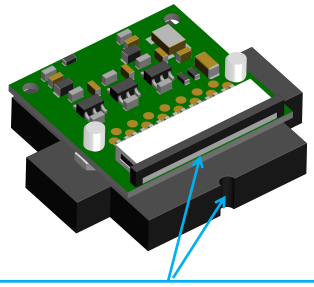
Effect diagram after assembling



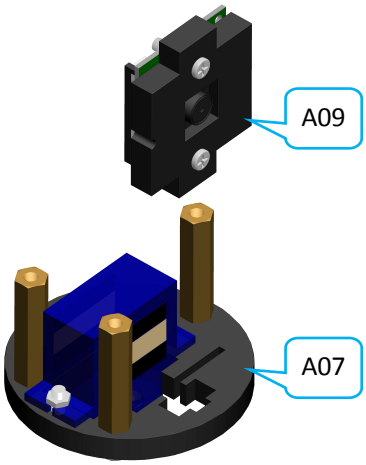
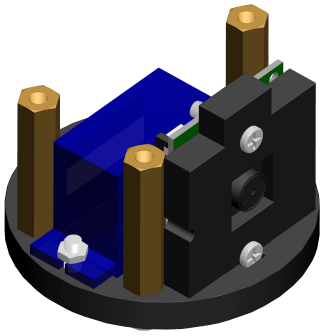
D. Assemble two M2*10 Screws into A09.

Assemble the following components	Effect diagram after assembling
	

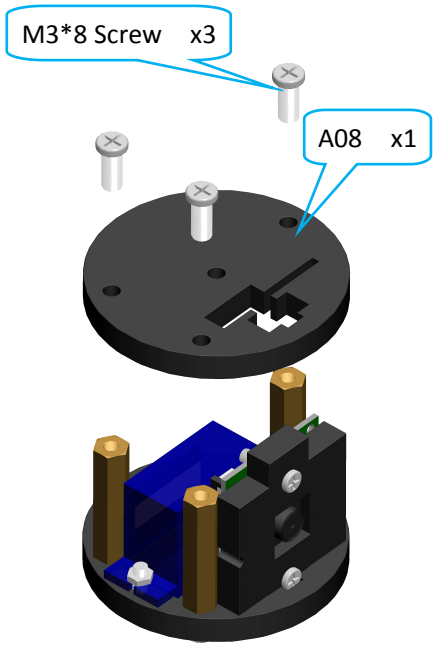
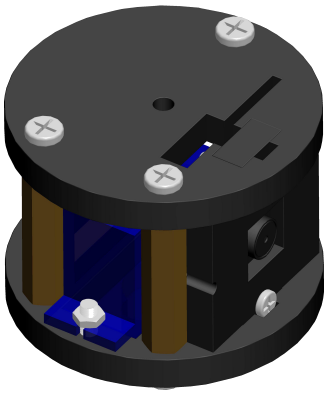
E. Install the Raspberry Pi Camera into the M2*10 Screws.

Assemble the following components	Effect diagram after assembling
	

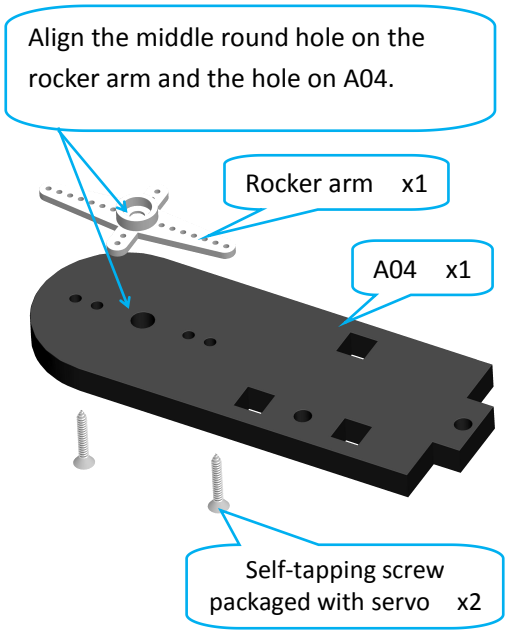
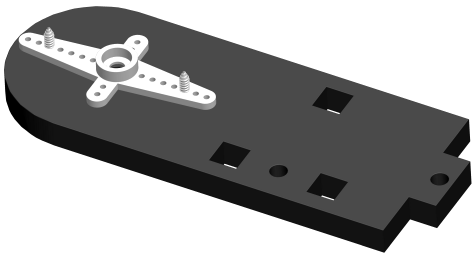
F.Insert A09 into A07.

Assemble the following components	Effect diagram after assembling
	

G. Assemble A08 and the M3*23 Copper Standoffs.

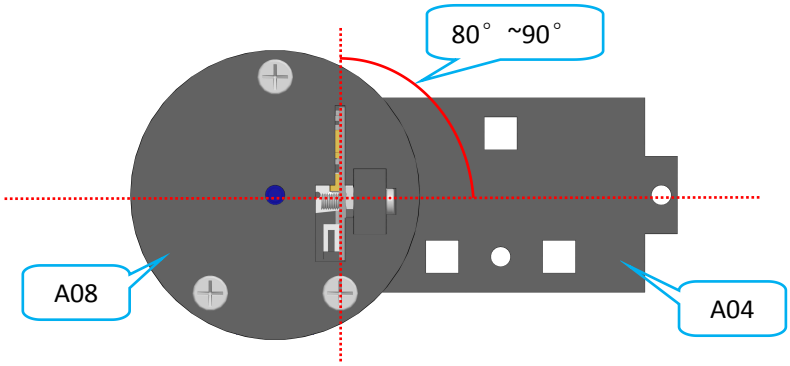
Assemble the following components	Effect diagram after assembling
	

H. Take one rocker arm of servo and install it to A04.

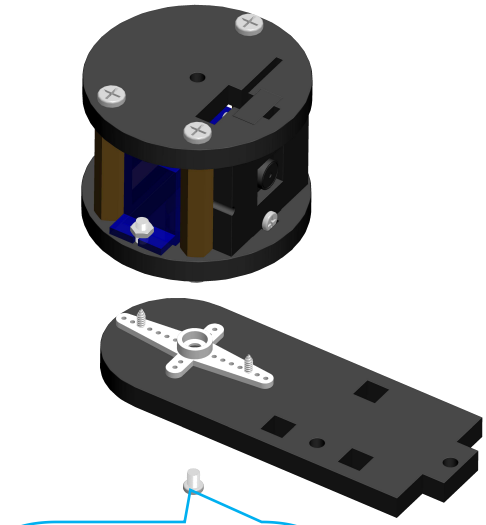
Assemble the following components	Effect diagram after assembling
	Pay attention to the position of the3 square holes on A04 and do not install them wrongly. 

I. Fasten the servo and rocker arm.

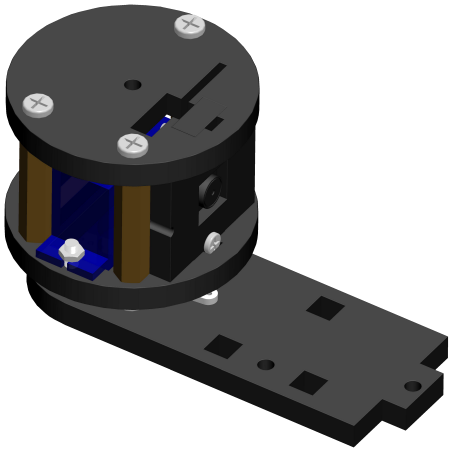
Make sure it's been adjusted correctly prior to this step. Now the servo should be connected with A09 and A08. For the angle between the servo and rocker arm, you may refer to the position of the long slot of A08 and A04, as shown below.



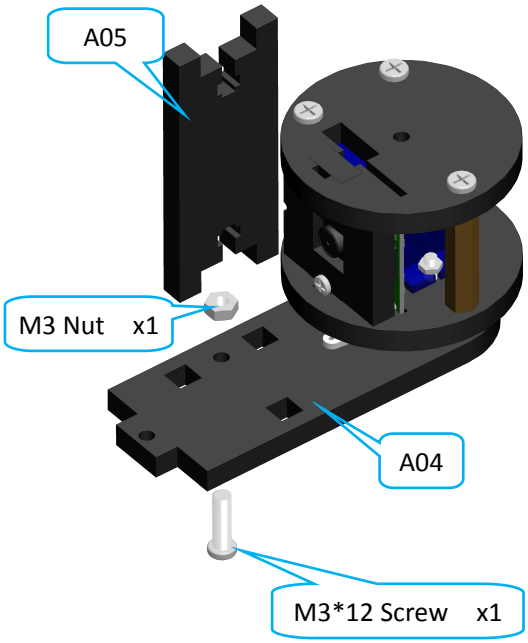
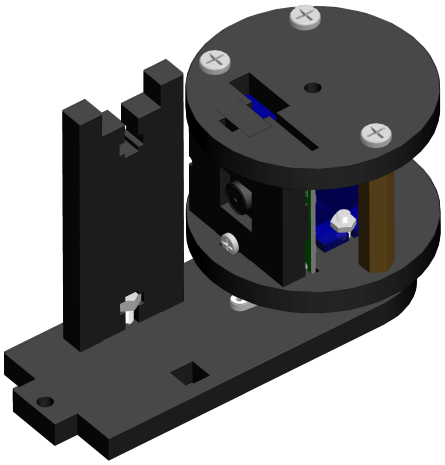
Assemble the following components



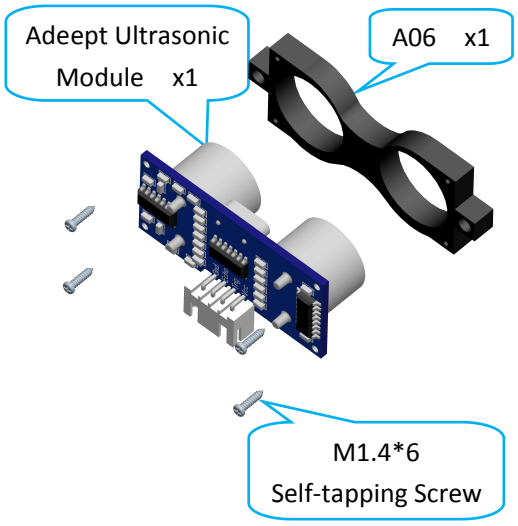
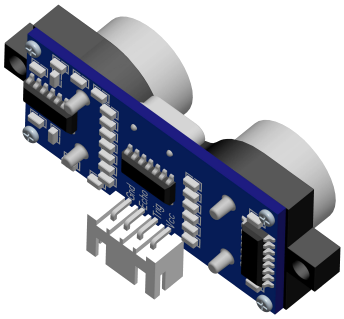
Effect diagram after assembling



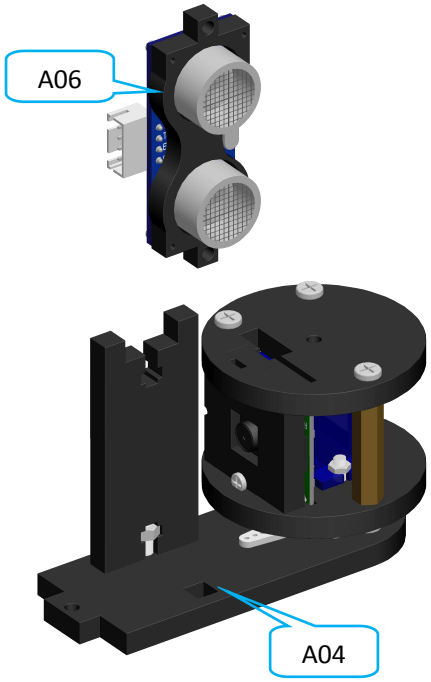
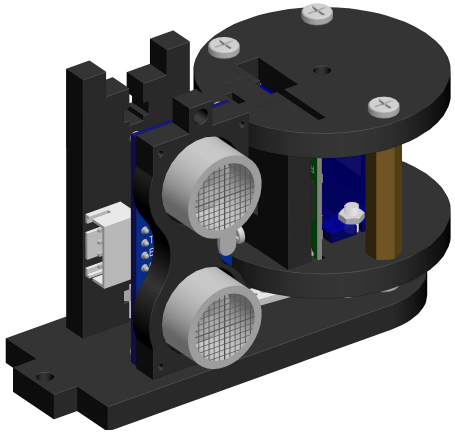
J. Fasten A05 and A04.

Assemble the following components	Effect diagram after assembling
	

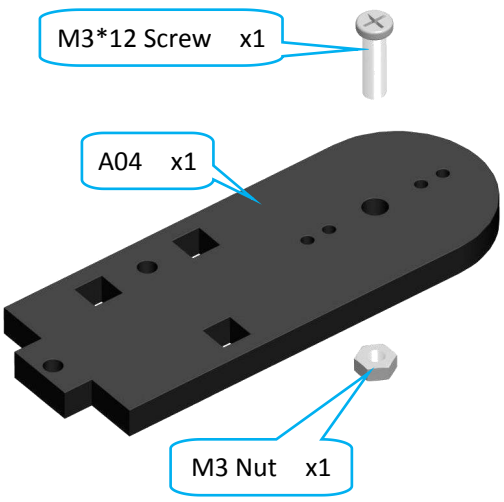
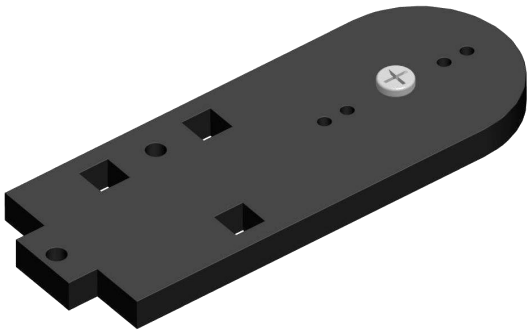
K. Assemble Adeept Ultrasonic Module and A06.

Assemble the following components	Effect diagram after assembling
	

L. Insert A06 into A04.

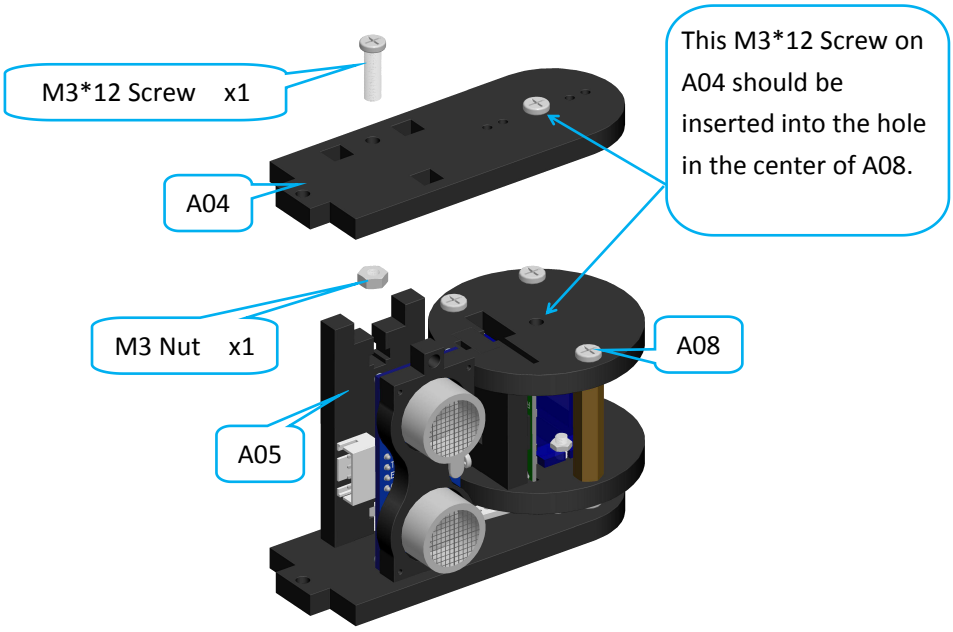
Assemble the following components	Effect diagram after assembling
	

M.Take the other A04 and insert an M3*12 Screw into it.

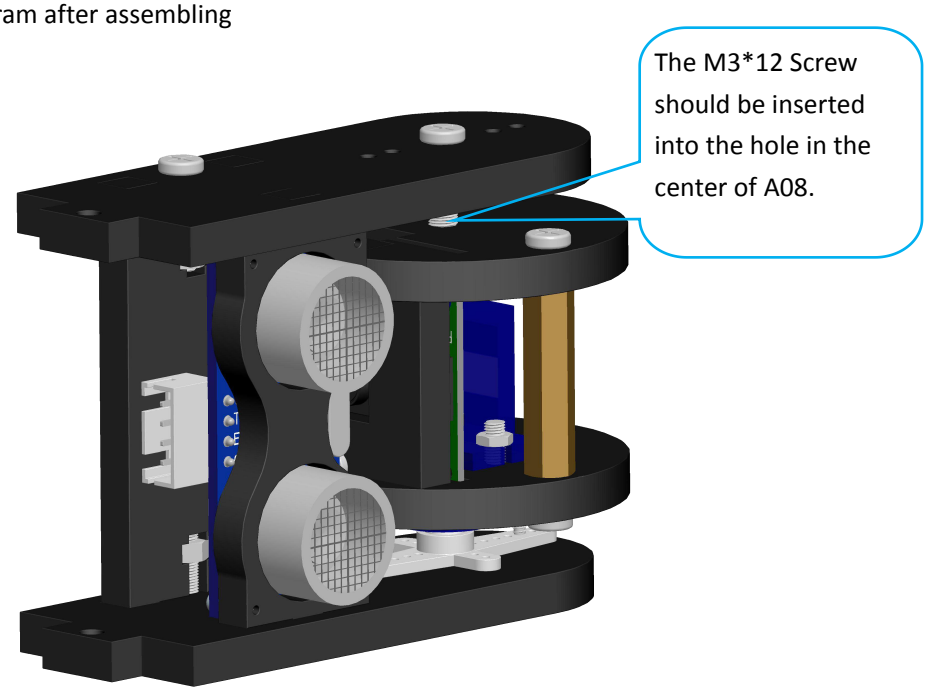
Assemble the following components	Effect diagram after assembling
	

N.Fasten A04 and A05.

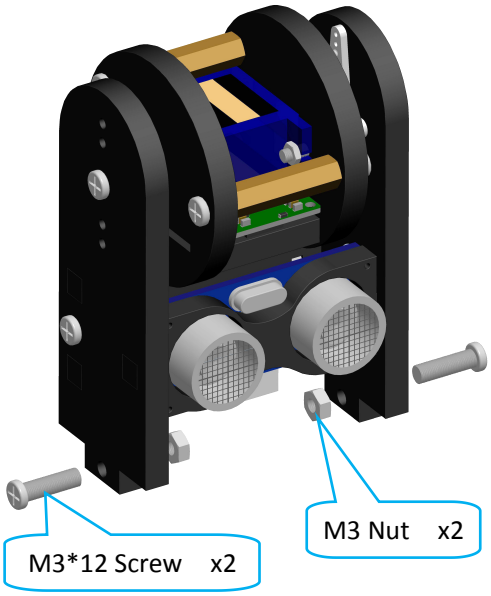
Assemble the following components

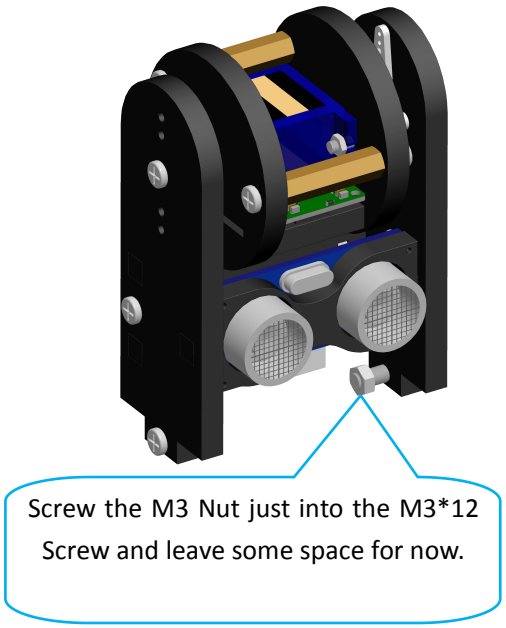


Effect diagram after assembling



O. Assemble an M3*12 Screw to each A04 plate.





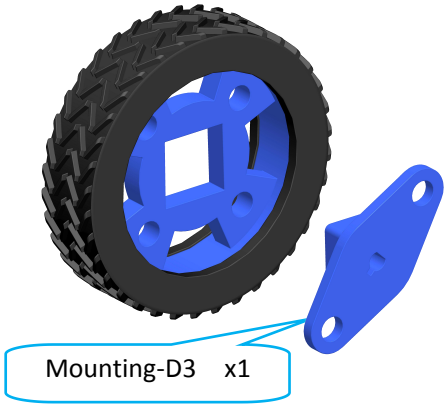
3.3. Assemble Wheels

A. Take two sets of rear wheels and fit the rubber tires onto the wheel hubs(two sets).

Assemble the following components

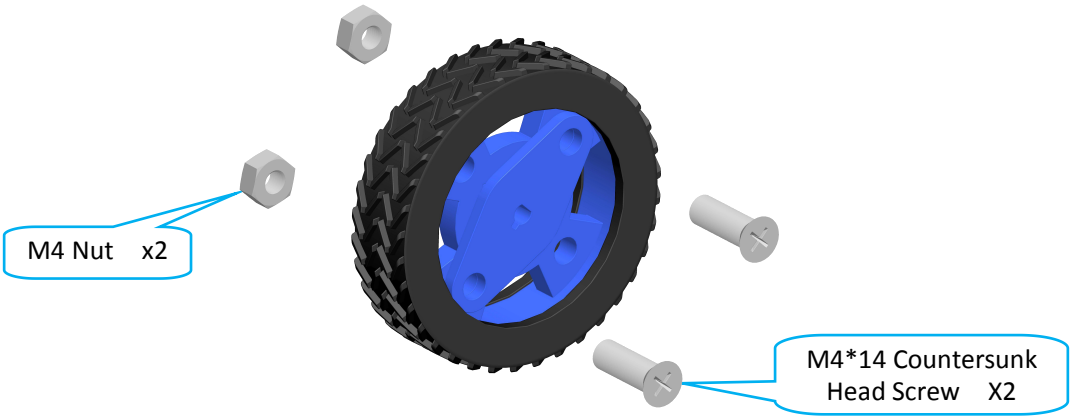
Effect diagram after assembling

B. Fasten the mounting-D3 to the two sets of wheel hub.

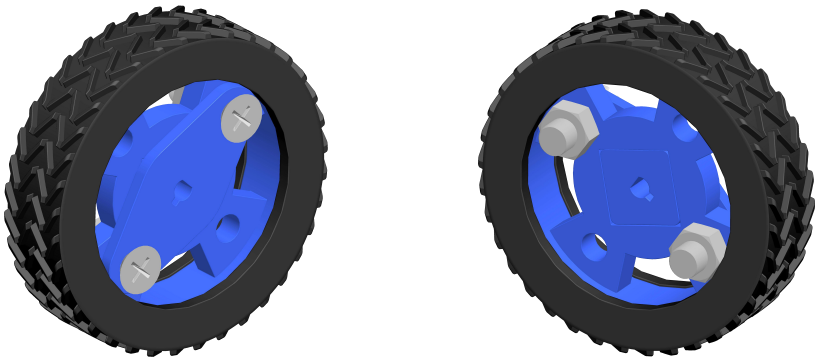
Assemble the following components	Effect diagram after assembling
	

C. Fasten the hub and mounting-D3 by the screws in the Rear Wheel package (two sets).

Assemble the following components



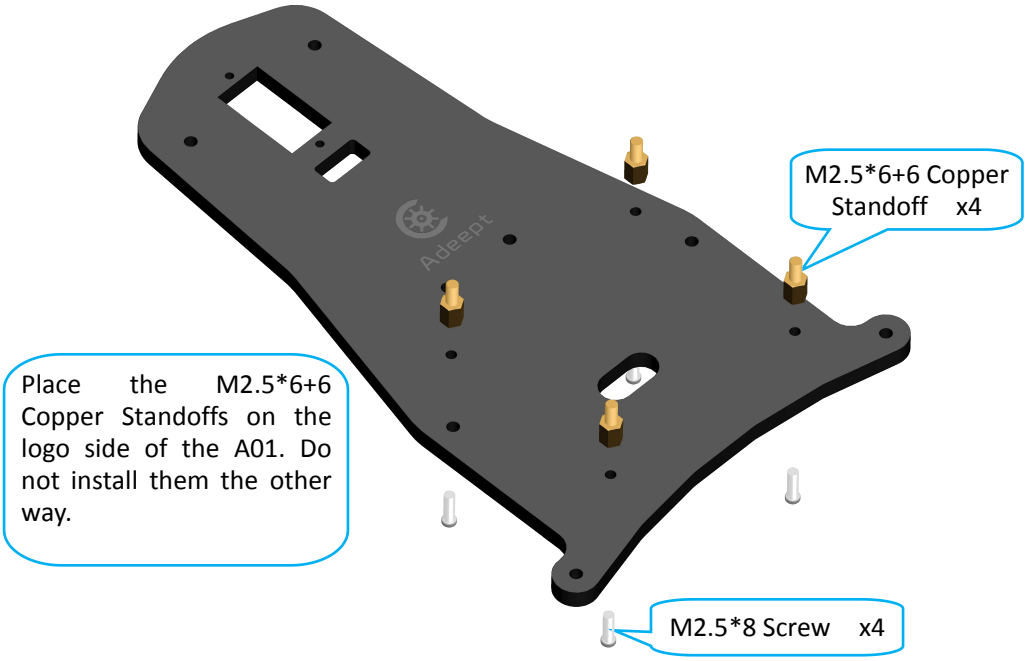
Effect diagram after assembling



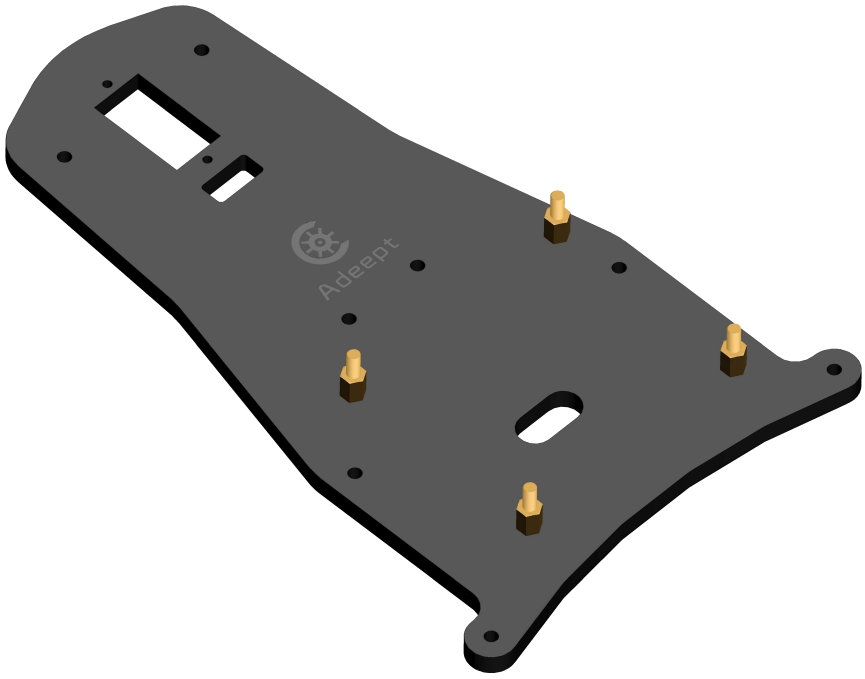
3.4. Assemble the Car

A. Fasten four M2.5*6+6 Copper Standoffs onto the A01 plate.

Assemble the following components

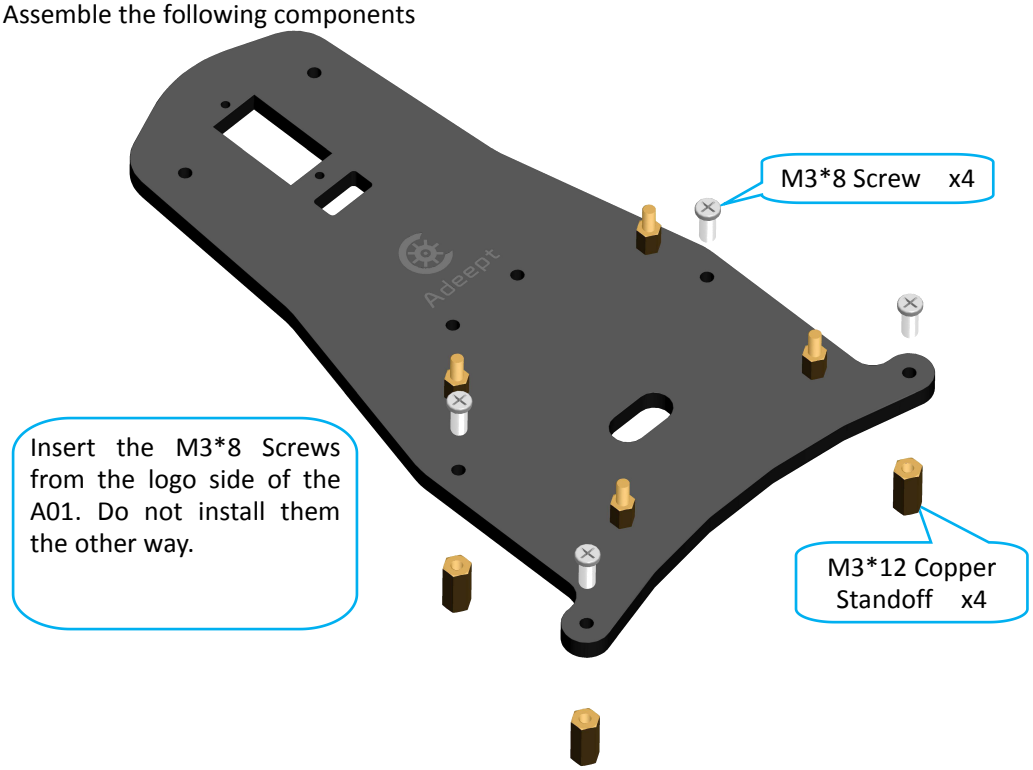


Effect diagram after assembling



B. Install four M3*12 Copper Standoffs onto A01.

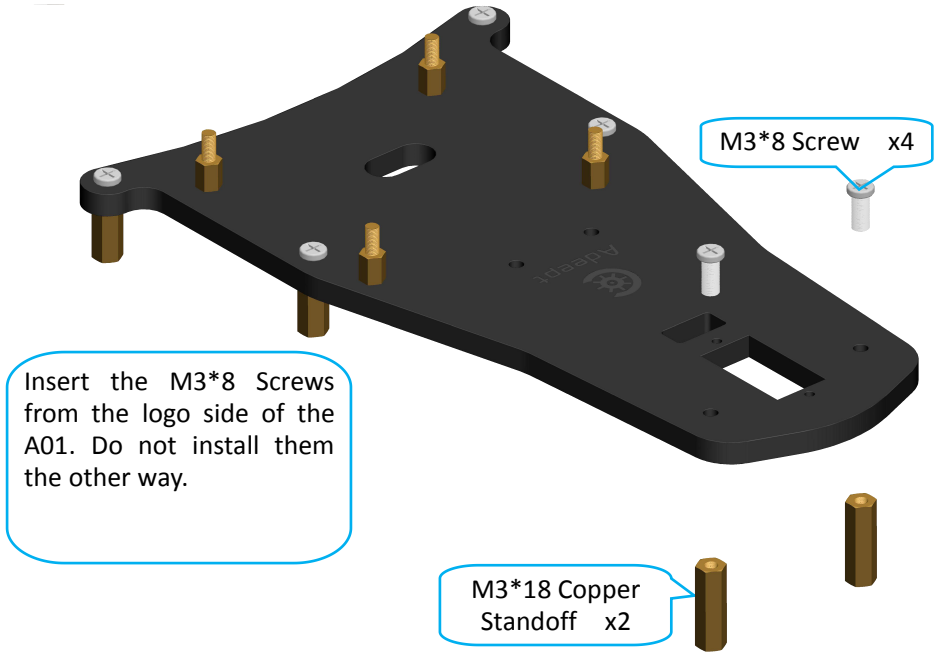
Assemble the following components



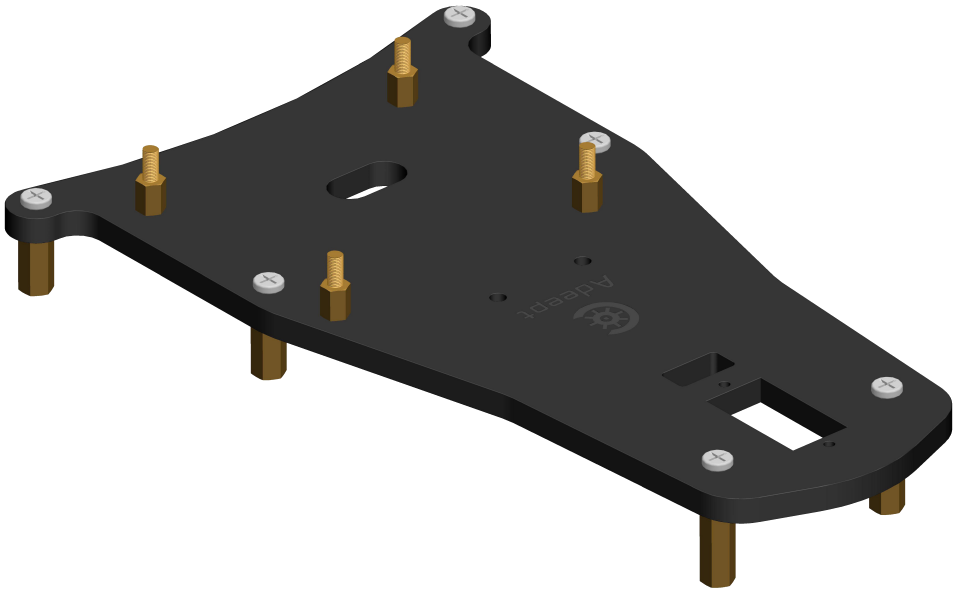
Effect diagram after assembling

C. Fasten two M3*18 Copper Standoff to A01.

Assemble the following components

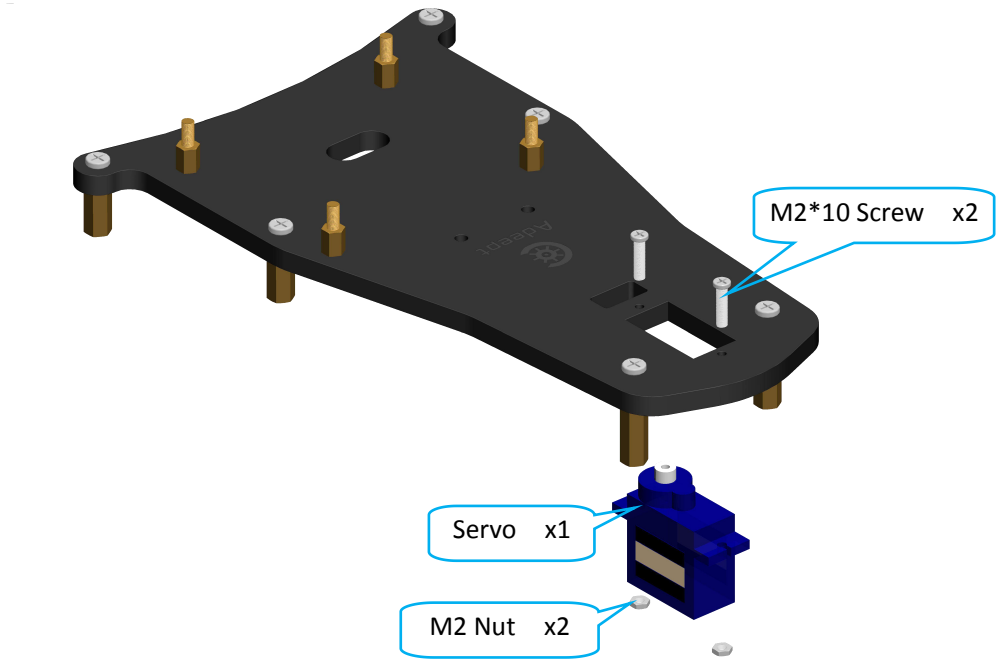


Effect diagram after assembling

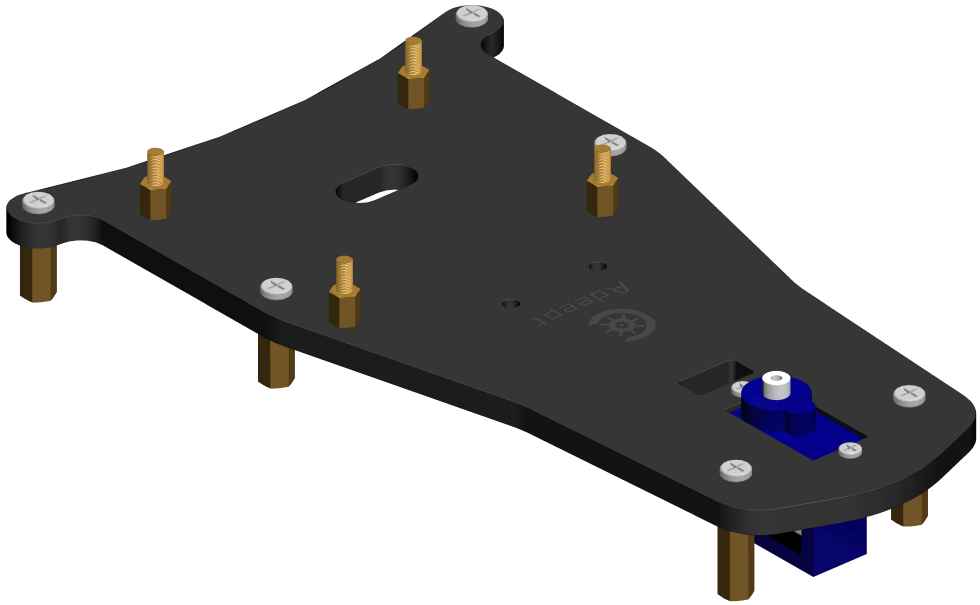


D. Take another servo and install it to A01.

Assemble the following components

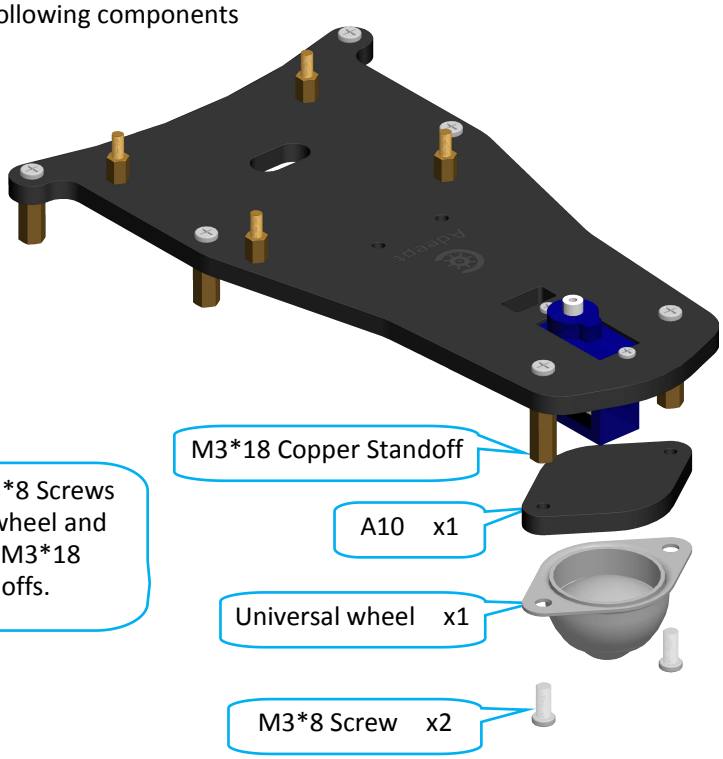


Effect diagram after assembling



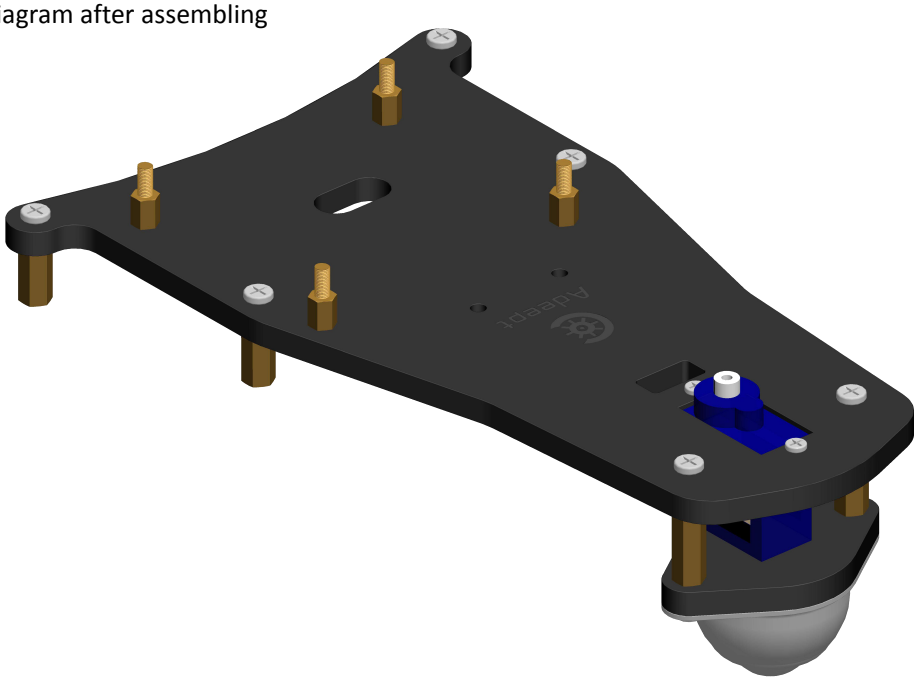
E. Fasten the universal wheel to the M3*18 Copper Standoffs.

Assemble the following components



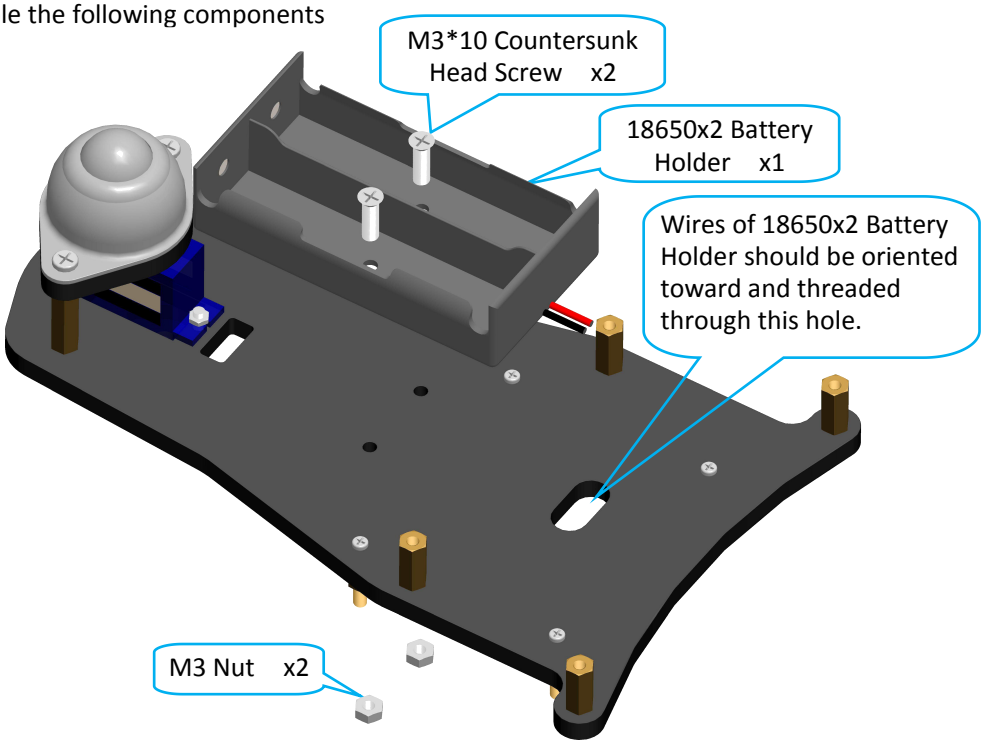
Insert the M3*8 Screws through the wheel and A10, into the M3*18 Copper Standoffs.

Effect diagram after assembling

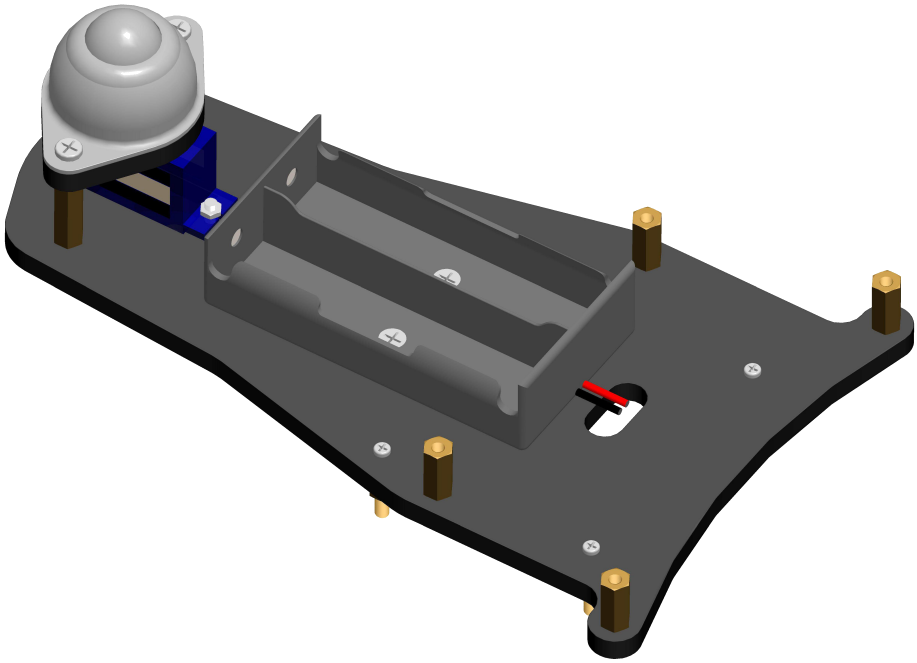


F. Fasten the 18650x2 Battery Holder to A01.

Assemble the following components

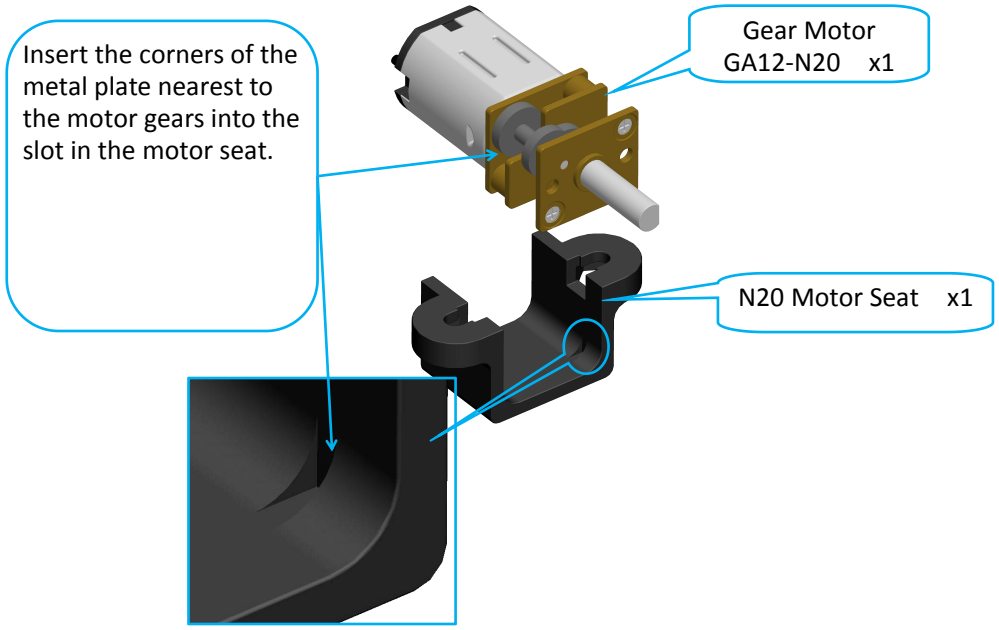


Effect diagram after assembling

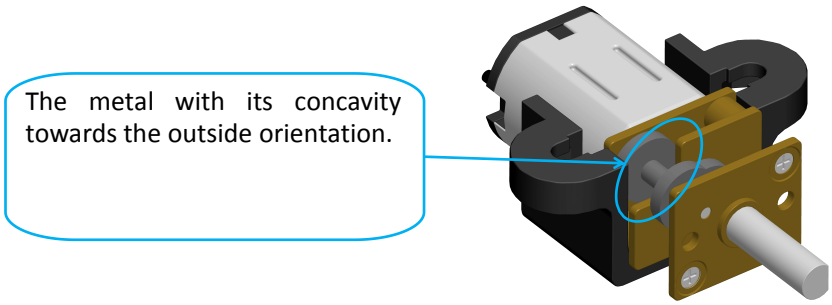


G. Fit the GA12-N20 Gear Motor into the N20 motor seat (2 sets).

Assemble the following components

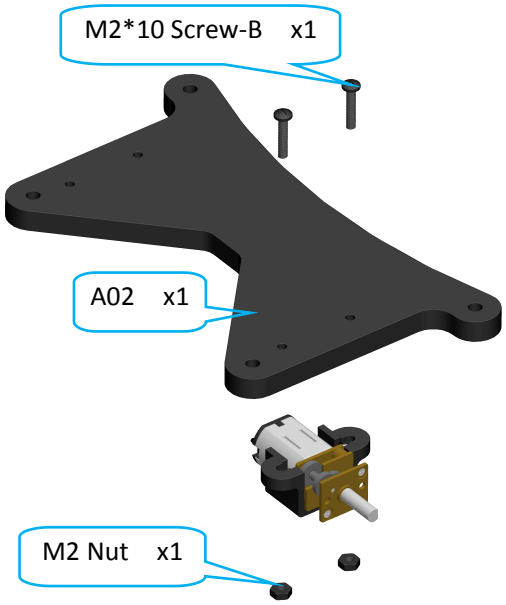


Effect diagram after assembling

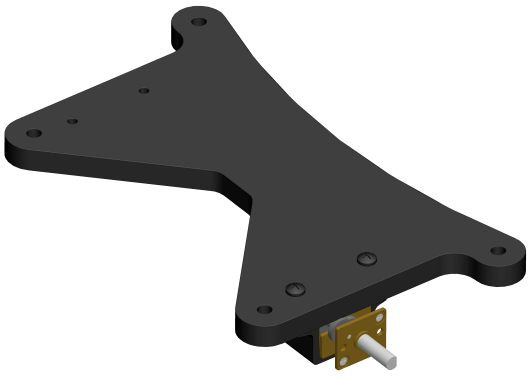


H. Fasten the Motor Seat N20 onto A02.

Assemble the following components

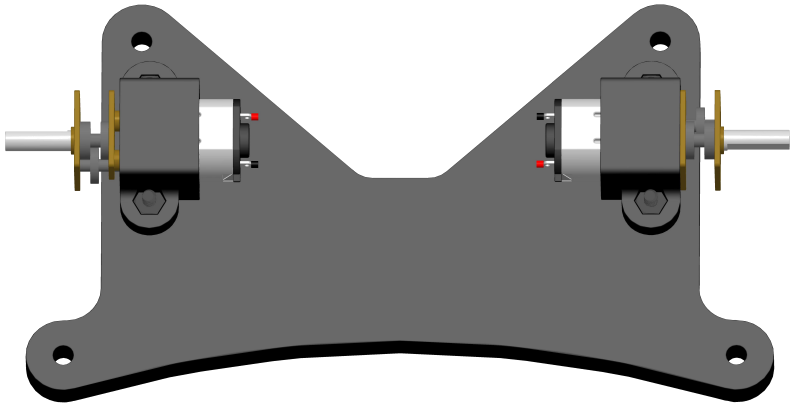


Effect diagram after assembling



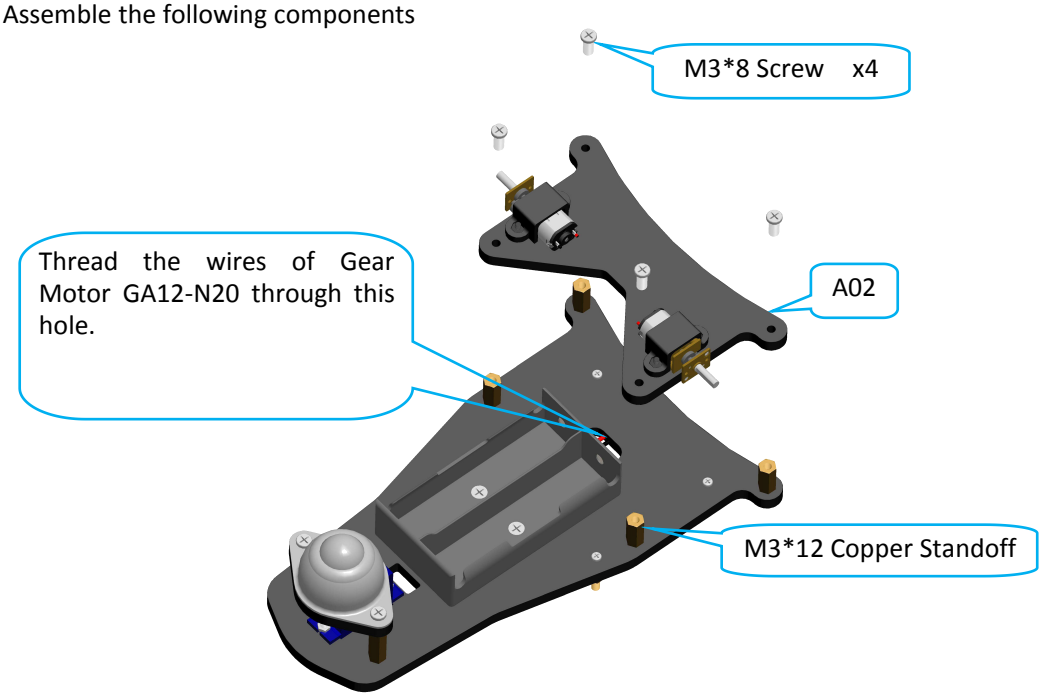
Fasten the other Motor Seat N20 on the other end of A02.

Effect diagram after assembling

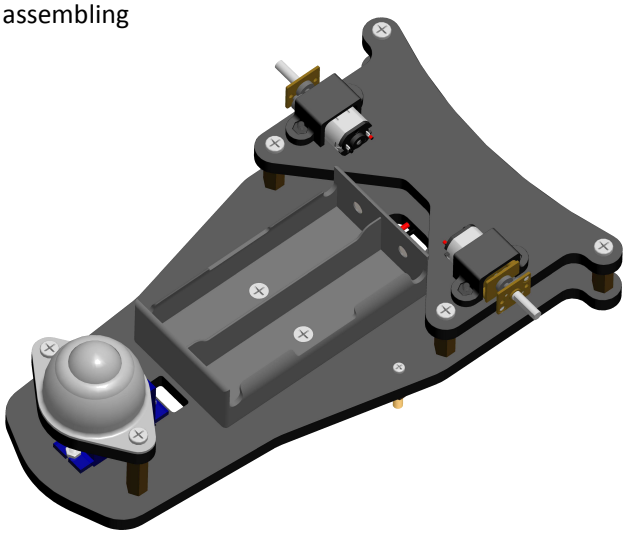


I. AssembleA02 to the M3*12 Copper Standoffs.

Assemble the following components

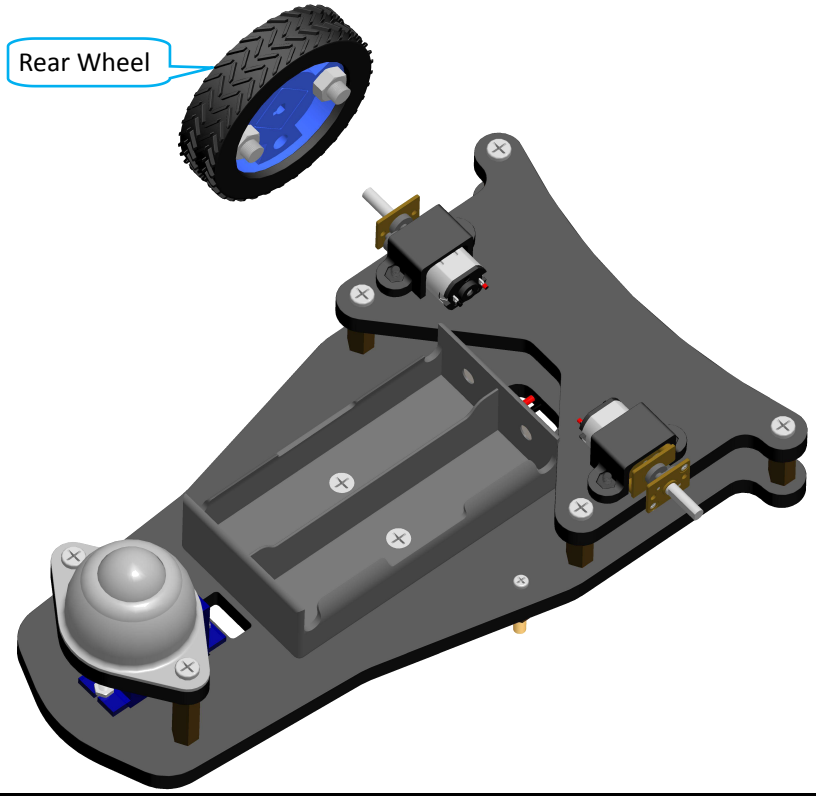


Effect diagram after assembling



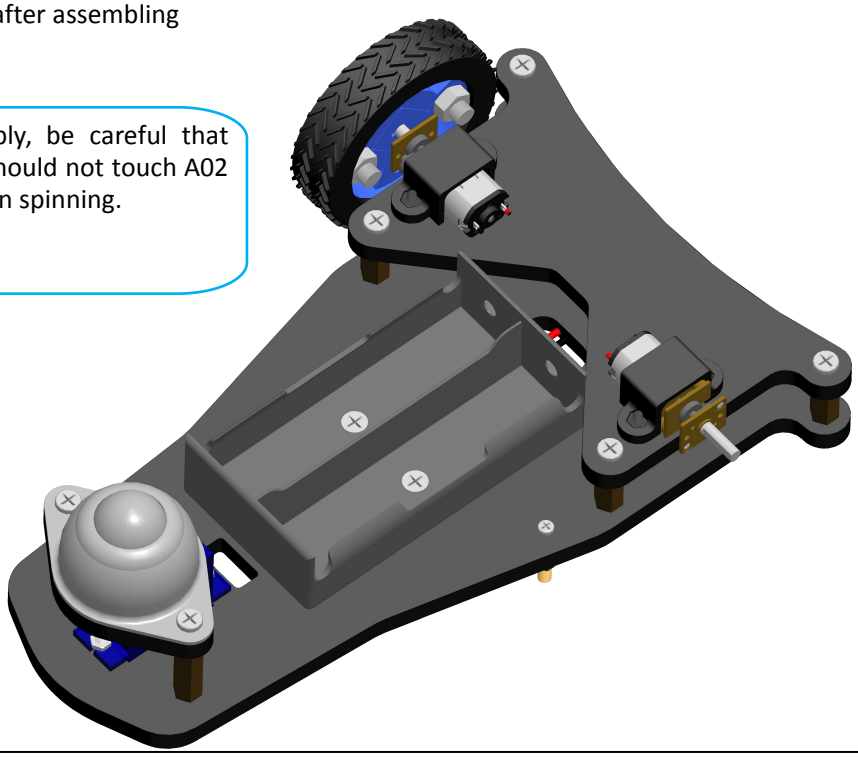
J. Install the rear wheels into the Gear Motor GA12-N20.

Assemble the following components



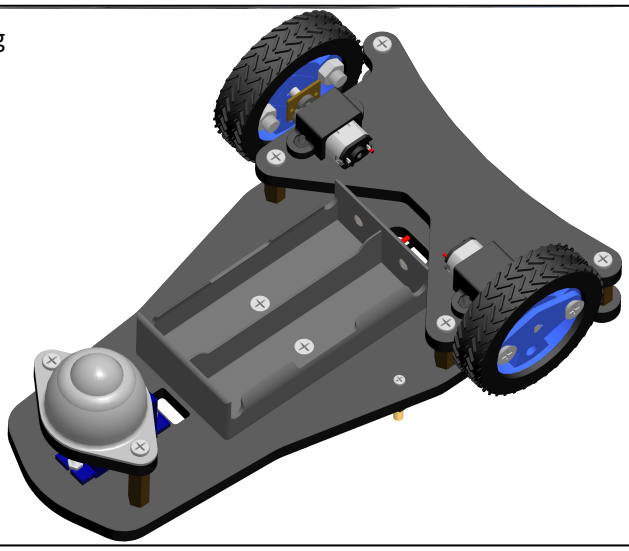
Effect diagram after assembling

After assembly, be careful that the wheels should not touch A02 and A01 when spinning.

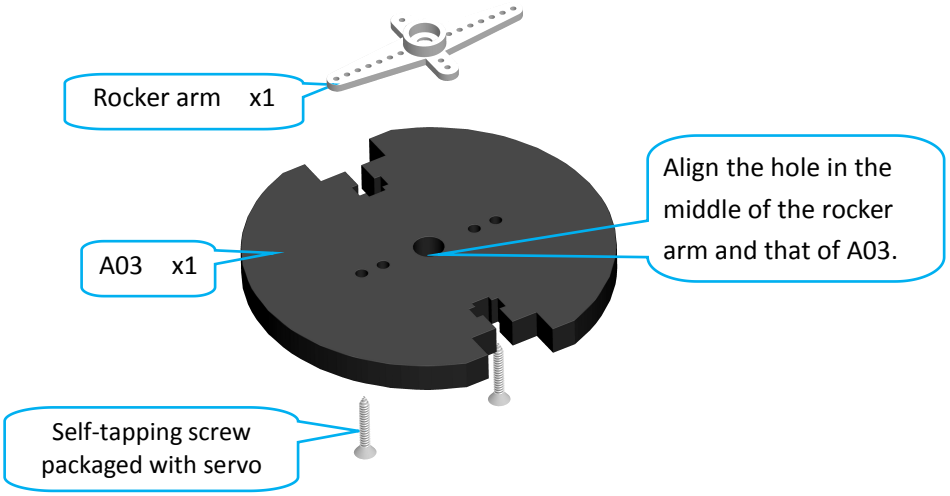


Assemble the other rear wheel.

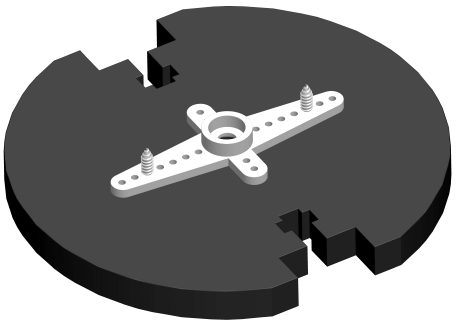
Effect diagram after assembling



K. Take out a rocker arm and fasten it onto A03.

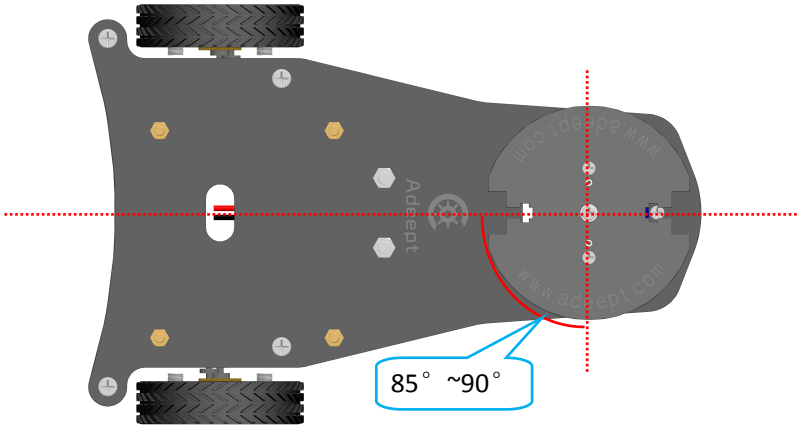


Effect diagram after assembling

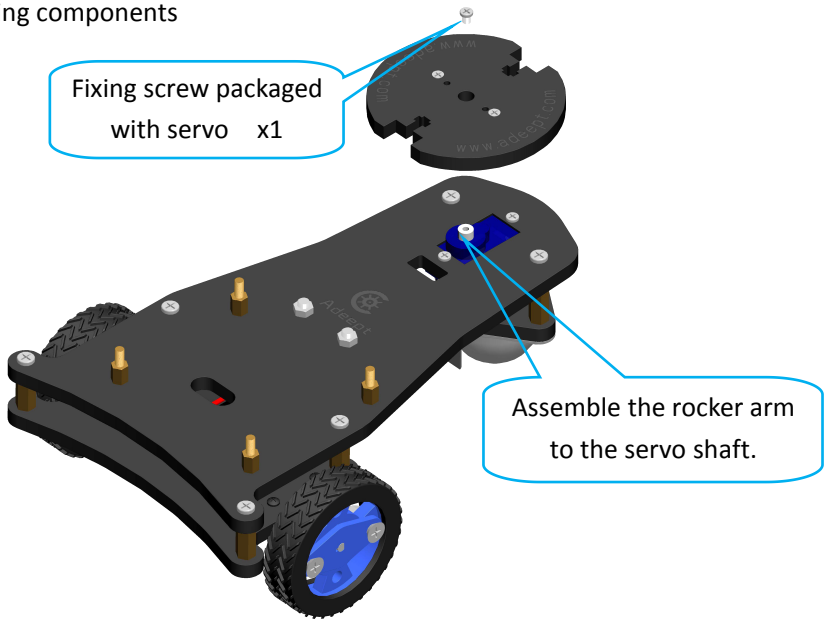


L. Fasten the rocker arm part and the servo on A01.

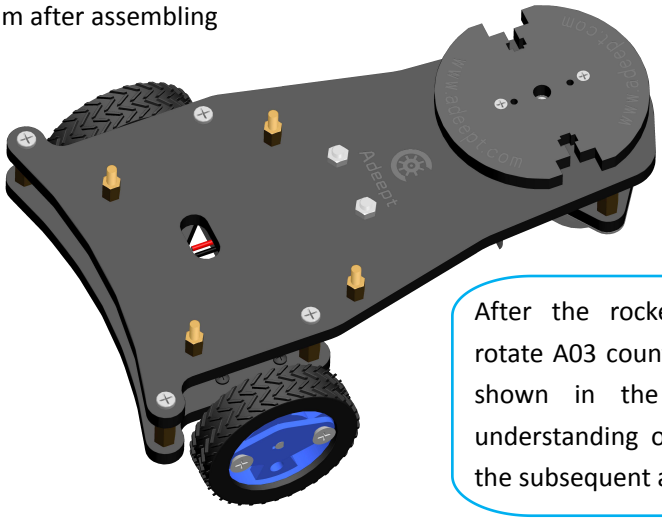
Assemble the servo and rocker arm after making sure the servo has been adjusted correctly before. Now the servo and A01 are fixed. Refer to the position of A03 and A01 for the angle between the servo and the arm, as shown below.



Assemble the following components

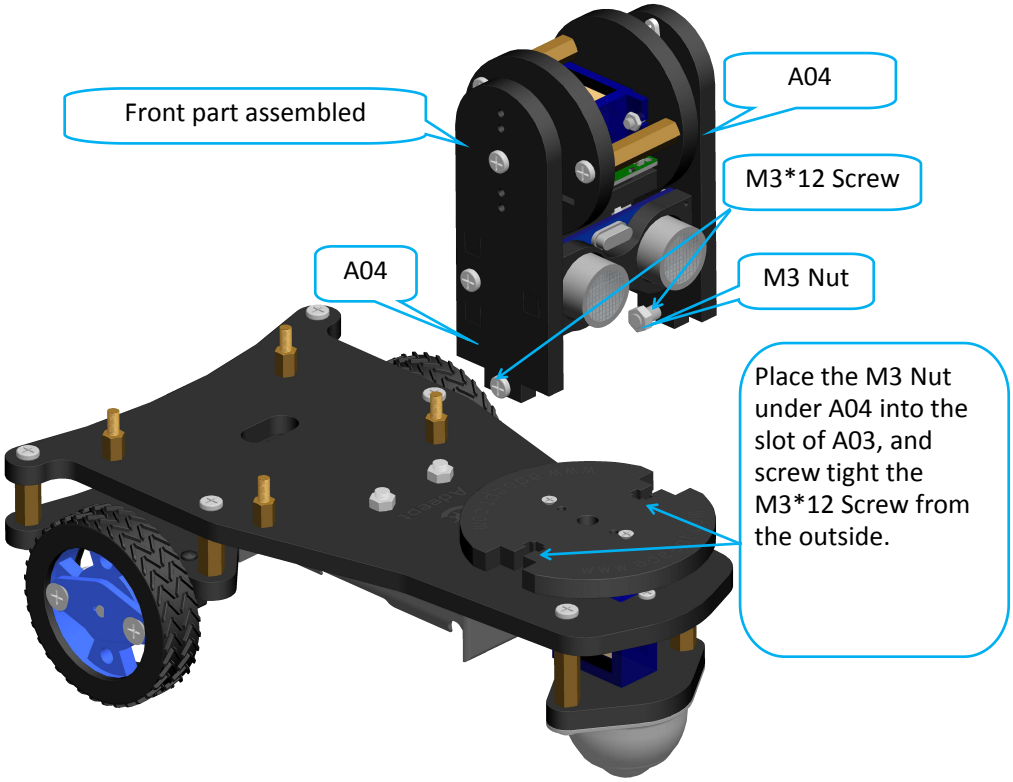


Effect diagram after assembling

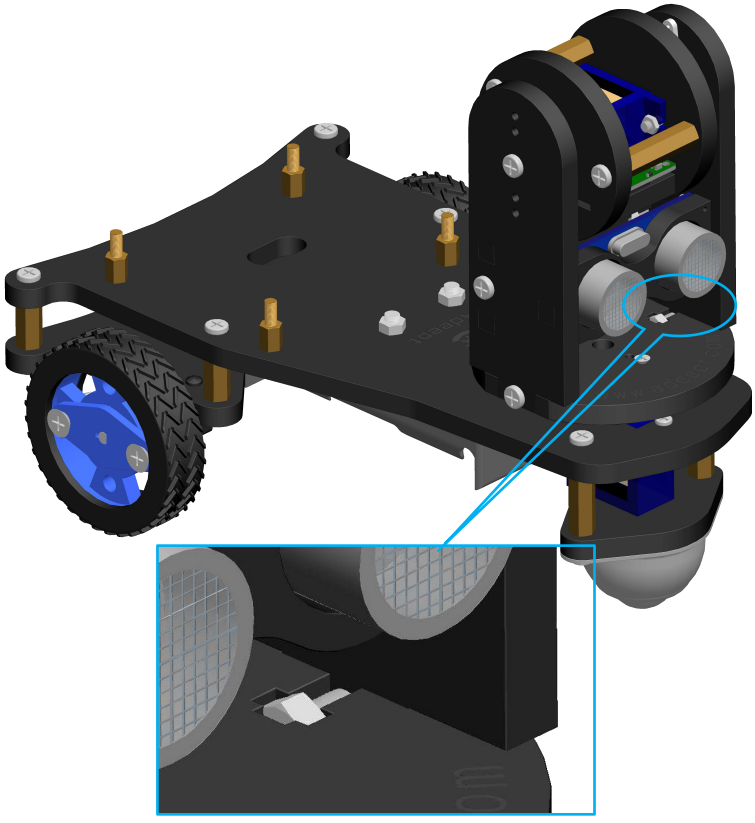


M. Fasten the front part of the car to A03.

Assemble the following components

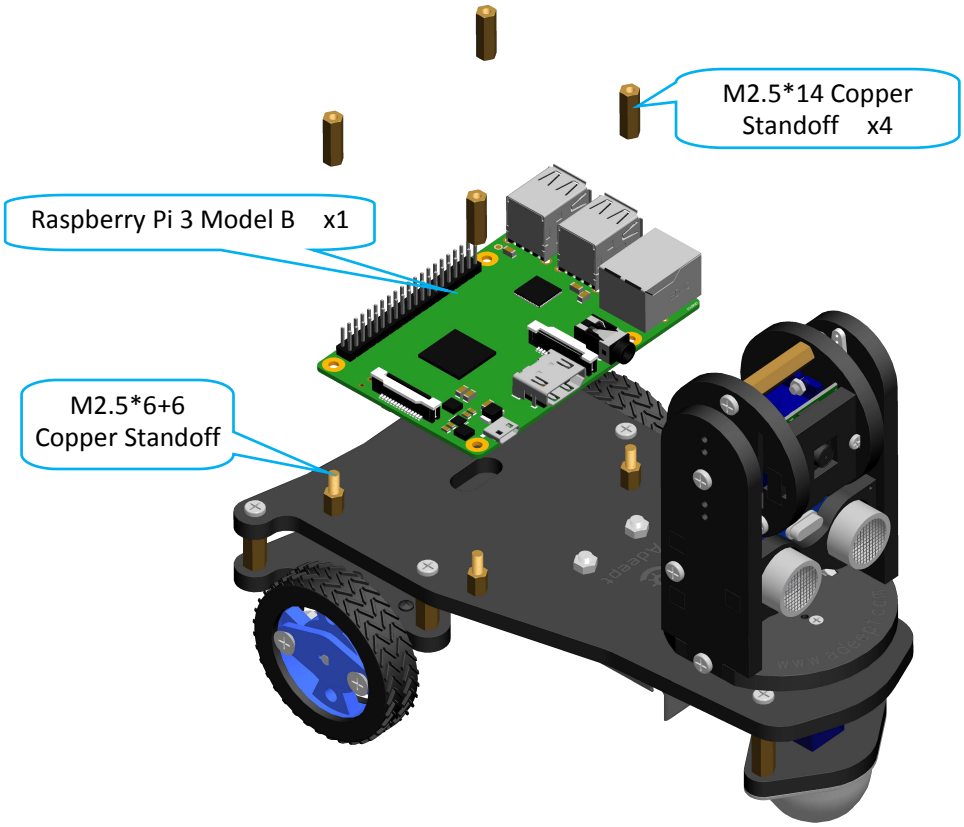


Effect diagram after assembling

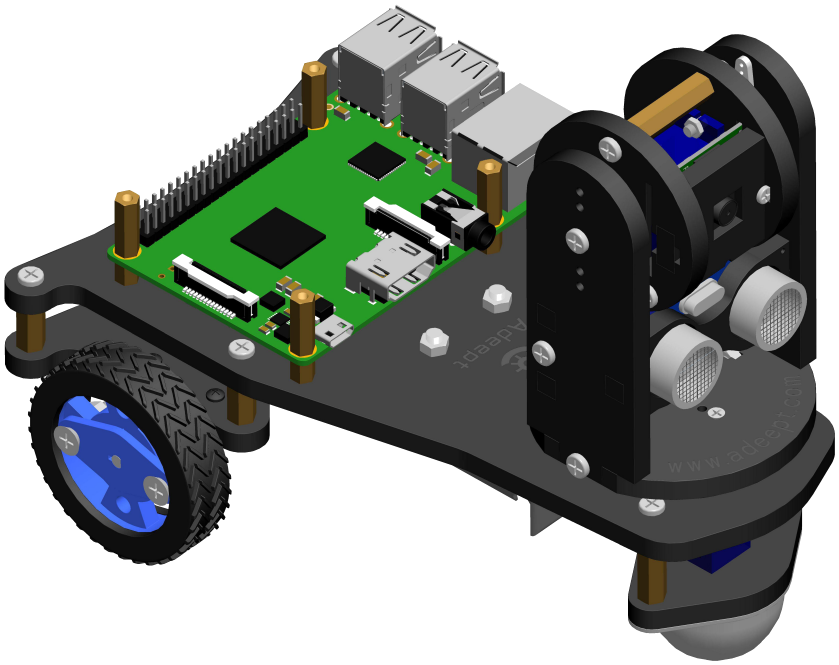


N. Fasten Raspberry Pi 3 Model B and the M2.5*6+6 Copper Standoffs.

Assemble the following components

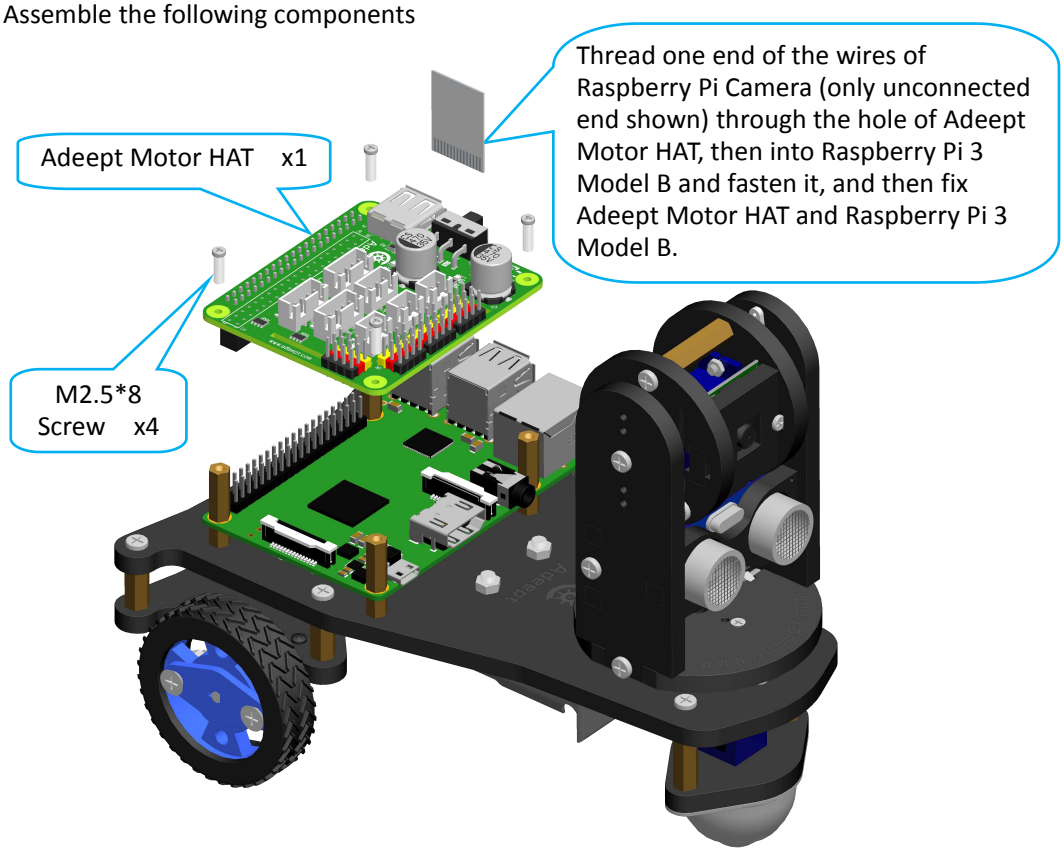


Effect diagram after assembling

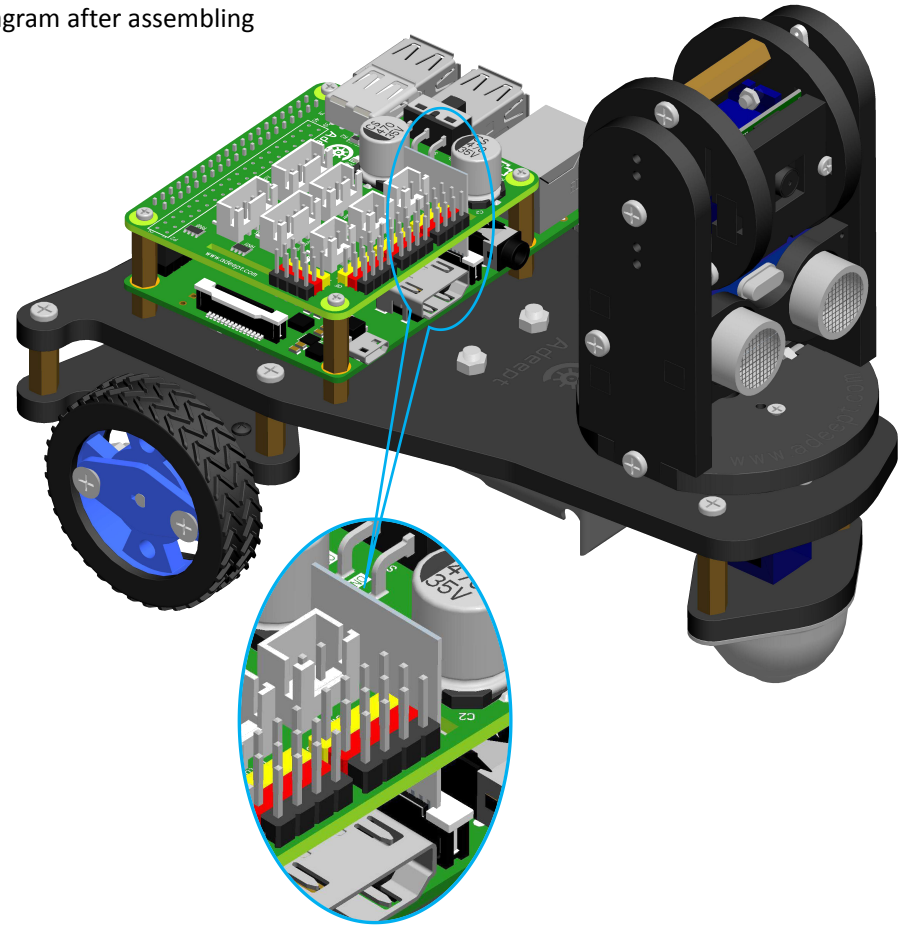


O. Place the Adeept Motor HAT onto the Raspberry Pi.

Assemble the following components

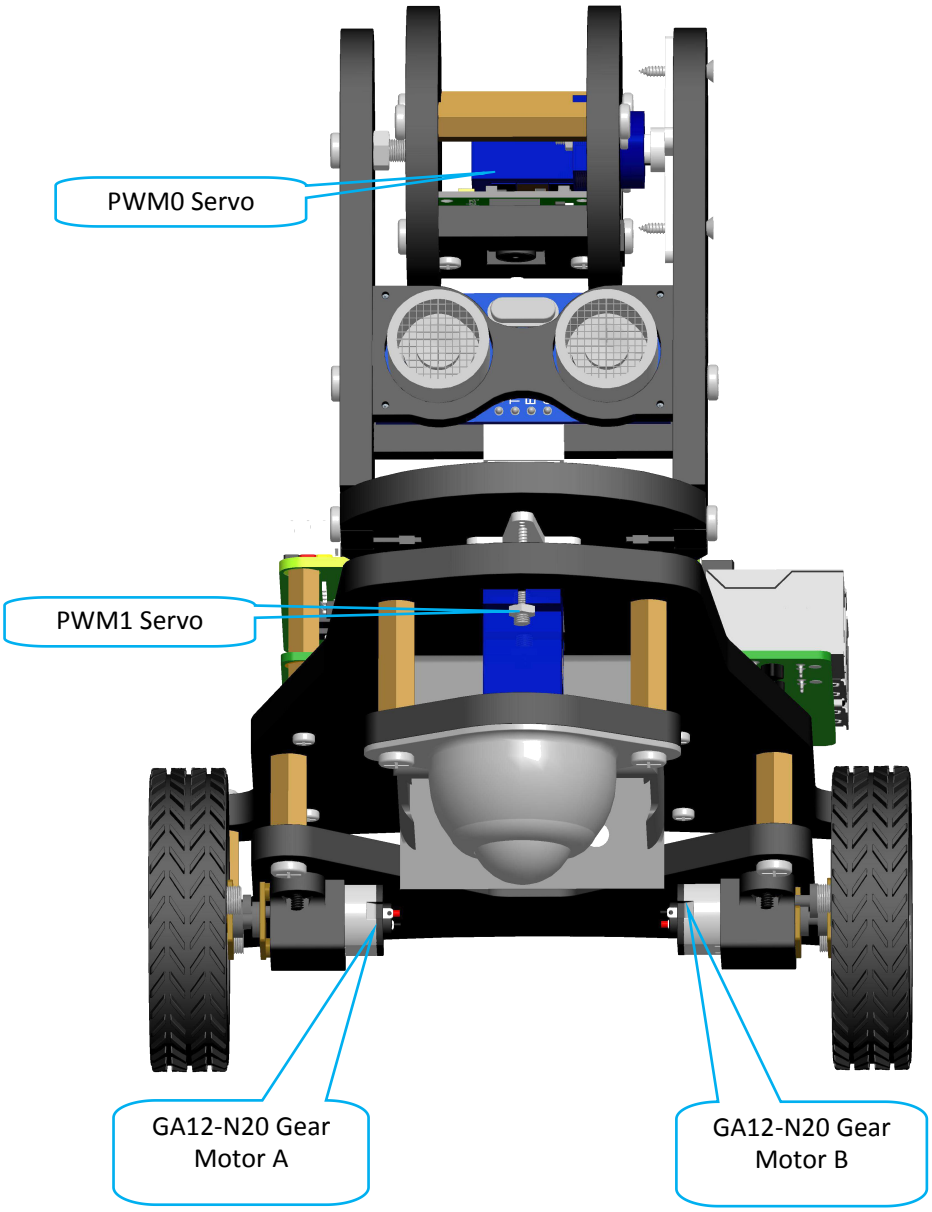


Effect diagram after assembling



4.Circuit Connection

Number the two servos and GA12-N20 Gear Motors.

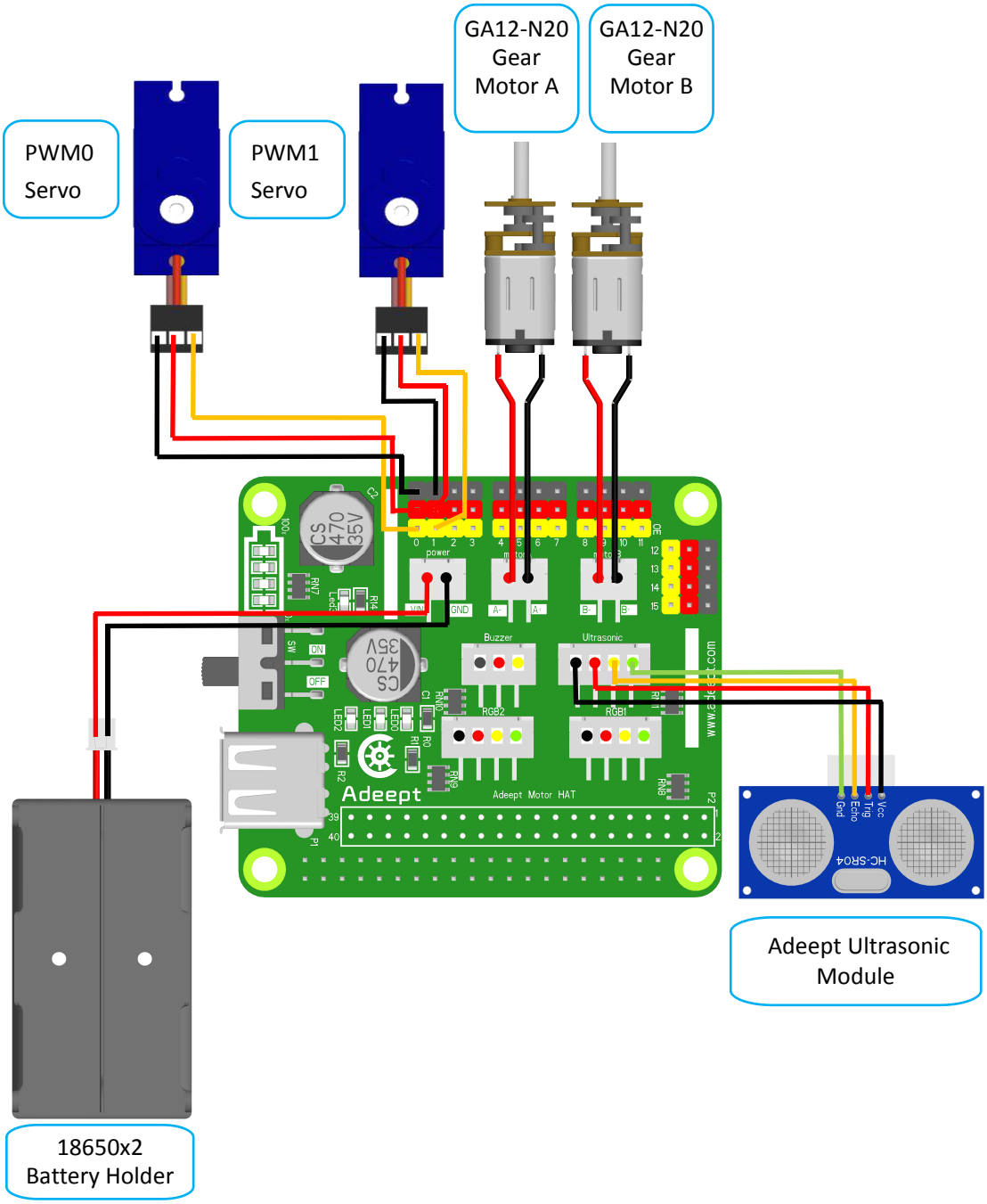


Then connect the circuits.

Connect components based on the figure。

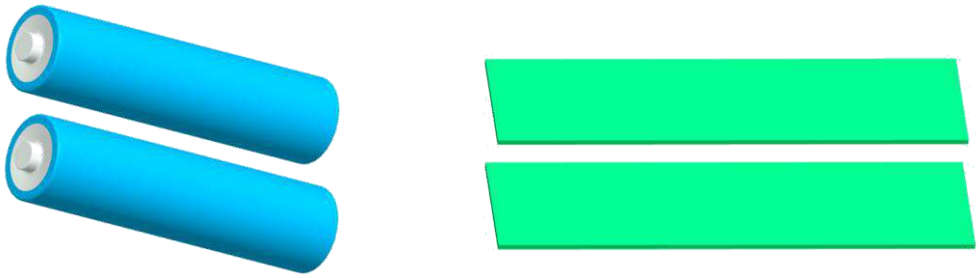
Pay attention to match the wire and port and not connect inversely.

Plug the power wire of PWM0 Servo into port PWM0, power wire of PWM1 Servo into port PWM1, and colors of wire should be consistent with that of the port.

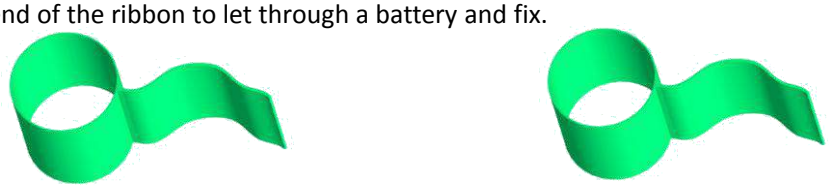


5.Install and Remove Batteries

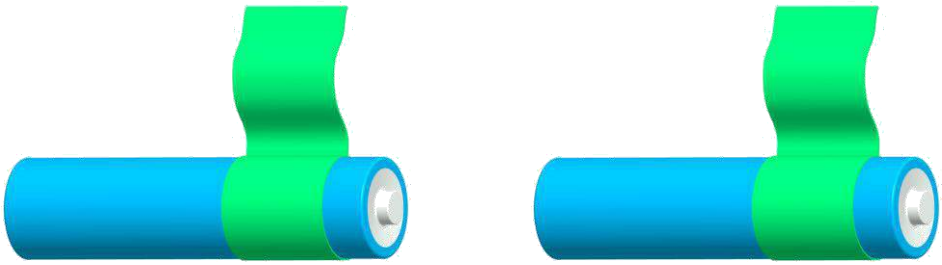
Take out 2 ribbons and 2 batteries.



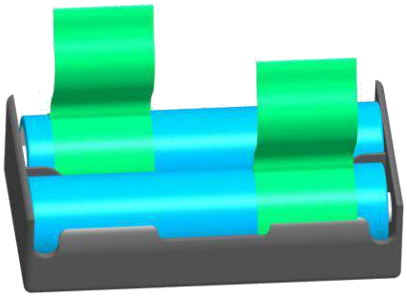
Roll one end of the ribbon to let through a battery and fix.



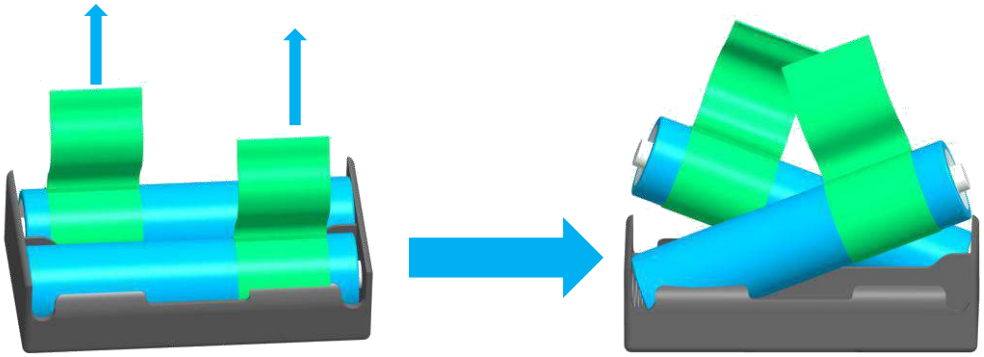
Insert the batteries into the rings-ribbon closer to the anode.

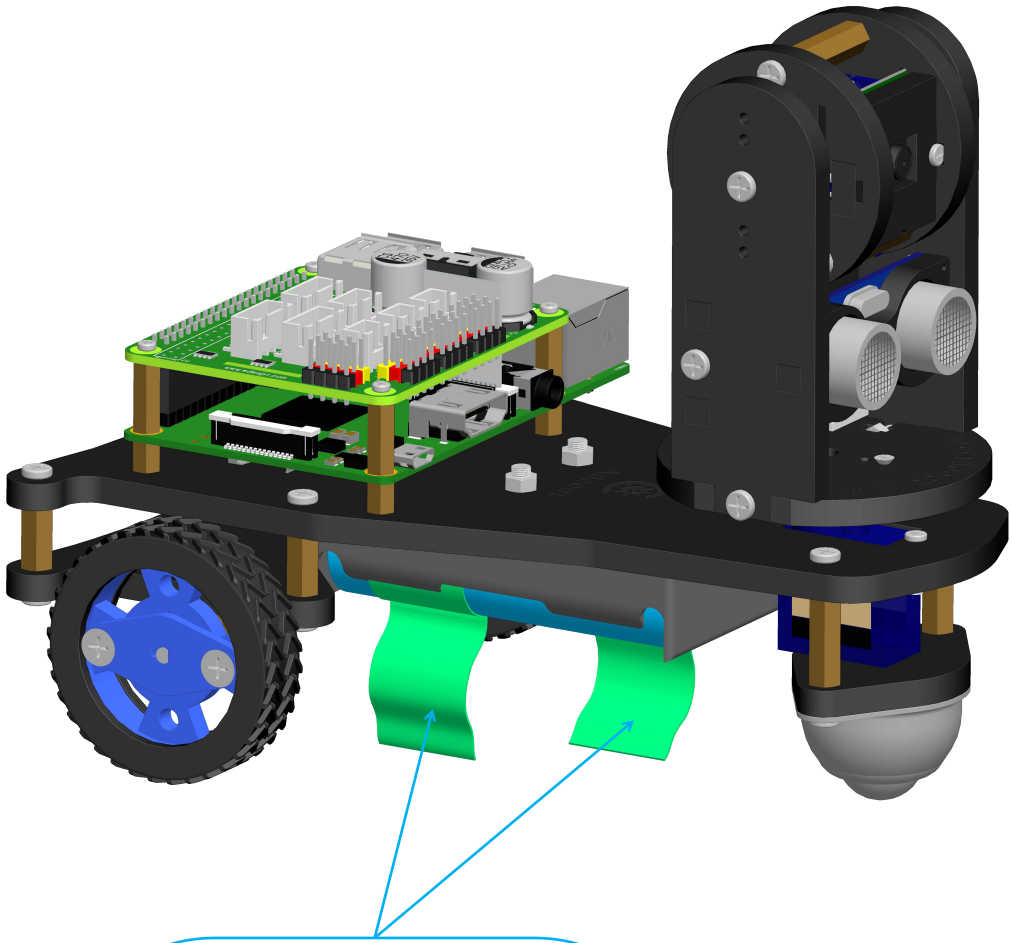


Install the batteries into the holder based on the pole.



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





Note: The extra part of the ribbon should not be left too long, in case it's drawn into the servo shaft causing the battery to be removed and motor burnt.

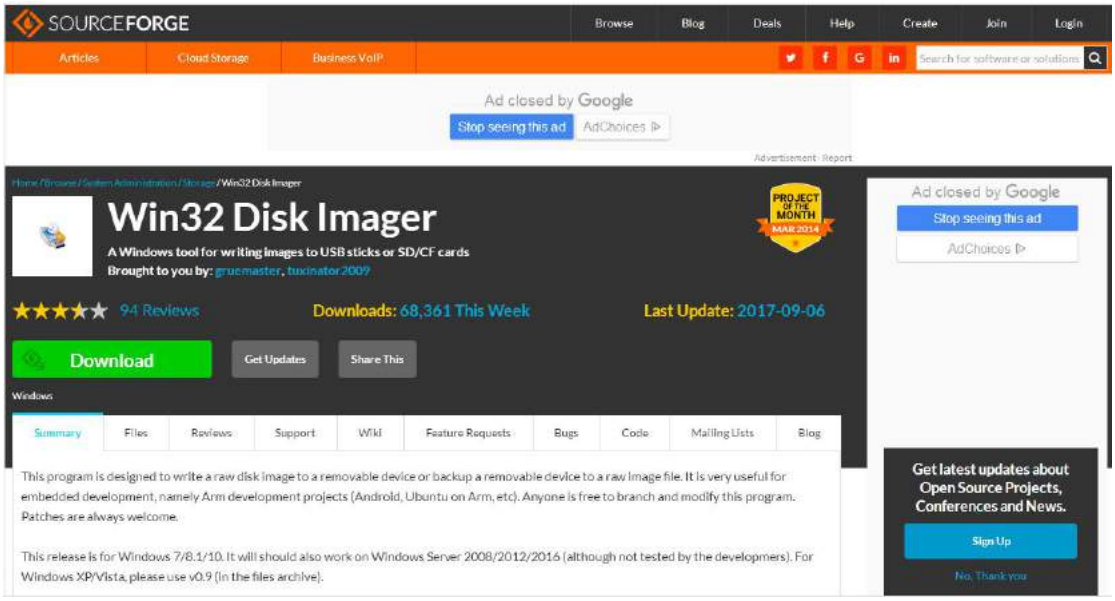
6.Software & Hardware

6.1.Software Installation

Install the Raspbian Operating System

First, install the operating system for the Raspberry Pi. The official operating system, Raspbian, is recommended. If you've finished the installation and the system works well, you may skip this step.

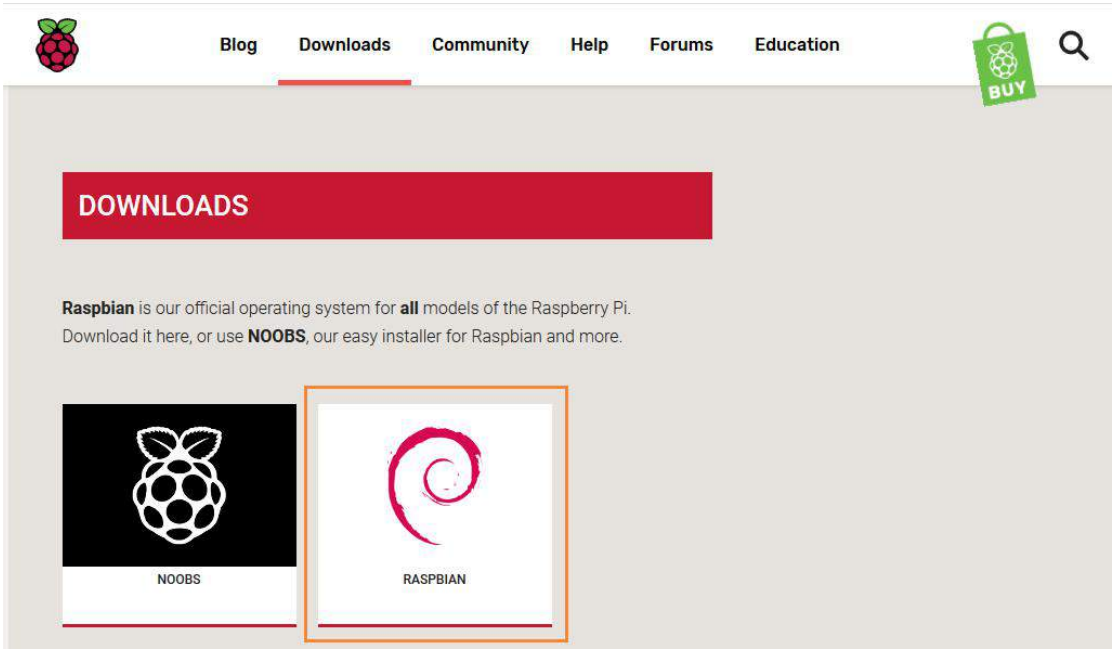
You need to download the Win32 Disk Imager and burn the system to the SD card.
Download the Win32 Disk Imager at:
https://sourceforge.net/projects/win32diskimager/

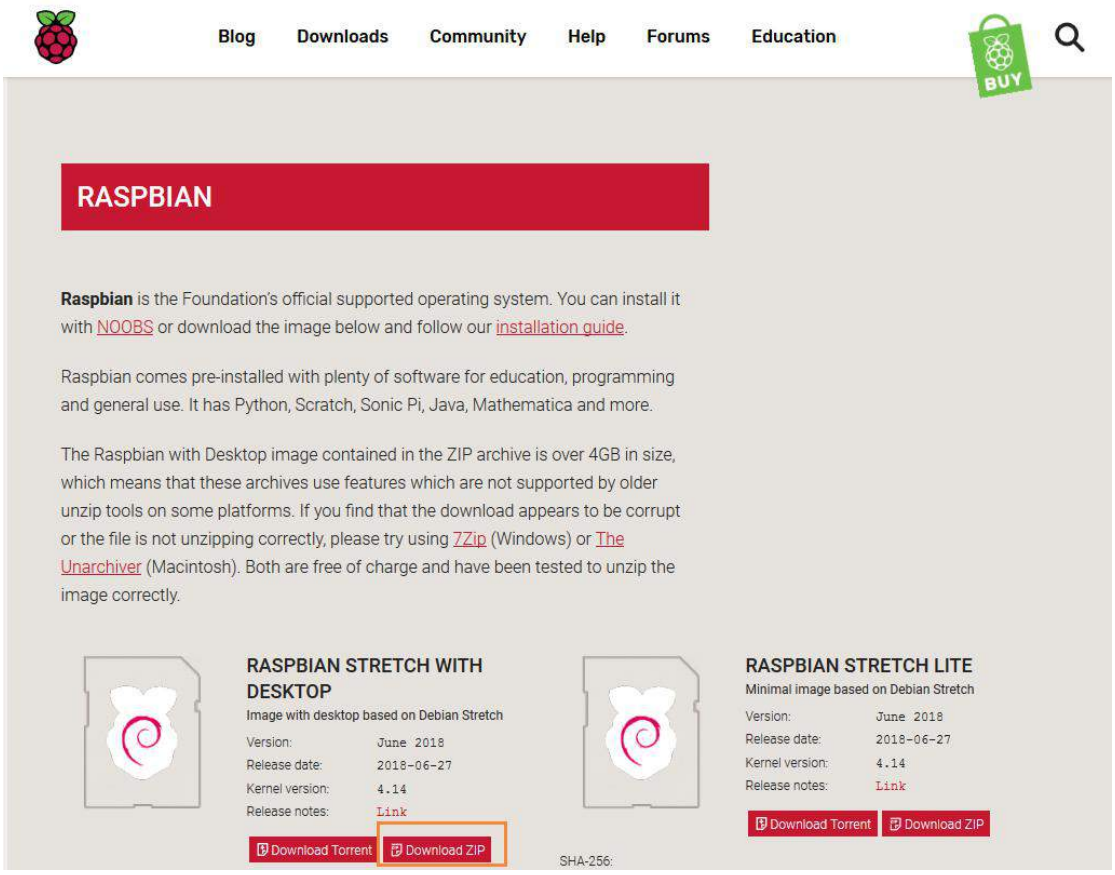


Download the Raspbian Operating System Image:

Go to Raspberry Pi official website:
https://www.RaspberryPi.org/

Click though **Download->Raspbian**. Raspbian is suitable for novice since it's supported by Raspberry Pi and based on Linux.



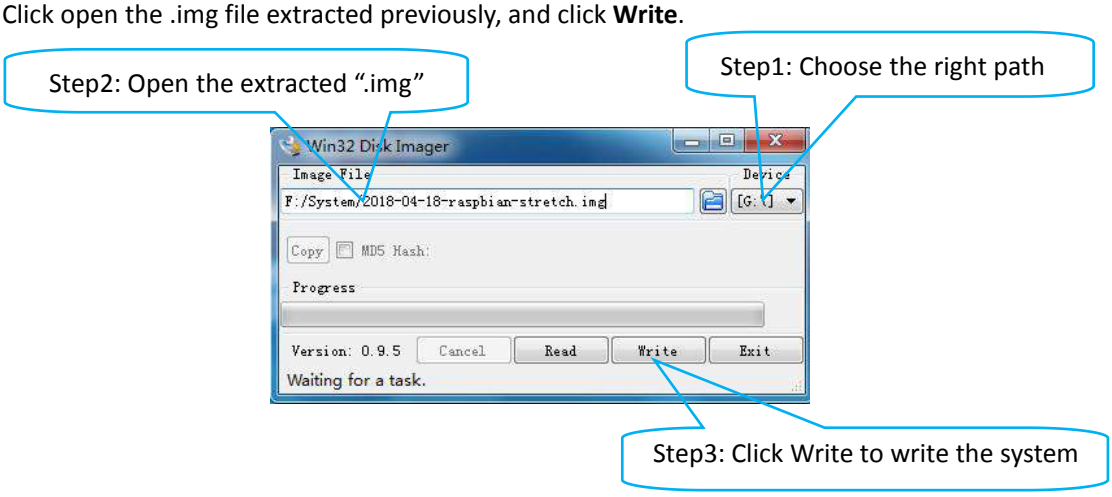


After downloaded, unzip it for later SD card system creation.

Write Raspberry Pi Operating System Image file to SD Card

First of all, insert the SD card into the card reader and connect it to the USB port of the computer. Open the **Win32 Disk Imager** and choose the path of the SD card (here it's Disk G).

Click open the .img file extracted previously, and click **Write**.



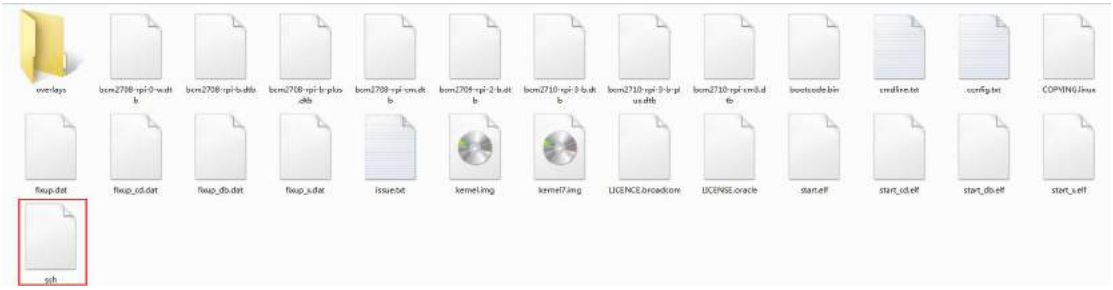
Display the Filename Extension(suffix)

For some operations, you may need to change the filename extension (suffix). In some Windows systems, they are hidden by default and you need to make the setting. You may search on the Internet by yourself for how to display the filename extension (suffix) in your own system.

For example, in Windows 7, you may go to **My Computer** ->**Organization** ->**Folder and Search**->**View**, and uncheck the **Hide extensions for known file types**.

Enable SSH

Keep the SD card connected with the computer. Open the boot directory of the card and create a file named ssh without any suffixes.



Setup WiFi

Under the boot directory of the SD card, create a file wpa_supplicant.txt and write the following contents into the file:

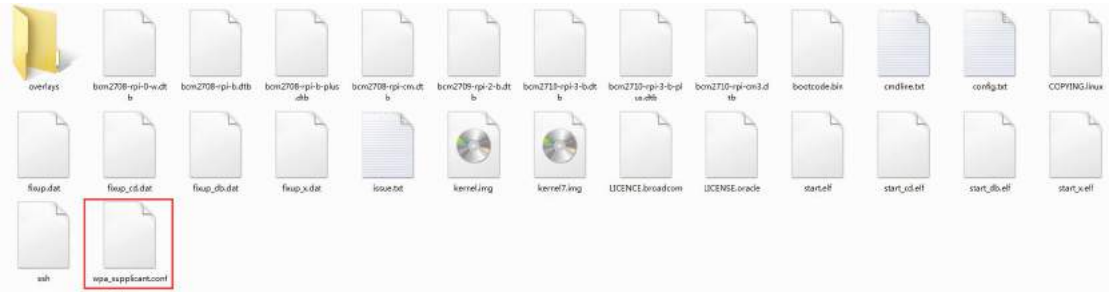
```
country=US
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
ssid="WIFI"
psk="PASSWORD"
key_mgmt=WPA-PSK
priority=1
}
```

```
country=US
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
ssid="WIFI"
psk="PASSWORD"
key_mgmt=WPA-PSK
priority=1
}
```

In the code above, replace **WIFI** with your own WiFi SSID name and **PASSWORD** with your password for the WiFi network. Save the file and change the name of the file wpa_supplicant.txt into wpa_supplicant.conf.



* Make sure MAC filtering has been turned off for the router.
* The WPA-PSK behind key_mgmt= is the common encryption method for most routers. If the network connection fails, you may log in and check on the router management page.
* For more about the network connection for Raspberry Pi, please visit the related page via this link:
  https://www.raspberrypi.org/forums/viewtopic.php?t=203716

The two files newly created are as shown below:

Download and Install PuTTy

PuTTy is a software that connects with the Raspberry Pi via ssh. With the tool, you may control the Raspberry Pi by the computer.

Download:

https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html


The installer packages above will provide all of these (except PuTTYtel), but you can download them one b

(Not sure whether you want the 32-bit or the 64-bit version? Read the FAQ entry.)

putty.exe (the SSH and Telnet client itself)

32-bit:	putty.exe	(or by FTP)	(signature)
64-bit:	putty.exe	(or by FTP)	(signature)

pscp.exe (an SCP client, i.e. command-line secure file copy)

32-bit:	pscp.exe	(or by FTP)	(signature)
64-bit:	pscp.exe	(or by FTP)	(signature)

psftp.exe (an SFTP client, i.e. general file transfer sessions much like FTP)

32-bit:	psftp.exe	(or by FTP)	(signature)
64-bit:	psftp.exe	(or by FTP)	(signature)

puttytel.exe (a Telnet-only client)

32-bit:	puttytel.exe	(or by FTP)	(signature)
64-bit:	puttytel.exe	(or by FTP)	(signature)

plink.exe (a command-line interface to the PuTTY back ends)

32-bit:	plink.exe	(or by FTP)	(signature)
64-bit:	plink.exe	(or by FTP)	(signature)

pageant.exe (an SSH authentication agent for PuTTY, PSCP, PSFTP, and Plink)

32-bit:	pageant.exe	(or by FTP)	(signature)
64-bit:	pageant.exe	(or by FTP)	(signature)

Acquire Raspberry Pi's IP Address

Install the 18650 batteries and switch on the car.

Method A: Log in to the router management page on the computer to check the address of the Raspberry Pi.

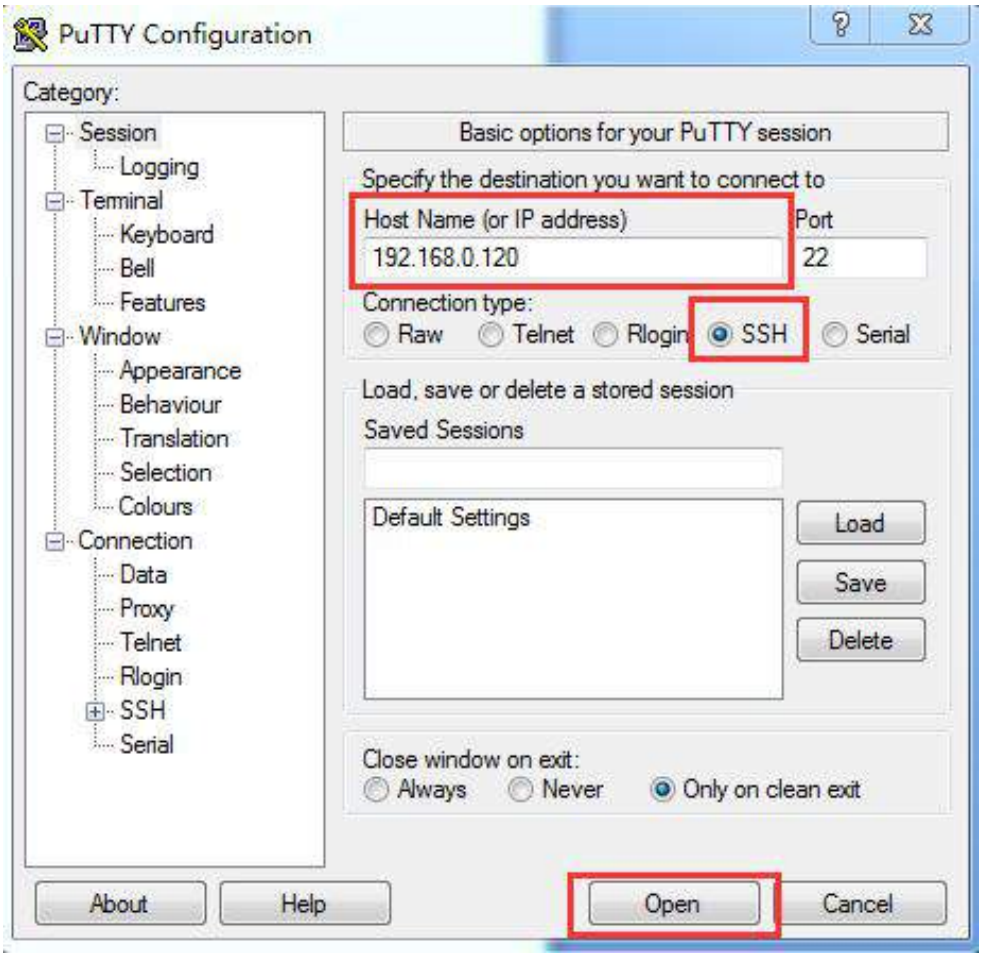
Method B: Download the **Network Scanner App** to check the address.

The address with "Raspberry" is that of the Raspberry Pi.

* The name of the router that the computer or mobile connects should be consistent with that of the WiFi in the file wpa_supplicant.conf written to the root directory of the SD card in the Raspberry Pi.

Connect the Raspberry Pi and Computer

Open PuTTY, enter the IP address of the Raspberry Pi in **Host Name (or IP address)** and click **Open**.



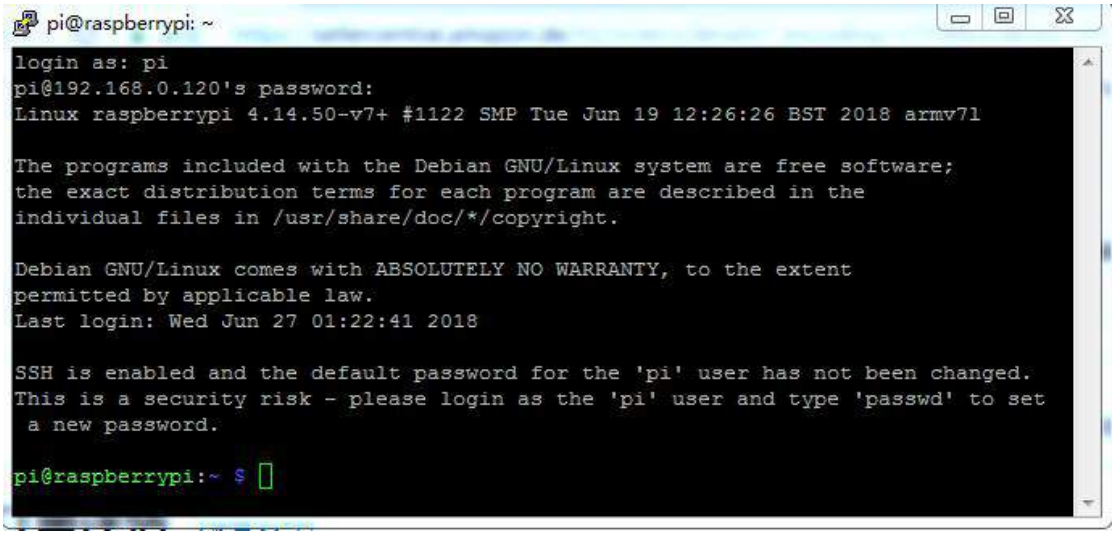
If a warning window prompts, click **Yes**.

Then a terminal will pop up. The default account is pi.

The password for login is “raspberry” by default.

* When you typing in the password, nothing will appear on the screen but it does not mean no input. Type in the password carefully and press **Enter** after it's done.

Log in successfully.



Change ordinary user into root user on the terminal

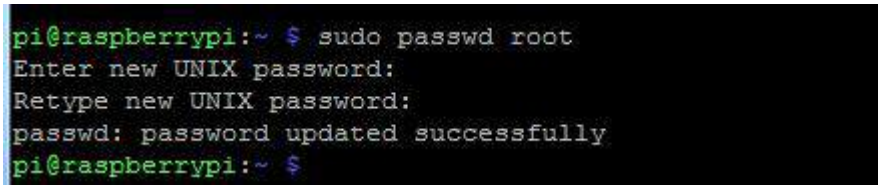
Prior to login as root user, you need to setup a password for the root user.

You may set the password as you prefer.

Enter the following command in the terminal of the RPi:

sudo passwd root

Enter the password twice, as shown below:

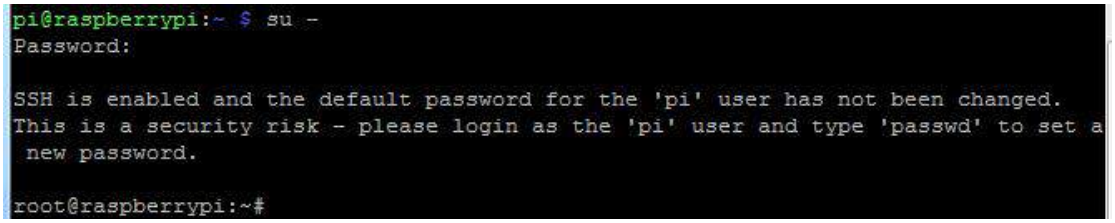


Log in as root user after setting the password.

Type in the following command in the terminal of the Raspberry Pi:

su -

Press **Enter**, and type in the password to confirm.



Update System

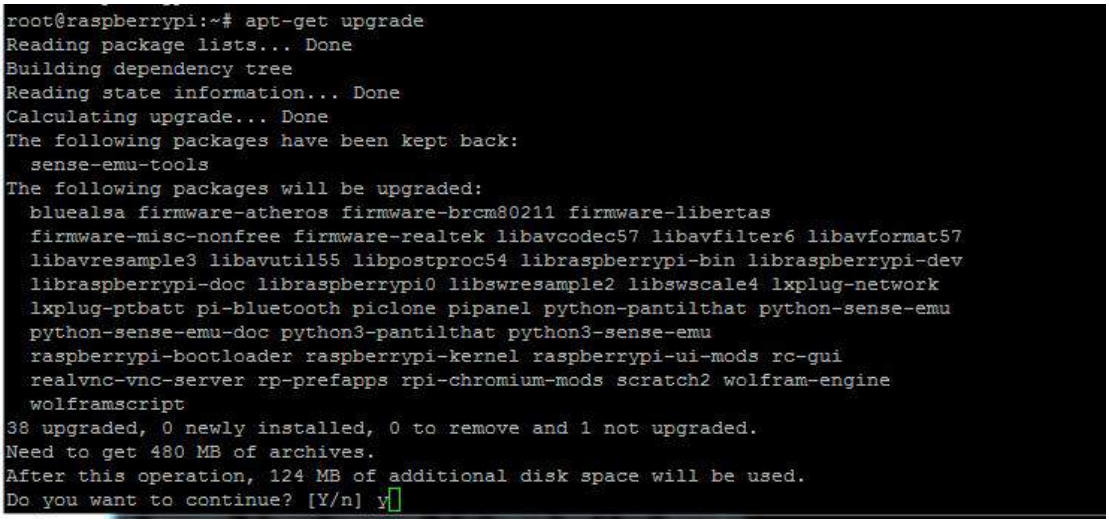
The system you downloaded may not be the latest version and it may cause inconvenience in the subsequent operations. Here we first upgrade the system of the Raspberry Pi. Type in the following command:

sudo apt-get update

The apt-get update command is to acquire the up-to-date software lists and update all the

software, so as to provide the latest software for next system upgrade.

sudo apt-get upgrade



The window will prompts "Do you want to continue", type in **Y** and press **Enter**.

It may take some time for the system upgrade. During this period, do not carry out any operations with the Raspberry Pi until it's done.

In this process, you may continue reading the following contents to download the Python 3.7and the VLC player under the Windows system.

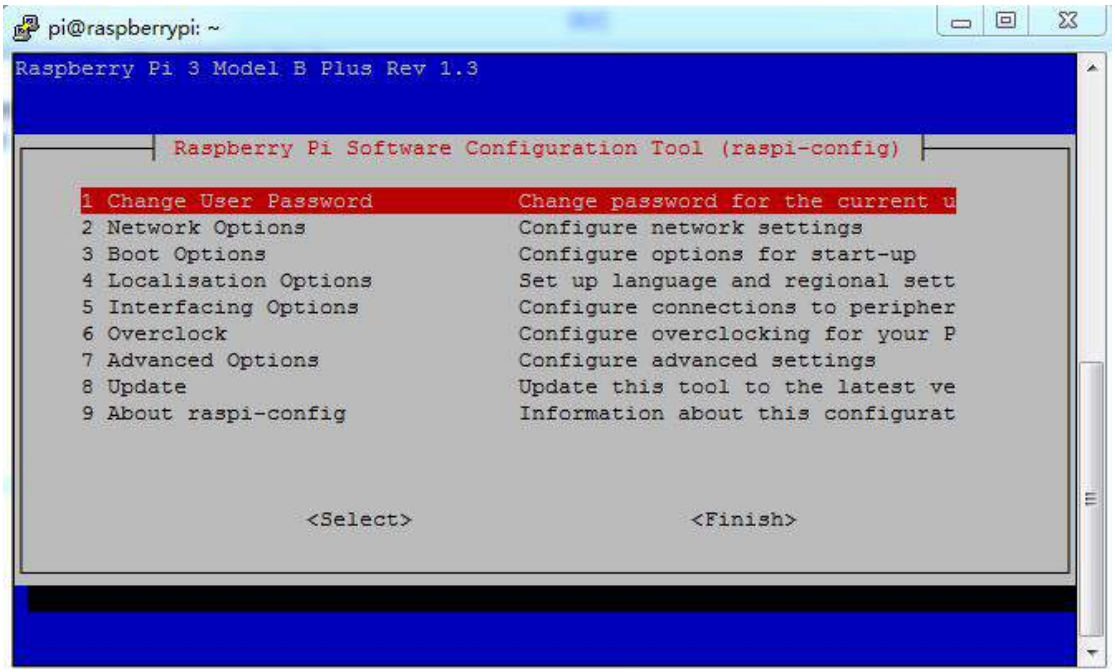
Enable I2C and Camera

After the Raspberry Pi is updated, you may continue operations on it.

The servo drive IC – PCA9685 on the Adeept Motor HAT V1.0 communicates with the Raspberry Pi via the I2C interface, but the I2C interface is disabled by default. You need to enable it:

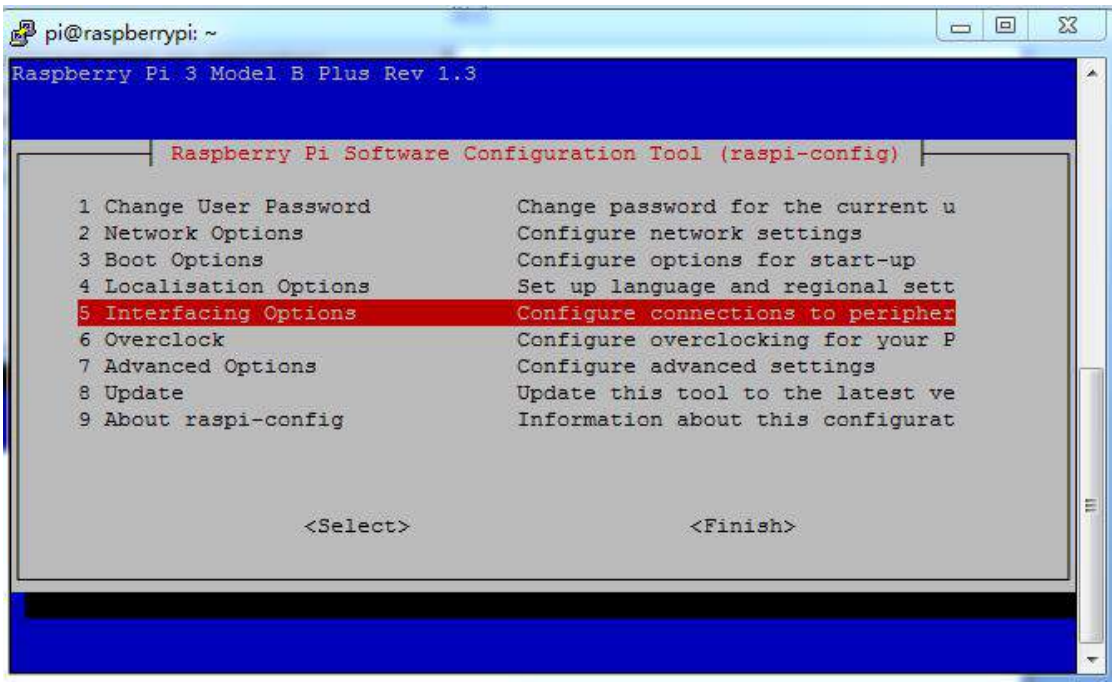
sudo raspi-config

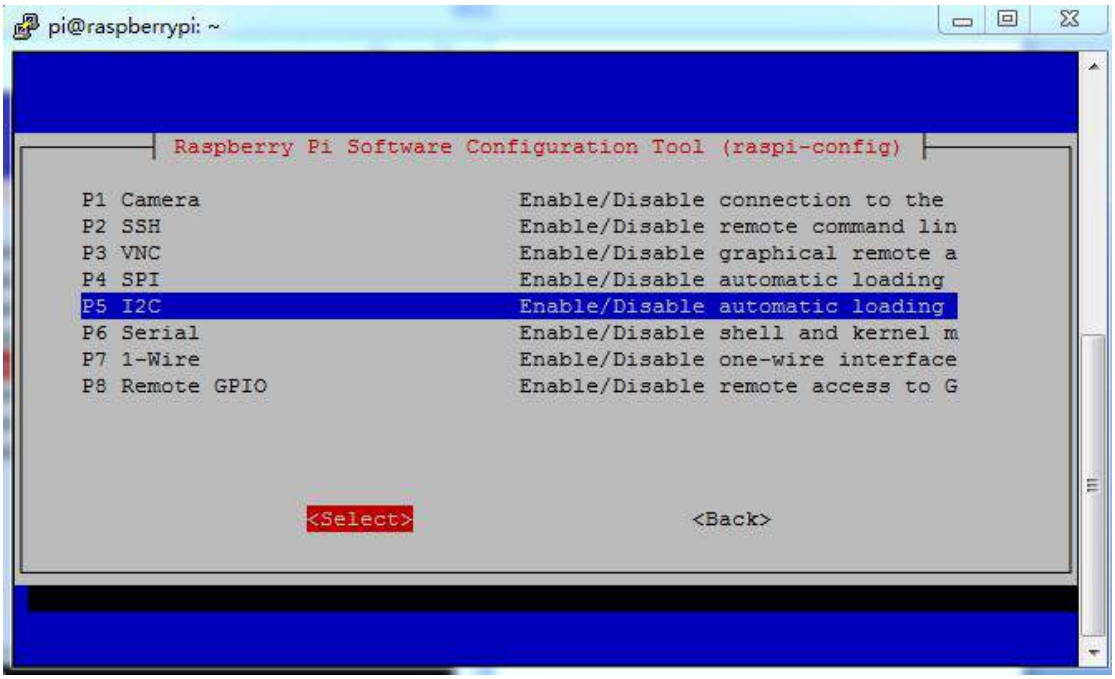
A window will pop up.

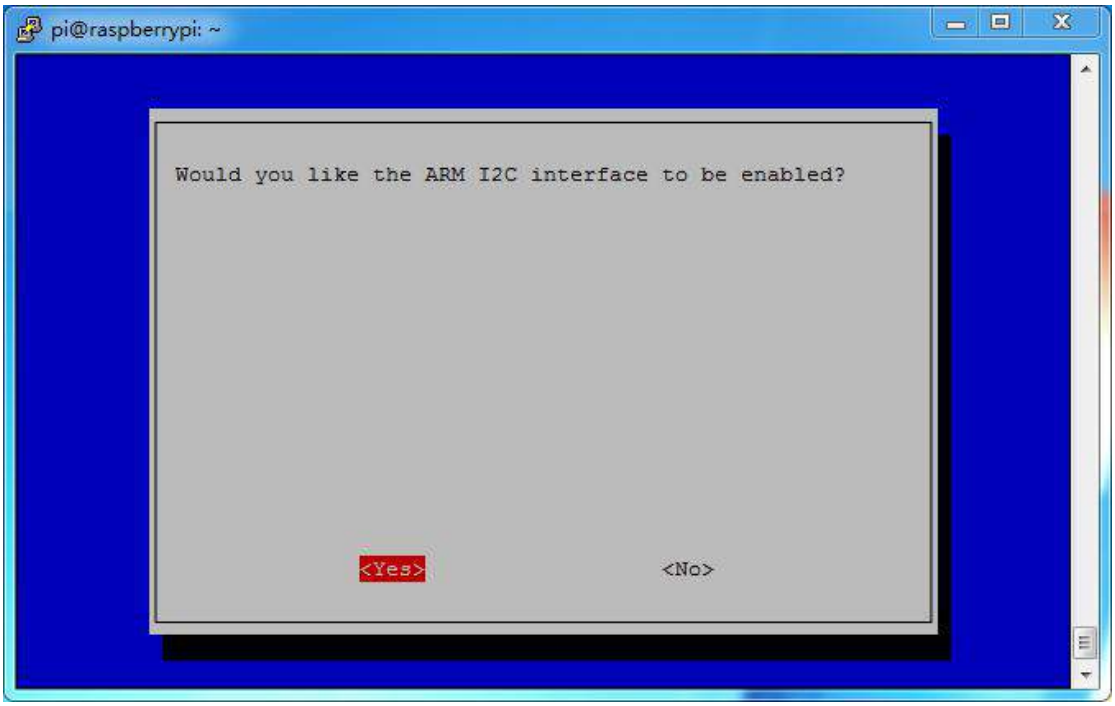


Use key up and down to select menu and sub-menu:

5 Interfacing Options->P5 I2C->Yes->OK->Finish




pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
P1 Camera Enable/Disable connection to the
P2 SSH Enable/Disable remote command lin
P3 VNC Enable/Disable graphical remote a
P4 SPI Enable/Disable automatic loading
P5 I2C Enable/Disable automatic loading
P6 Serial Enable/Disable shell and kernel m
P7 1-Wire Enable/Disable one-wire interface
P8 Remote GPIO Enable/Disable remote access to G
<Select>
<Back>


pi@raspberrypi: ~
Would you like the ARM I2C interface to be enabled?
<Yes>
<No>

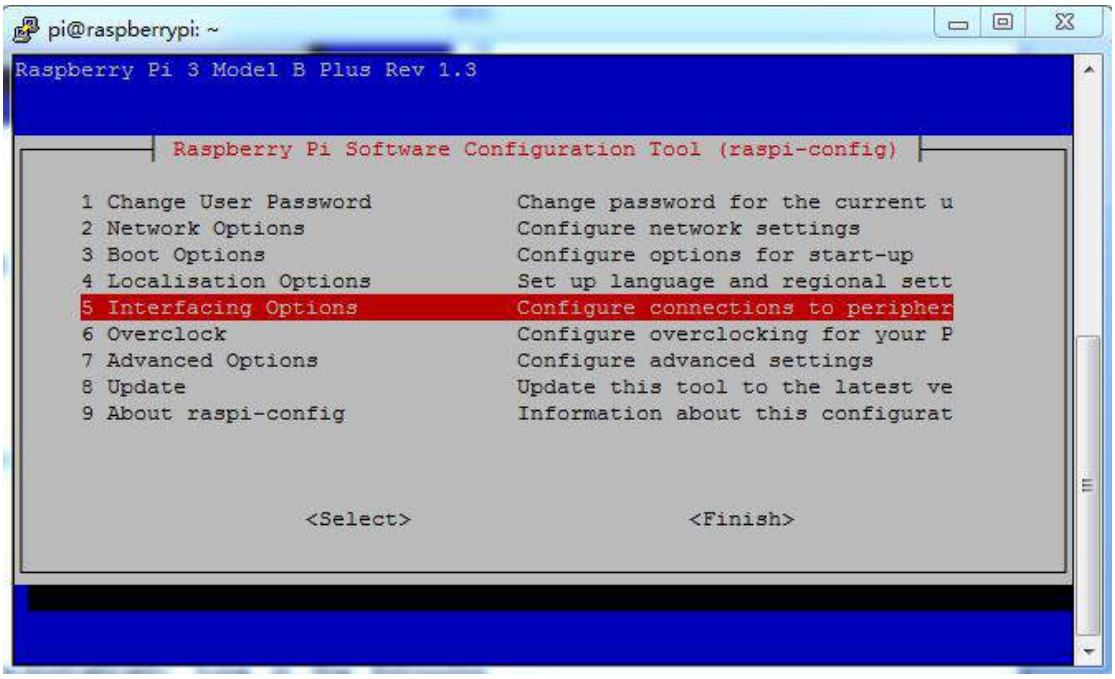
Enable Raspberry Pi's Camera

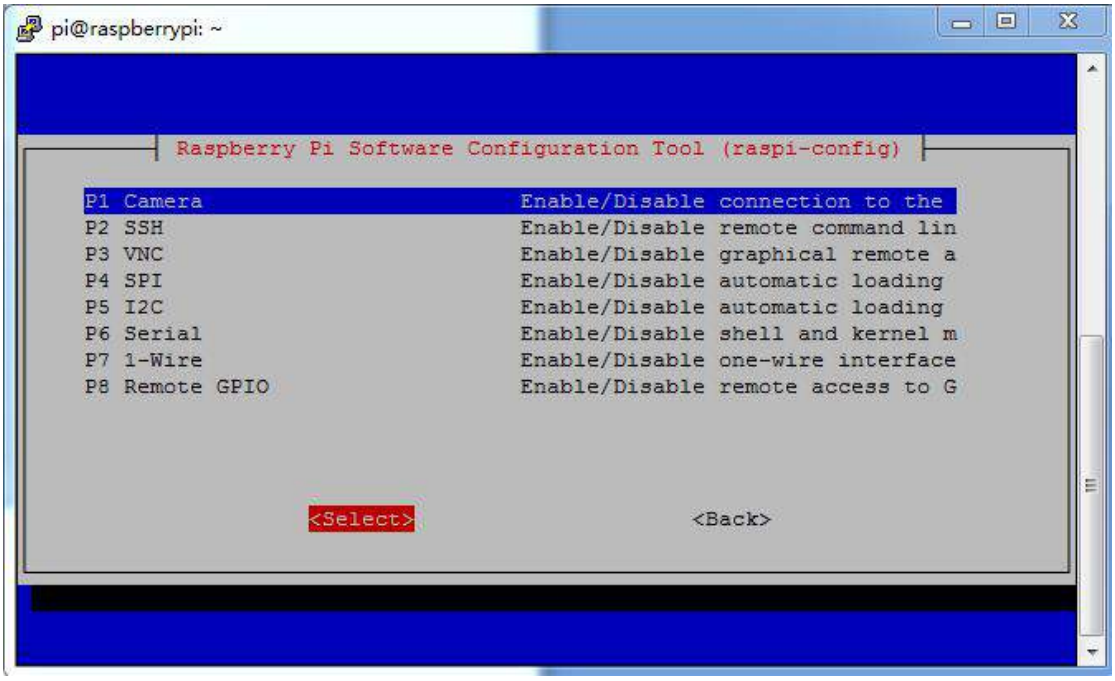
By default, the camera of the Raspberry Pi is disabled. You need to enable it for use. Open the Raspi-Config:

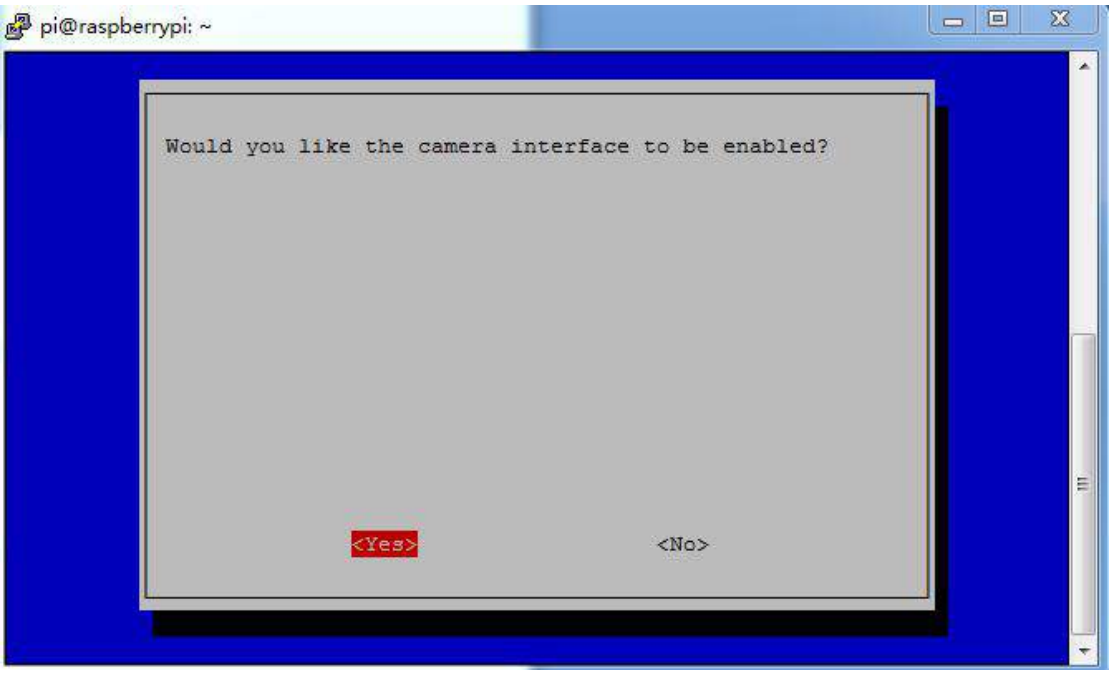
sudo raspi-config

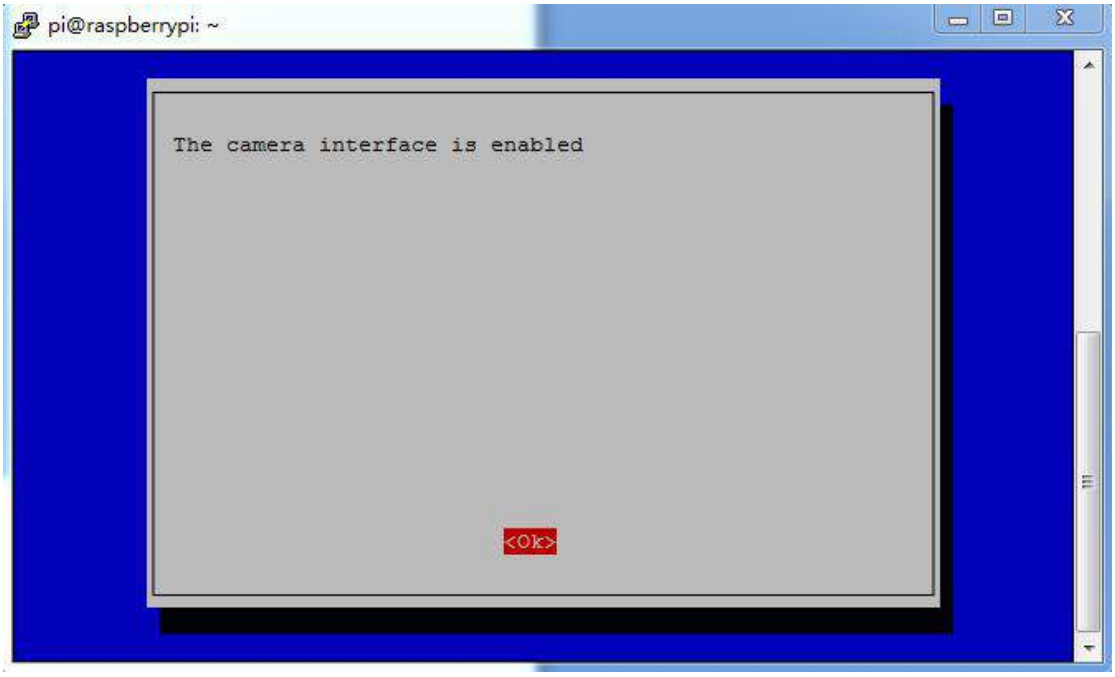
Use key up and down to select menu and sub-menu:

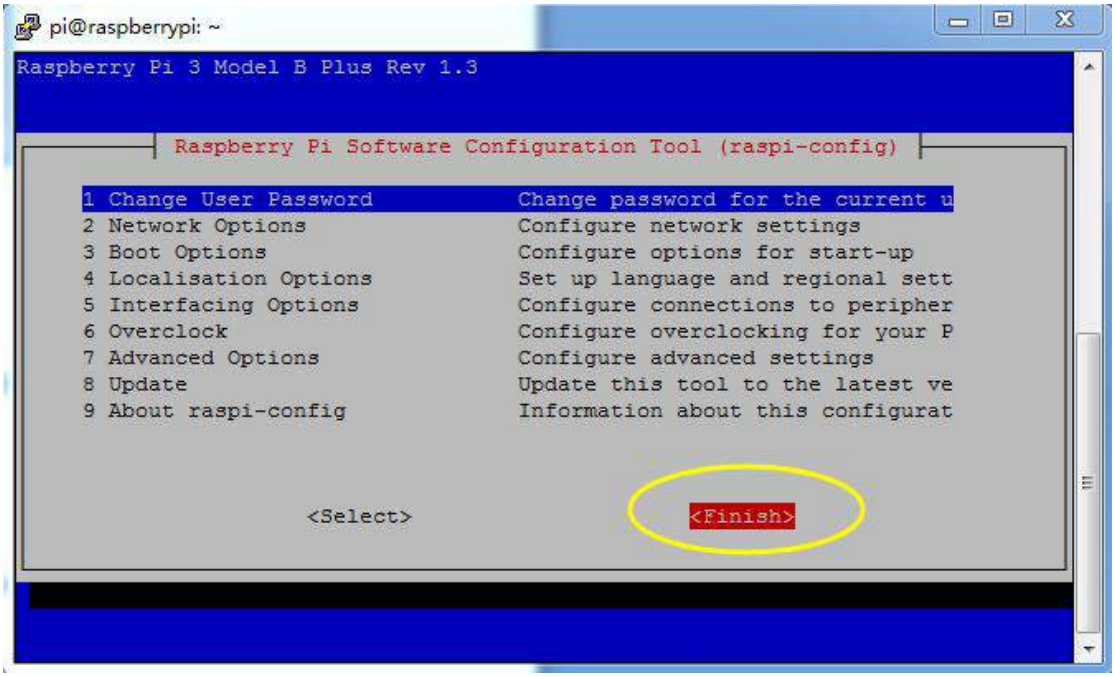
5 Interfacing Options ->P1 Camera ->Yes ->OK ->Finish ->Yes




pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)
P1 Camera Enable/Disable connection to the
P2 SSH Enable/Disable remote command lin
P3 VNC Enable/Disable graphical remote a
P4 SPI Enable/Disable automatic loading
P5 I2C Enable/Disable automatic loading
P6 Serial Enable/Disable shell and kernel m
P7 1-Wire Enable/Disable one-wire interface
P8 Remote GPIO Enable/Disable remote access to G
<Select>
<Back>


pi@raspberrypi: ~
Would you like the camera interface to be enabled?
<Yes>
<No>


pi@raspberrypi: ~
The camera interface is enabled
<Ok>


pi@raspberrypi: ~
Raspberry Pi 3 Model B Plus Rev 1.3
Raspberry Pi Software Configuration Tool (raspi-config)
1 Change User Password Change password for the current u
2 Network Options Configure network settings
3 Boot Options Configure options for start-up
4 Localisation Options Set up language and regional sett
5 Interfacing Options Configure connections to peripher
6 Overclock Configure overclocking for your P
7 Advanced Options Configure advanced settings
8 Update Update this tool to the latest ve
9 About raspi-config Information about this configurat
<Select>
<Finish>

If it does not reboot automatically, please type in the following command:

```
reboot
```

Then the I2C and Camera module are both enabled.

After the Raspberry Pi is rebooted, type in the following command to check that the module has been enabled:

```
lsmod | grep i2c
```

If the following contents are shown, it indicates the module is enabled successfully.

```
pi@raspberrypi:~ $ lsmod | grep i2c
i2c_bcm2835            16384  0
i2c_dev                16384  0
pi@raspberrypi:~ $
```

Install I2C-Tools

Install I2C-Tools to check whether the external I2C devices are connected successfully as well as the address of the devices. Type in the command to install:

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

Install the Python drive program for PCA9685:

```
sudo pip install adafruit-pca9685
```

Download Program for the Smart Car

Type in the following commands in the terminal of the Raspberry Pi to download the code:

```
cd /home
```

```
git clone https://github.com/adeept/Adeept_PiCar-A.git
```

```
root@raspberrypi:~#
root@raspberrypi:~# cd /home/
root@raspberrypi:/home# git clone https://github.com/adeept/Adeept_PiCar-A.git
Cloning into 'Adeept_PiCar-A'...
remote: Counting objects: 19, done.
remote: Compressing objects: 100% (18/18), done.
remote: Total 19 (delta 1), reused 14 (delta 0), pack-reused 0
Unpacking objects: 100% (19/19), done.
root@raspberrypi:/home#
```

You may visit our official website:
http://www.adeept.com/

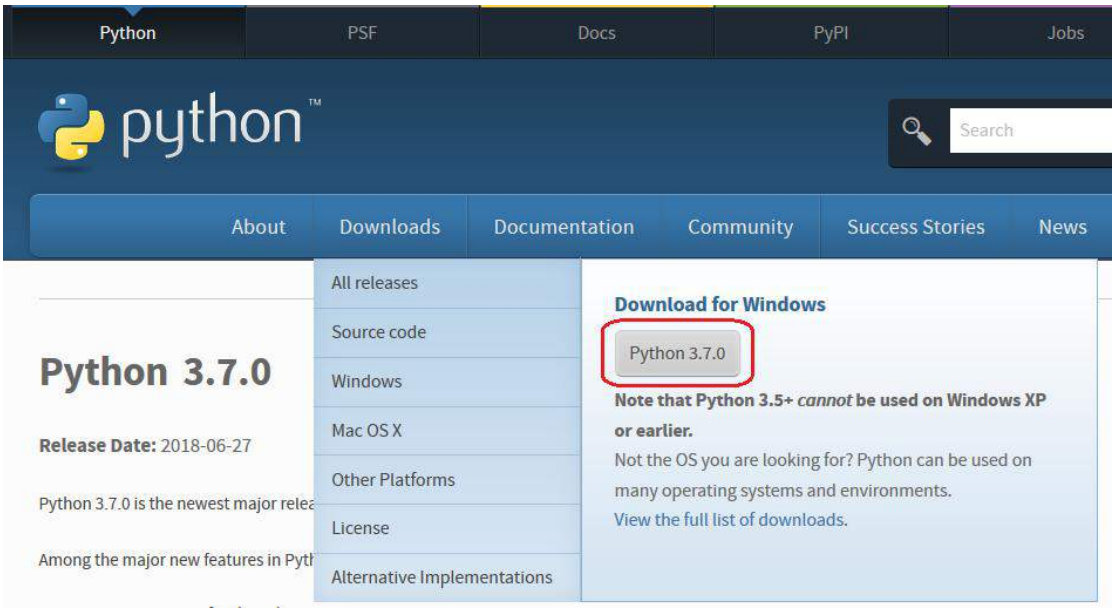
GitHub homepage:
https://github.com/adeept/Adeept_PiCar-A

to download the program.

*You may double click to run the **client.py** under the Windows or run it by command lines. For the latter method, you may place the folder “Client” in the folder “Administrator” on the computer, so you can run it conveniently and do not need to enter a long path.

Install Python3.7 in the PC

So far there are two versions of Python: 2.X and 3.X. The graphical UI of the terminal controller is written in Python 3.7 and it supports multiple platforms. Here we'll focus on the installation of Python 3.7 under Windows.
Download Python 3.7: https://www.python.org/



Click through **Downloads**->**Download Python 3.7.0.**
Install it after download is done. Python will configure the environment variables during the installation.

*Note the 32-bit or 64-bit of your system when downloading Python - choose the corresponding Python version based on your own system.

Install VLC Media Player

VLC Media Player is a streaming media player that we can use to display the images transmitted from the Raspberry Pi in real time. You're recommended to install it to the default path, that is, C:\Program Files (x86); otherwise, you may need to change the responding code in the Python program.

VLC download address 1:

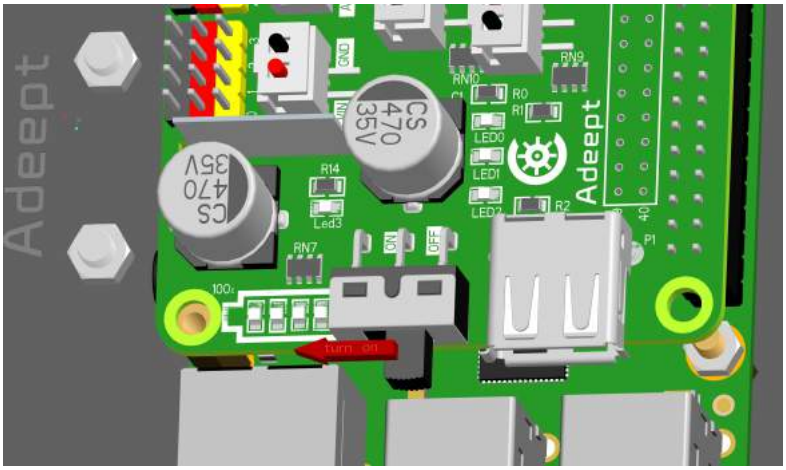
https://www.videolan.org/vlc/

VLC download address 2：

https://download.cnet.com/VLC-Media-Player-64-bit/3000-13632_4-75761094.html

6.2.Run the Car

Power on the Smart Car.



After a while, open PuTTY to build up connection with Raspberry Pi via ssh.

Enter the following commands in the terminal of the Raspberry Pi:

cd /home/Adeept_PiCar-A/server

python server.py

```
pi@raspberrypi:/home/Adeept_PiCar-A/server $ python server.py
dir_mid=385

dis_mid=385

b_spd=50

t_spd=50

left=20

right=20

waiting for connection...
```

The car waits for the PC client to join.

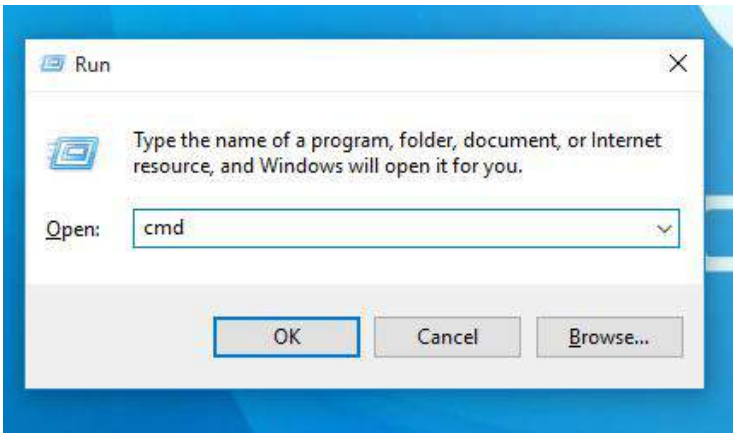
Then implement operations in Windows.

Method A:

Double click to run the file client.py in the folder client.

Method B:

Press **Win+R** in Window and enter “cmd” in the textbox.

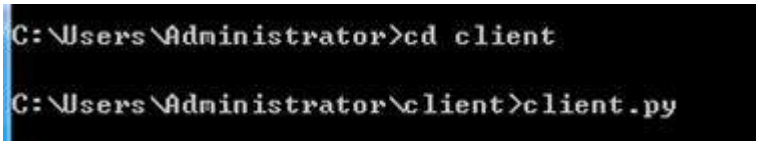


Click **OK**.

Enter the following commands in the terminal:

cd client

client.py



Open the graphical user interface (GUI) as shown below:

For initial running, you need to enter the IP address of the Raspberry Pi car **IP Address**, then click **Connect**, and the program will connect to the Raspberry Pi.

After connection, the program will save the IP address. For the next use, if the IP address of the Raspberry Pi has not changed, you may press **Enter** directly next time to connect.
After the connection is made successfully, the Video button in the GUI will be available. Click it or press **V** on your keyboard, and after a while the VLC player will appear and show the images captured by the car in real time.

Now you may control the car by the keyboard based on the instructions on the GUI.
Press **X** to implement ultrasonic scanning. During this process, the car is unable to execute other actions. After scanning is done, the results will be shown on the GUI as shown below:

You may select the range of scanning in the upper scale and set the speed of car running in the bottom one. After all changes, you need to click **Set** button to send the new data to the car.

6.3.Debugging

Since motors may be different from each other in some way or another, you need to adjust the related parameters of motors to make the car go straight, camera and ultrasonic module oriented to straight forward, and turn left and right in curves with almost consistent radius.

< To adjust camera tilting angle when in middle (425 by default)

< To adjust horizontal orientation when ultrasonic module in middle (425 by default)

<To adjust motor A's speed (90 by default)

<To adjust motor B's speed (90 by default)

<To adjust motor A's speed in turning (30 by default)
The slower speed of Motor A rotates during turning, define the slow speed of this motor

<To adjust motor B's speed in turning (30 by default)
The slower speed of Motor B rotates during turning, define the slow speed of this motor

<To define the address of the VLC Media Player
By default, the parameter is the same as the address of installation of VLC. If you self-defined another address, you need to enter this field.
Note: Use \\instead of \ in the address.

Note: After you enter new parameters, they will not be sent to the car until you press the corresponding key. You need to restart server.py of the car to apply the new parameters.

*The file of VLC Media Player is saved under the client folder by default, named VLC.txt. You may alter the VLC.txt file to change the actual address of the VLC Media Player. You're recommended to apply the default installation.
The parameters will be saved in the car after being setup. When the car reboot, it will call the parameters saved previously. Therefore, you may use the settings every time you use the car once they are set for once.

6.4.WiFi Wireless Hotspot

Configure the Raspberry Pi as the WiFi hotspot mode to build up a direct communication between the PC and the car. Thus, the limit of position due to a WiFi network by router can be eliminated and the communication can be stable.

During the configuration of the hotspot, the connection via ssh will be broken once the hotspot is enabled. For this reason, you're recommended to connect the monitor to the Raspberry Pi for the configuration.

Method A: (Simple, but needs many dependent libraries)
Refer to : http://www.adeept.com/Blog/?p=453

Check the following steps：
Download the code from Github to a local path for installation:
git clone https://github.com/oblique/create_ap
cd create_ap
sudo make install

Install the dependent libraries:
sudo apt-get install util-linux procps hostapd iproute2 iw haveged dnsmasq

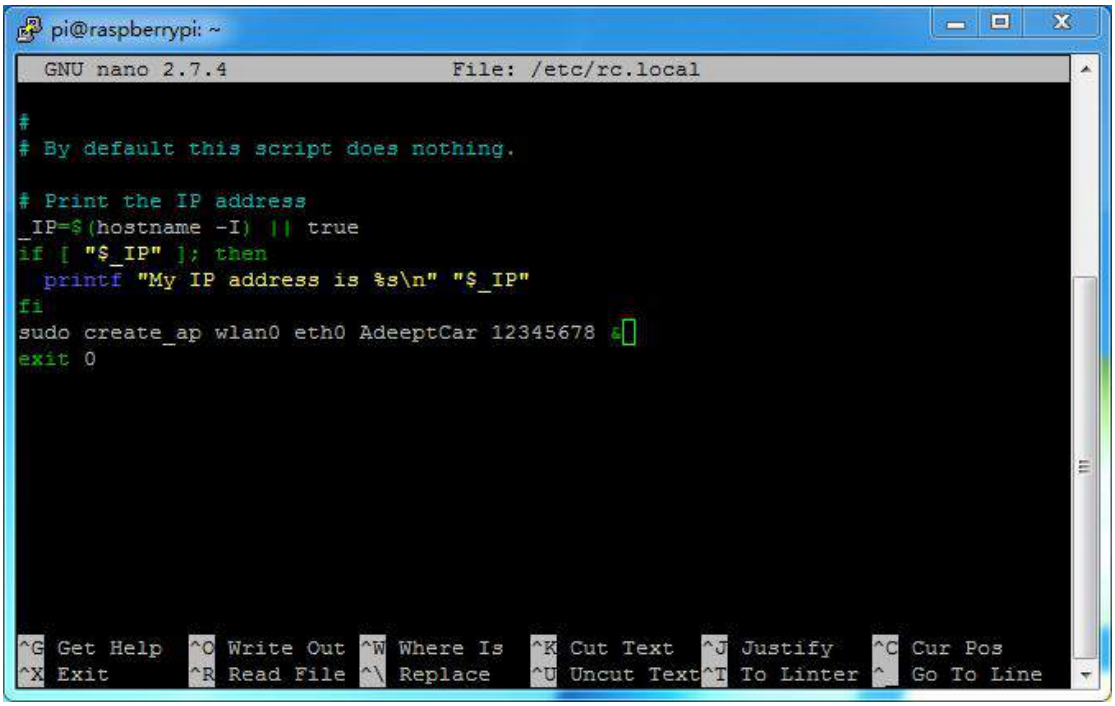
Create a WiFi hotspot: (must be operated with disconnected WiFi)
sudo create_ap wlan0 eth0 AdeeptCar 12345678

Search for a hotspot on the computer,
SSID name: AdeeptCar
password: 12345678.

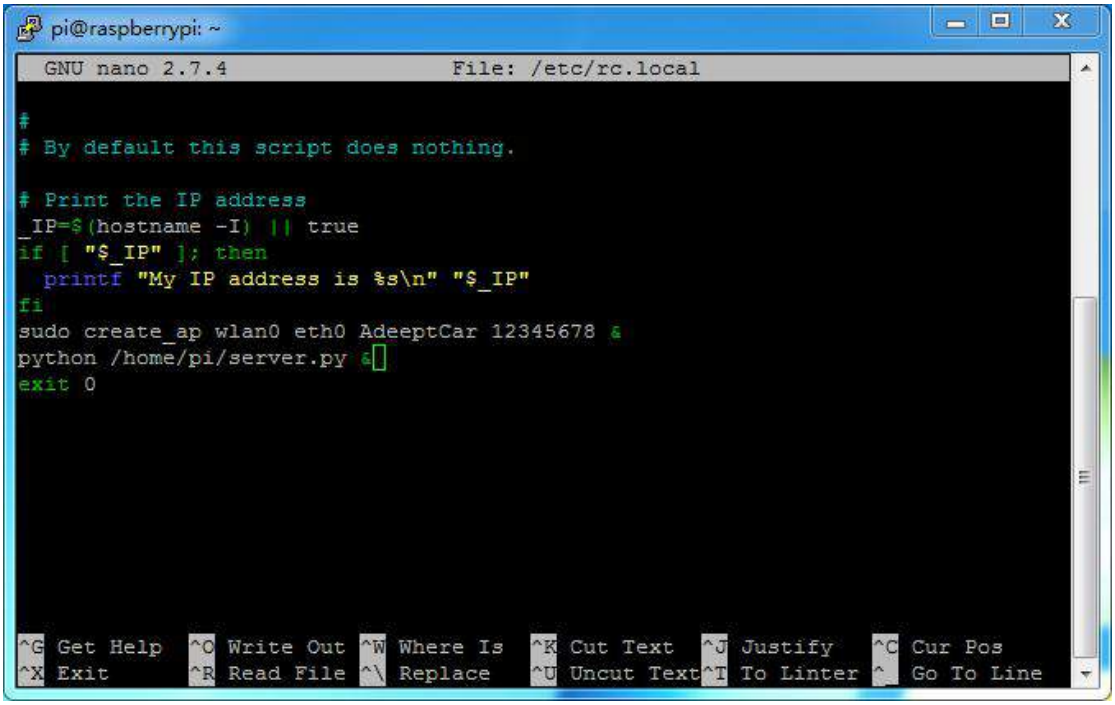
After connection, you may check the IP address and make its communication with the car.

You may also add it to auto-start.
sudo nano /etc/rc.local

Type in the *sudo create_ap wlan0 eth0 AdeeptCar 12345678 &* before *exit 0:*



Also you may add server.py to auto-start (use your own address).



Note: Be careful to write the correct address.

Method B: (a little complicated, needs less dependent libraries)

Check the following steps (from Github: https://github.com/SurferTim/documentation/blob/6bc583965254fa292a470990c40b145f553f6b34/configuration/wireless/access-point.md)

Software need for installation

sudo apt-get install dnsmasq hostapd

Since the configuration file is not ready, disable the software newly installed:

sudo systemctl stop dnsmasq

sudo systemctl stop hostapd

Set Static IP

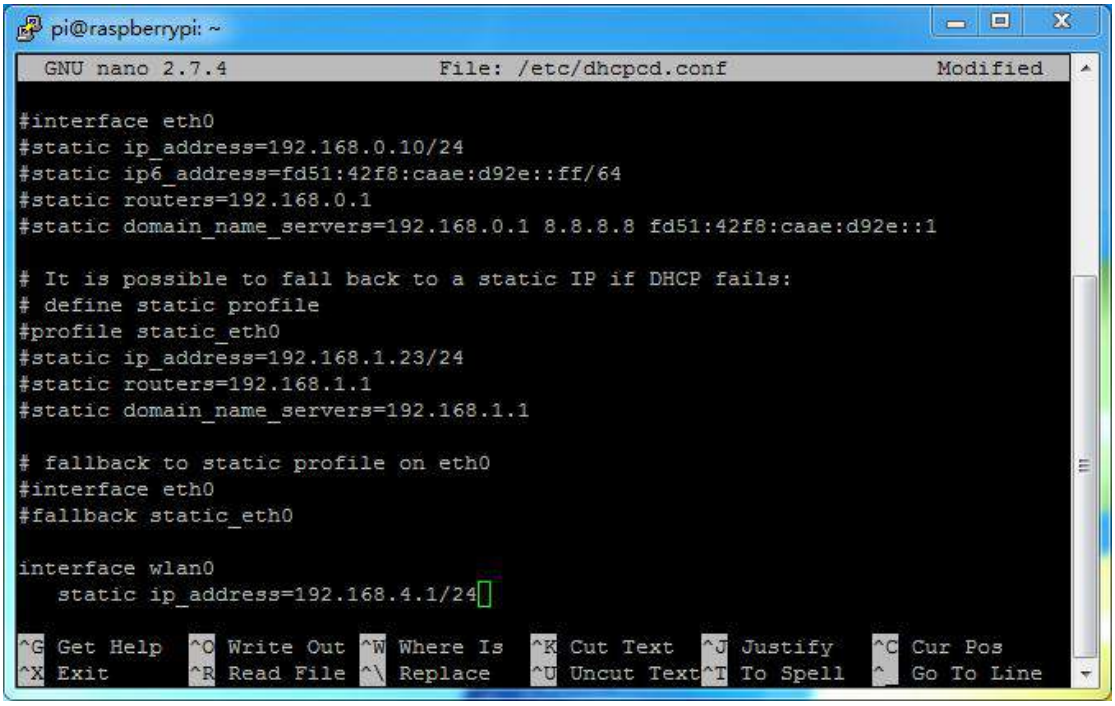
Open dhcpcd.conf:

sudo nano /etc/dhcpcd.conf

Add the following contents at the end of the file:

interface wlan0

staticip_address=192.168.4.1/24



Now restart the service dhcpcd:

sudo service dhcpcd restart

Set DHCP service

First of all, backup the dnsmasq.conf file:

sudo mv /etc/dnsmasq.conf /etc/dnsmasq.conf.orig

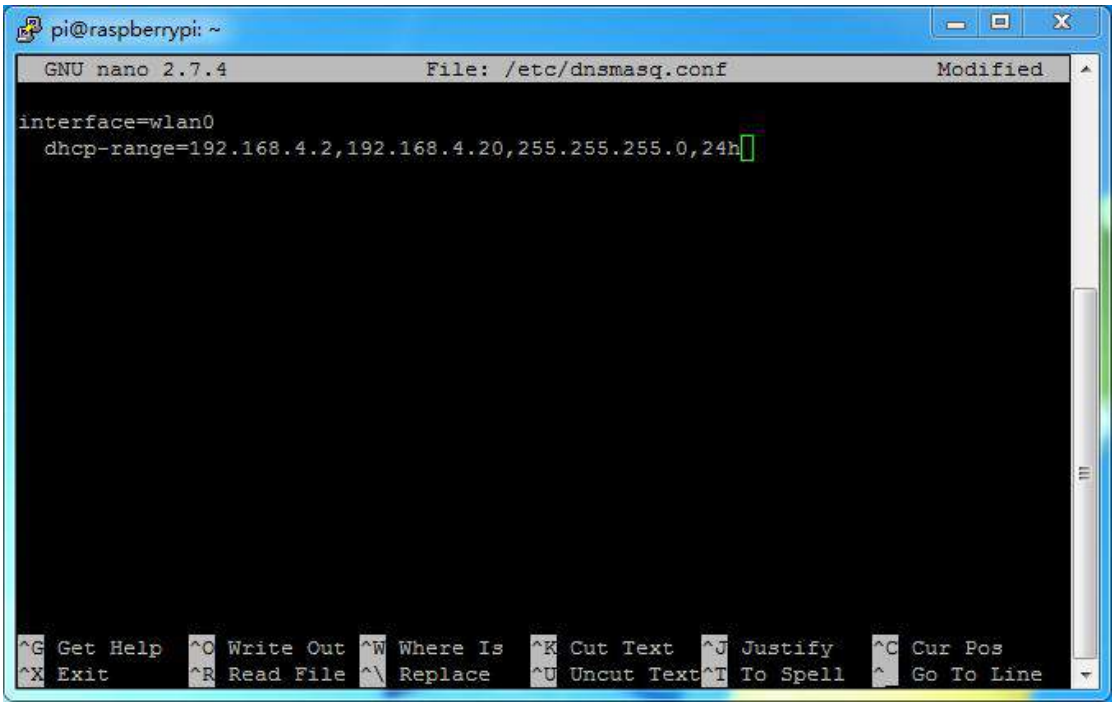
Create a file named dnsmasq.conf for editing:

sudo nano /etc/dnsmasq.conf

Enter the following contents:

interface=wlan0

dhcp-range=192.168.4.2,192.168.4.20,255.255.255.0,24h



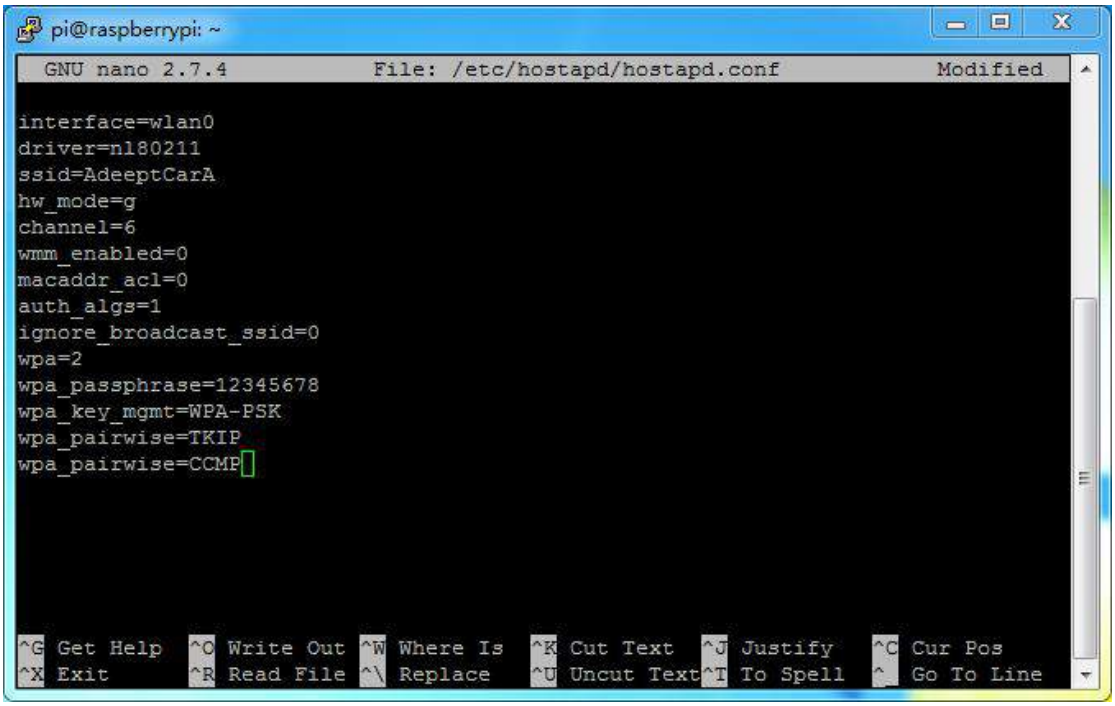
Configuring the access point host software(hostapd)

You need to configure the hostapd configuration file:

sudo nano /etc/hostapd/hostapd.conf

Add the following contents (DO NOT add quotation marks):

interface=wlan0
driver=nl80211
ssid=AdeeptCarA
hw_mode=g
channel=6
wmm_enabled=0
macaddr_acl=0
auth_algs=1
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=12345678
wpa_key_mgmt=WPA-PSK
wpa_pairwise=TKIP
wpa_pairwise=CCMP

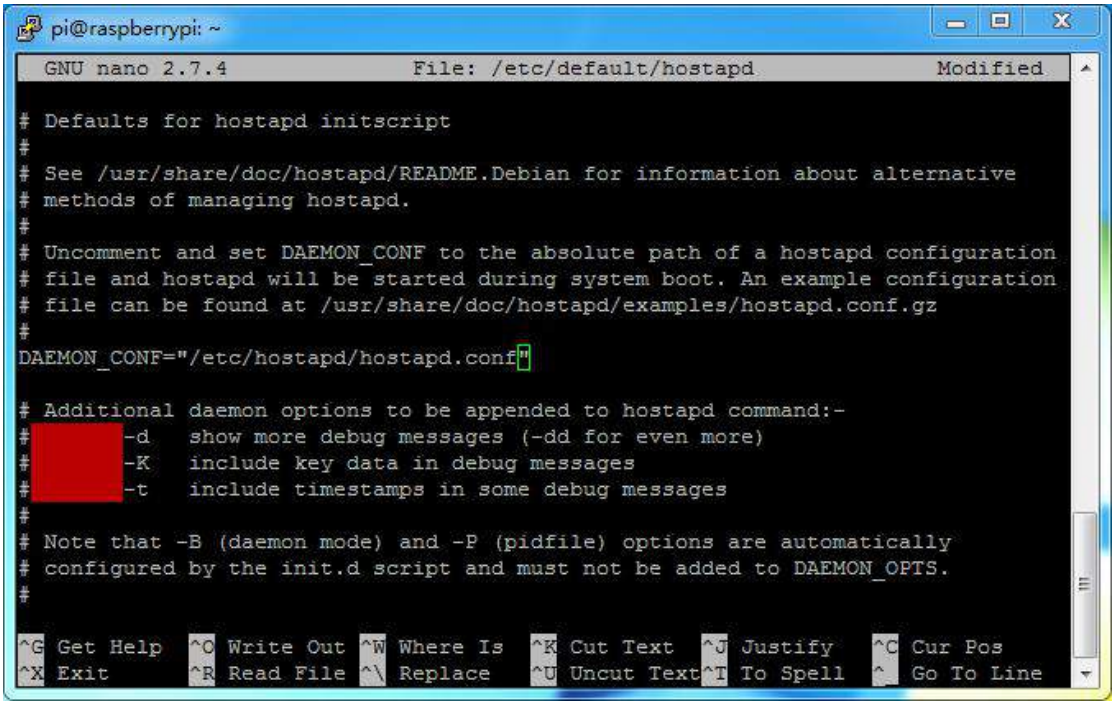


Then you need to tell the system where to find the configuration file:

sudo nano /etc/default/hostapd

Find the line *#DAEMON_CONF*, delete#,and add address in the quotation marks:

DAEMON_CONF=" /etc/hostapd/hostapd.conf"



After configuration is done, open the two services disabled previously:

sudo service hostapd start

sudo service dnsmasq start

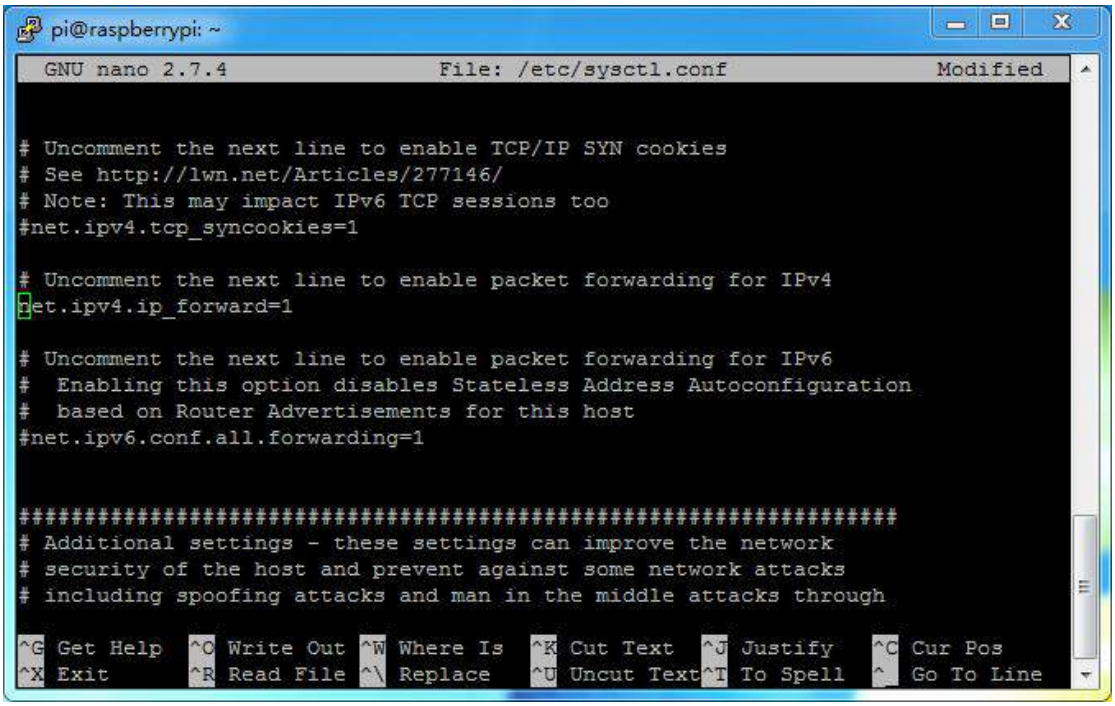
Add routing and masquerade

Edit the file/etc/sysctl.conf:

sudo nano /etc/sysctl.conf

Delete the # at the beginning of *#net.ipv4.ip_forward=1*

net.ipv4.ip_forward=1



Add a masquerade for outbound traffic on eth0:

sudo iptables –t nat –A POSTROUTING –o eth0 –j MASQUERADE

Save the iptables rule:

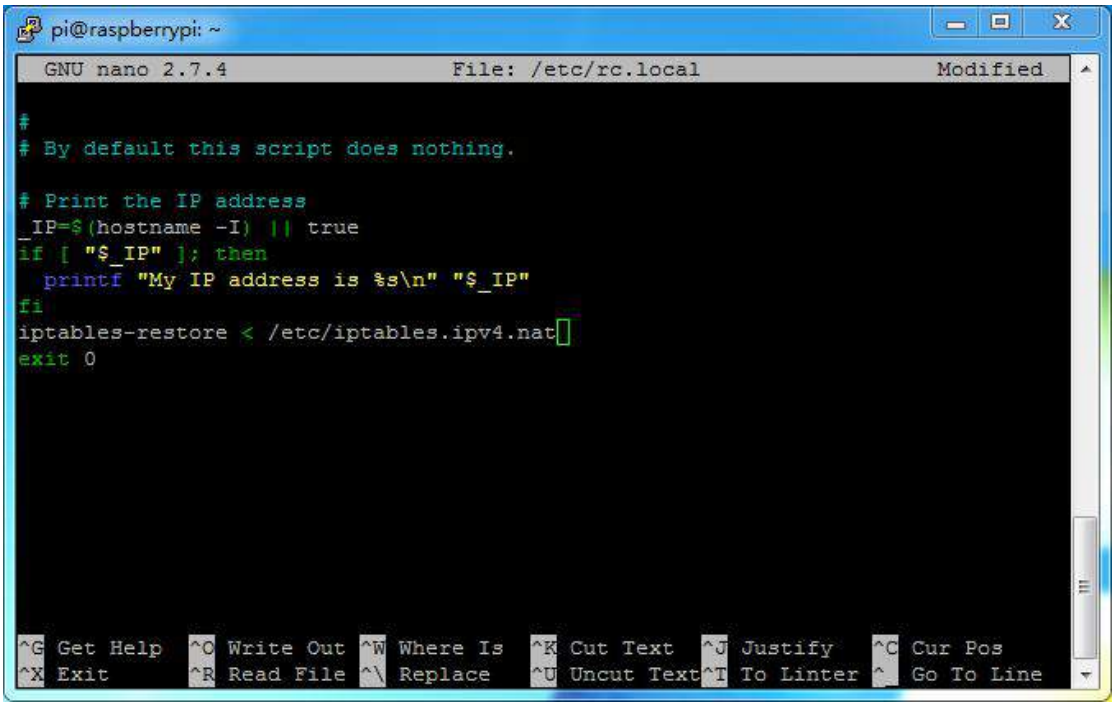
sudo sh–c "iptables-save > /etc/iptables.ipv4.nat"

Add auto-start:

sudo nano /etc/rc.local

Add the following contents before exit 0:

iptables-restore< /etc/iptables.ipv4.nat



Then reboot:

reboot

Now search for the hotspot **AdeeptCarA** with a WiFi device. Connect to the hotspot, enter **192.168.4.1** at **SSH** to build up an SSH communication with the Raspberry Pi. You may add server.py to auto-start so you don't need to open the server every time for SSH communication.

sudo nano /etc/rc.local

Add the following contents before exit 0:

sudo python /home/Adeept_PiCar-A/server/server.py

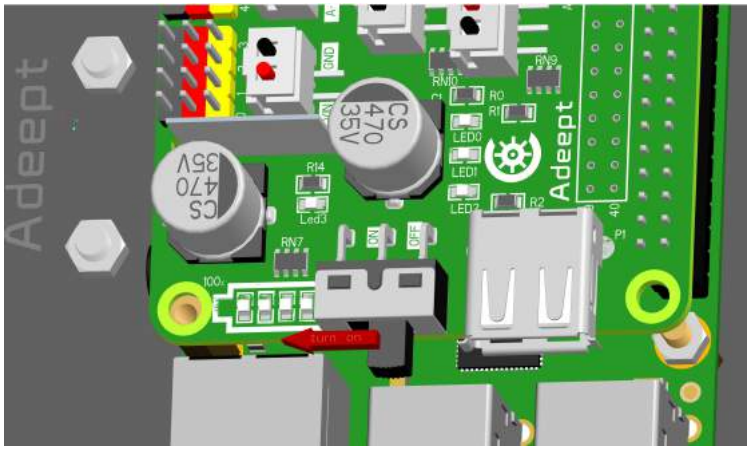
6.5.Safe Shutdown

You may notice there's no such thing as a power button for the Raspberry Pi as for PC. Most people would directly unplug the power cable for the Raspberry Pi, which actually may cause damage to the Raspberry Pi and SD card, data loss, etc. To avoid such issues, you need a safe shutdown for the Raspberry Pi.

If you just use the Raspberry Pi independently, you may shut it down with the following command:

sudo shutdown –h now

When the green light stops blinking on the Raspberry Pi, turn off the switch on driver board.



If you're applying the Raspberry Pi smart car, you may tab the Exit button in the app of this product. When the green light stops blinking on the Raspberry Pi, switch to OFF for the Power switch on Shield and you can shut down the Raspberry Pi.

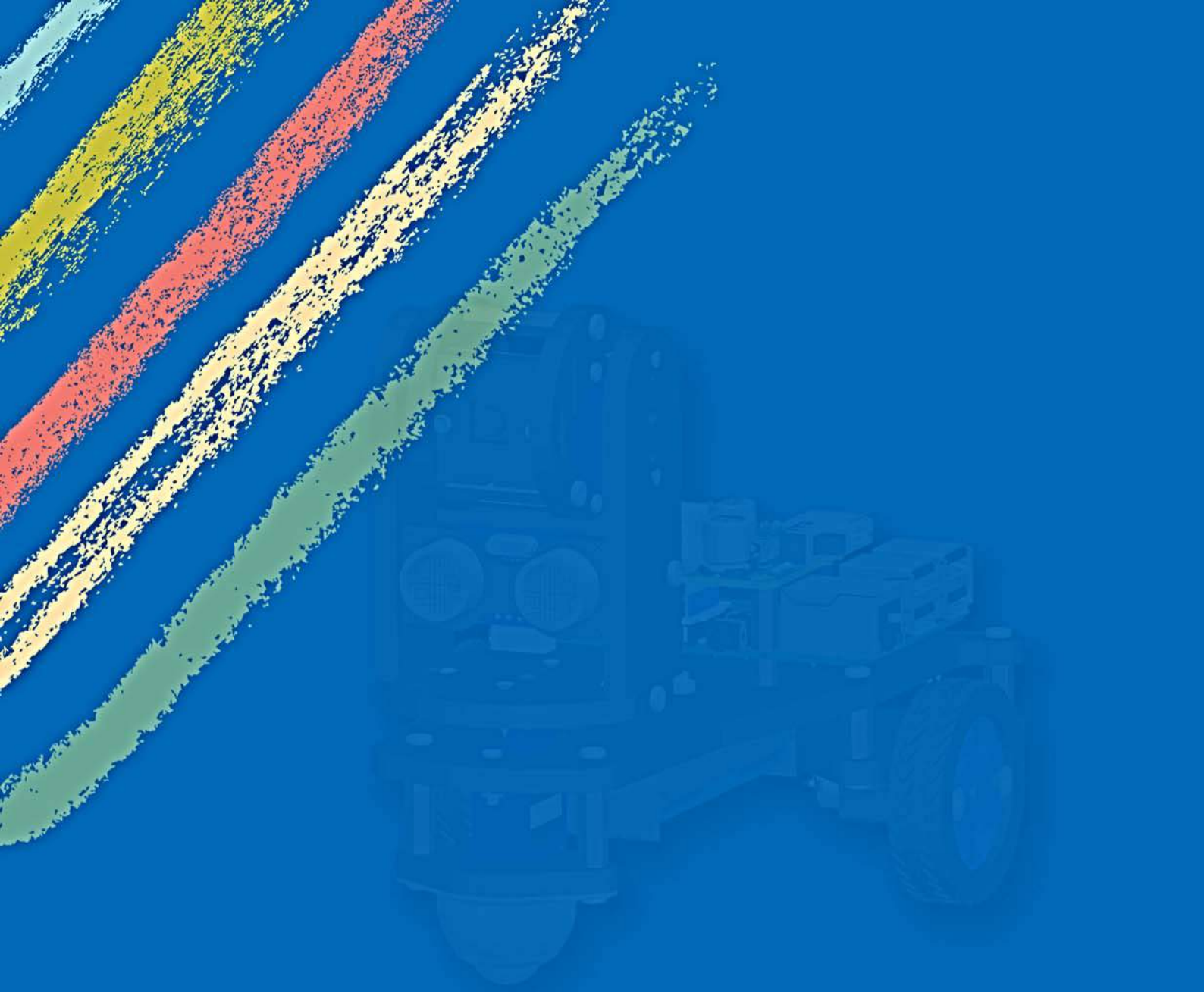
7. Afterword

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 Adeept 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.adeept.com. We will introduce more cost-effective, innovative and intriguing products!

Thanks again for choose Adeept product and service!



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