3. Software & Hardware

3.1. Software Installation

The software installation video is as follows

https://www.adeept.com/video/detail-70.html

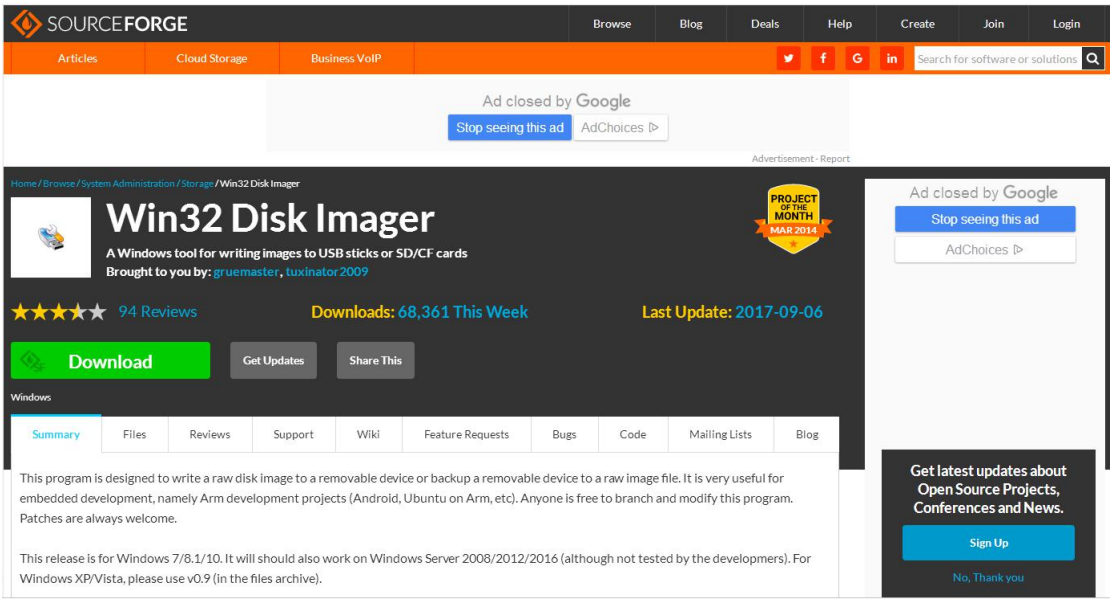
Install the Raspbian Operating System

First, install the operating system for the Raspberry Pi. The official 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 operating system to the SD card.

Download the Win32 Disk Imager at:

https://sourceforge.net/projects/win32diskimager/

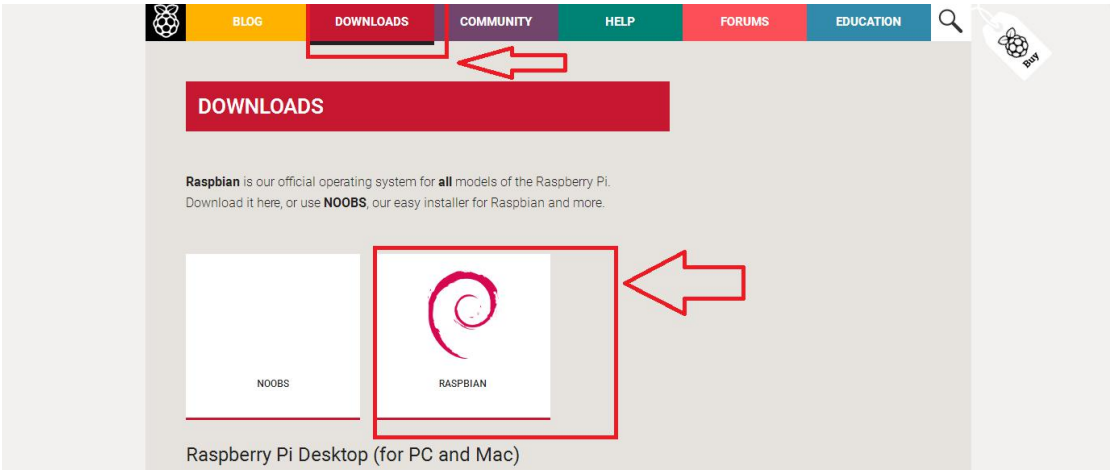


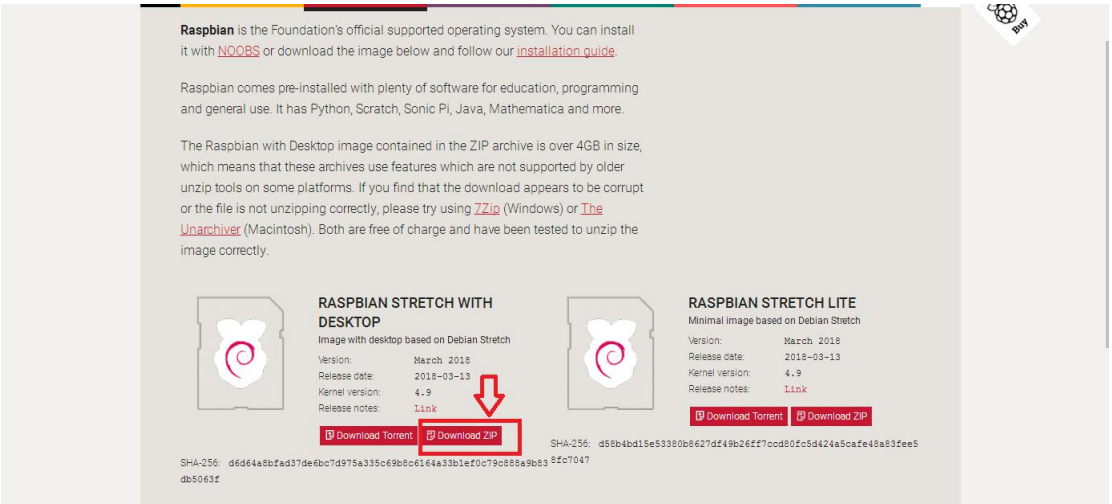
Download the Image for Raspbian

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.





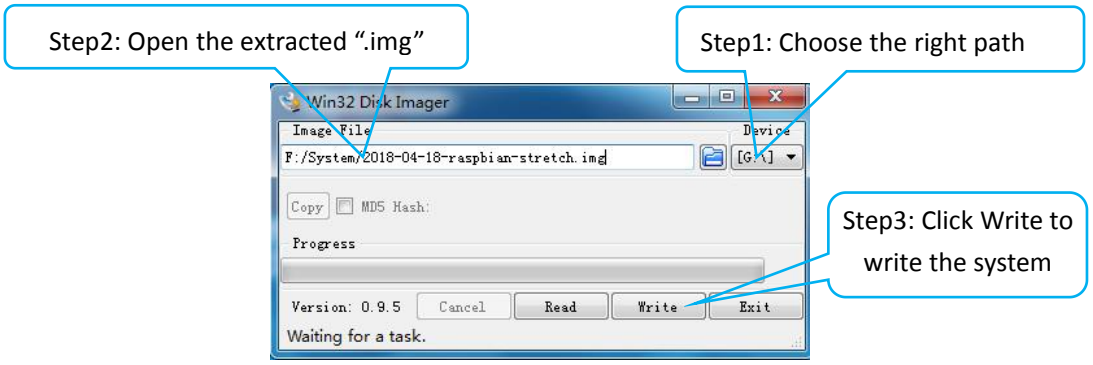
After it's downloaded, unzip it for later SD card system creation.

Write Raspberry Pi Operating System to SD Card

First, insert the SD card into the card reader and connect it to the USB port of the computer.

Click 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

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 SHH and Setup WiFi

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

Under the root 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
```

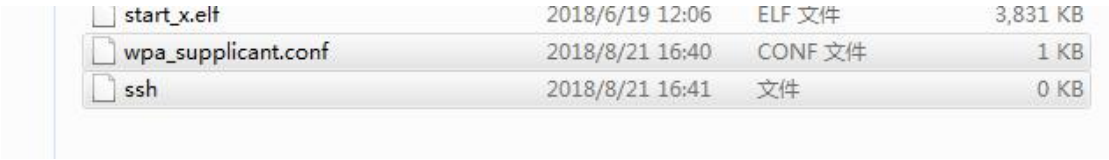
```
network={
ssid="WIFI"
psk="PASSWORD"
key_mgmt=WPA-PSK
priority=1
}
```

```
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.

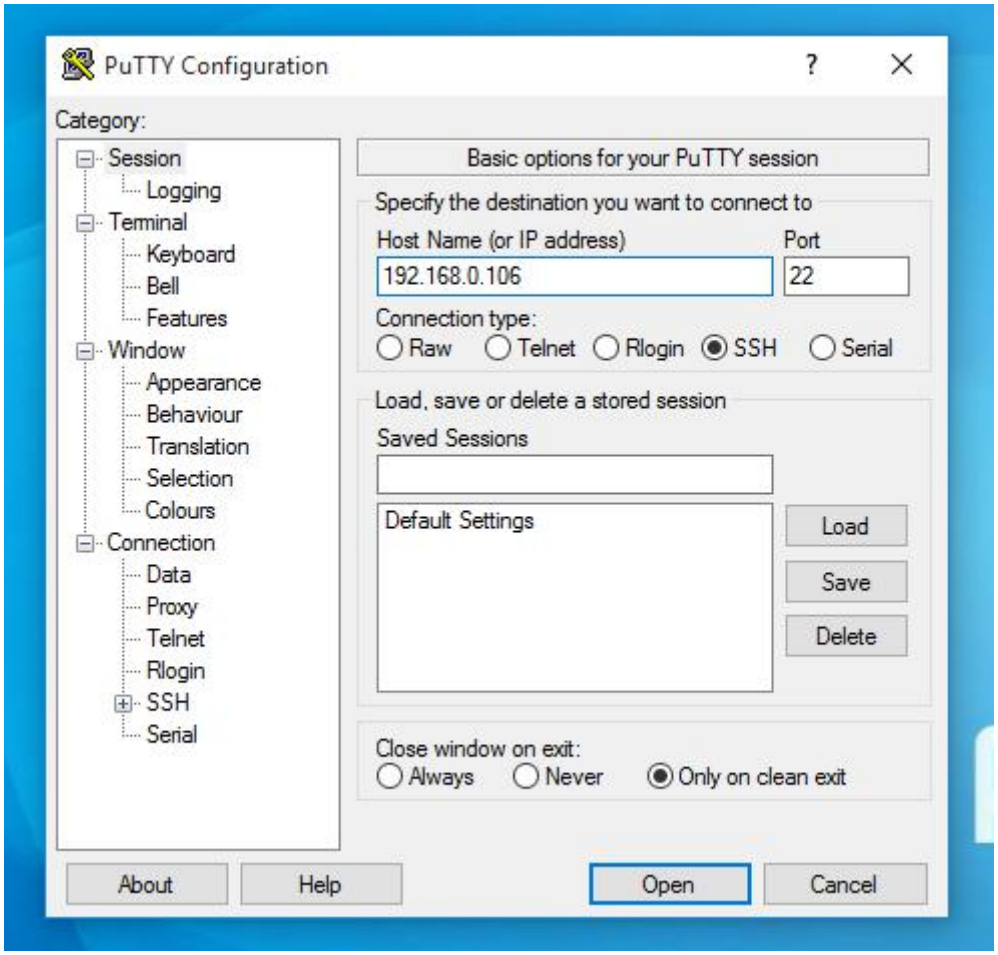
Method B: Download the **Network Scanner App** to check the address.

The address of the Raspberry Pi is the one with "*Raspberry*".

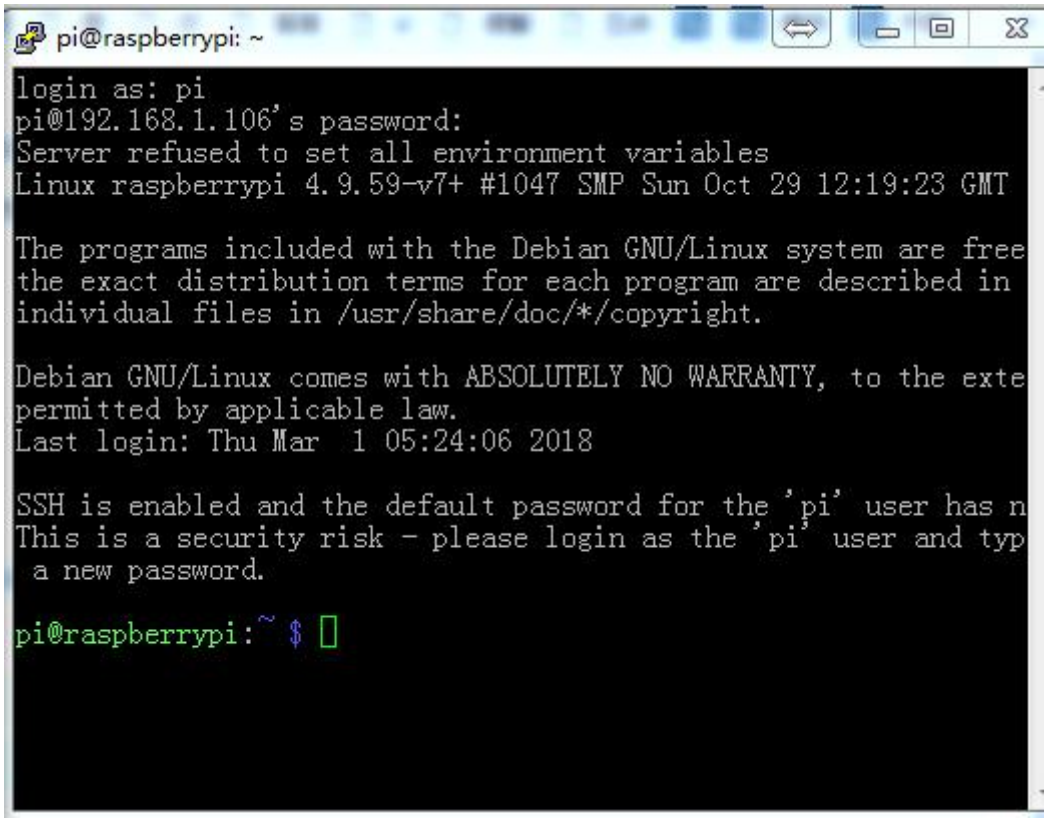
* The name of the router that the computer or mobile connects should be consistent with the one of the WiFi in the file *wpa_supplicant.conf* written to the root directory of the SD card in the Raspberry Pi.

Connect the Raspberry Pi and Computer

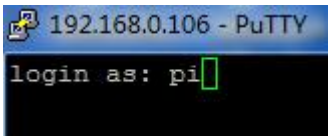
Open PuTTy, enter the IP address of the Raspberry Pi in **Host Name (or IP address)** and click **Open**.



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.

3.2. Download Program

Setting up in a Raspberry Pi may take you a lot of time, and there are too many libraries needed, so we write a python program to do the most of works for you.

Download the program of the rasptank.
Note that the following two commands are all lowercase.
Input the code below to download:
git clone https://github.com/adeept/adeept_rasptank.git
Then setup：
sudo python3 adeept_rasptank/setup.py
It may take some time to finish.
It may take 2-3 hours to install, and we need to wait patiently. Also do not turn off or disconnect the Raspberry Pi. If the installation fails in this step, please contact us at support@adeept.com in time.

When the Raspberry Pi software is installed, the Raspberry Pi will automatically restart. And the program runs automatically after booting. At this time PuTTy will automatically disconnect.
The Raspberry Pi program has been installed when it comes to this step. Next we need to assemble the robot, please shut down the Raspberry Pi and remove the power supply.

3.3. Install Python3.7 in the PC

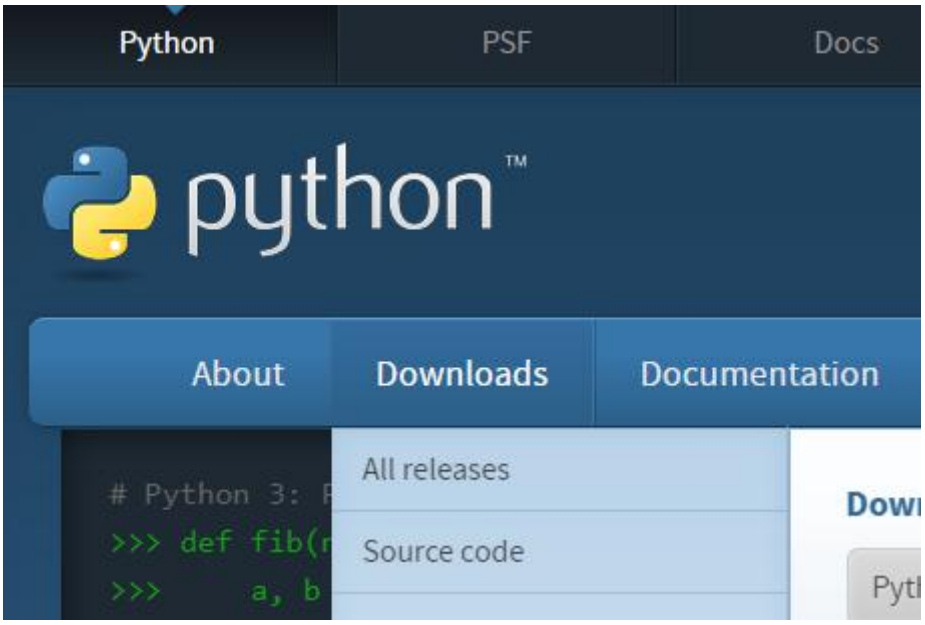
The software installation video is as follows

https://www.adeept.com/video/detail-70.html

Install Python3.7

So far there are two versions of Python: 2.X and 3.X. The graphical UI of the terminal control 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/



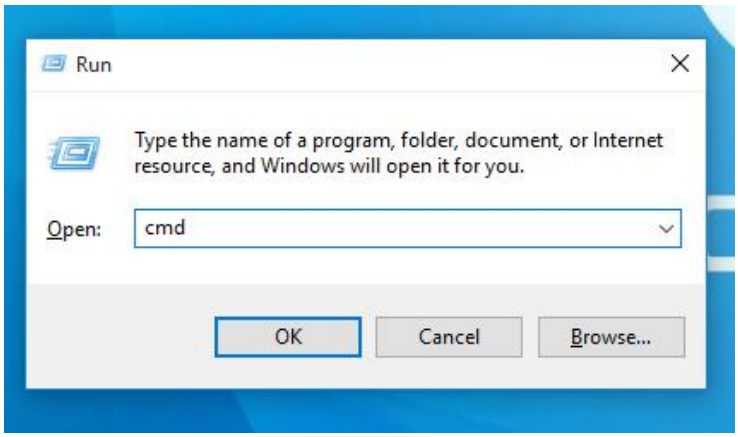
Click through **Downloads**->**Download Python 3.7.0**.

Install it after download is done. Python will configure the environment variables during the installation.

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

Install OpenCV:

Press + **R** in Window and enter CMD in the textbox



Click **OK**

Type in:
pip3 install numpy
to Install numpy.

NOTE: If Python3.7 is the only version in your PC, you can use both pip and pip3 to install software, but when you also have Python2.x installed, you must use pip3 to install it in your Python3.7 library.

NumPy is a general-purpose array-processing package designed to efficiently manipulate large multi-dimensional arrays of arbitrary records without sacrificing too much speed for small multi-dimensional arrays.

Download OpenCV_python.whl:
https://www.lfd.uci.edu/~gohlke/pythonlibs/#opencv

In our case, we download opencv_python-3.4.3-cp37-cp37m-win_amd64.whl for Python3.7 on x64 OS.
Download it and save it in default user path (in my case is C:\Users\effec\) so you don't have to input the path when installing.
Now you can install OpenCV_python:
pip3 install opencv_python-3.4.3-cp37-cp37m-win_amd64.whl

And then you need to install zmq and pybase64 for FPV function (same reason in RPi):
pip3 install zmq pybase64

3.4. Run the RaspTank

Start

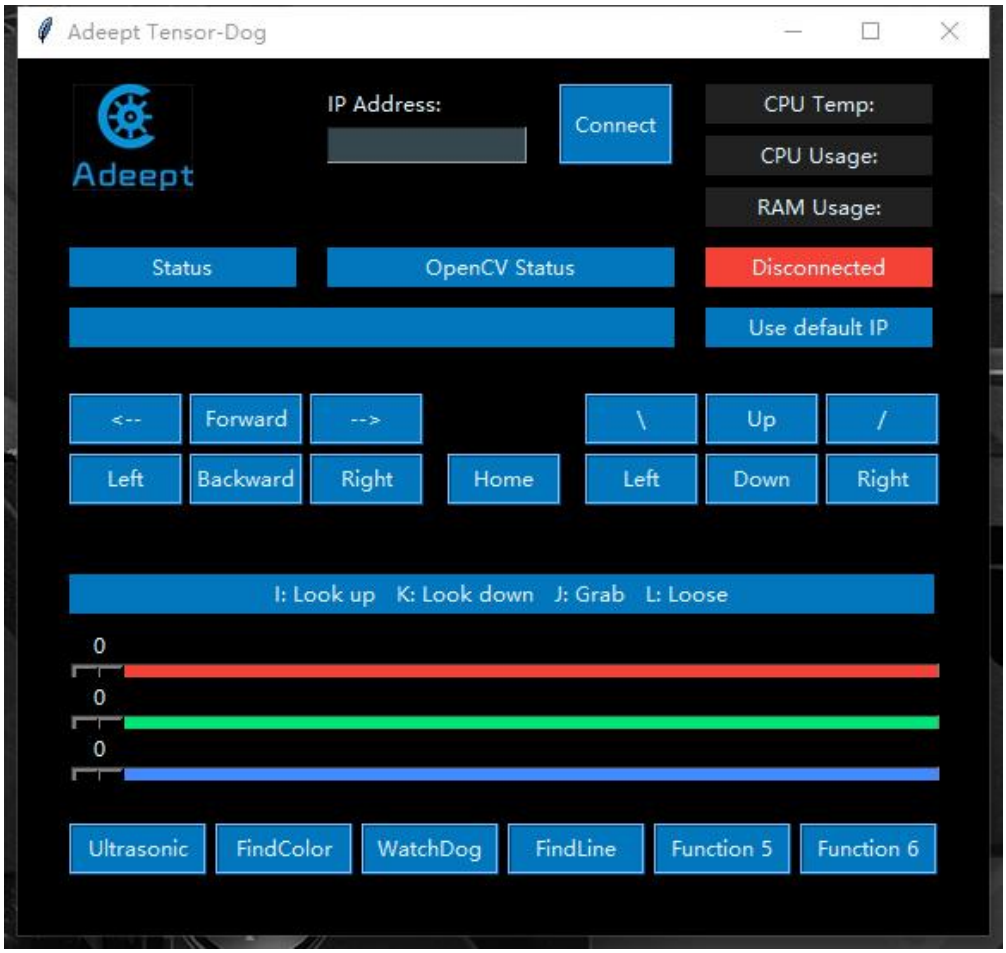
Switch on the car.

After a while, if the LEDs turn red, it means the car's server is connected to a Wi-Fi waiting for the PC client to join.

If there is no Wi-Fi for the car to connect with, the LEDs turn blue, it means the car has set up an AP-Hotspot, you can use your PC to search it, the RPi Car's AP-Hotspot's SSID name is AdeeptCar and password is 12345678.

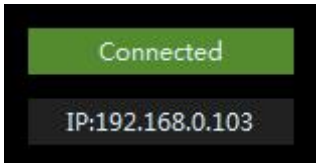
Then implement operations in Windows.

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

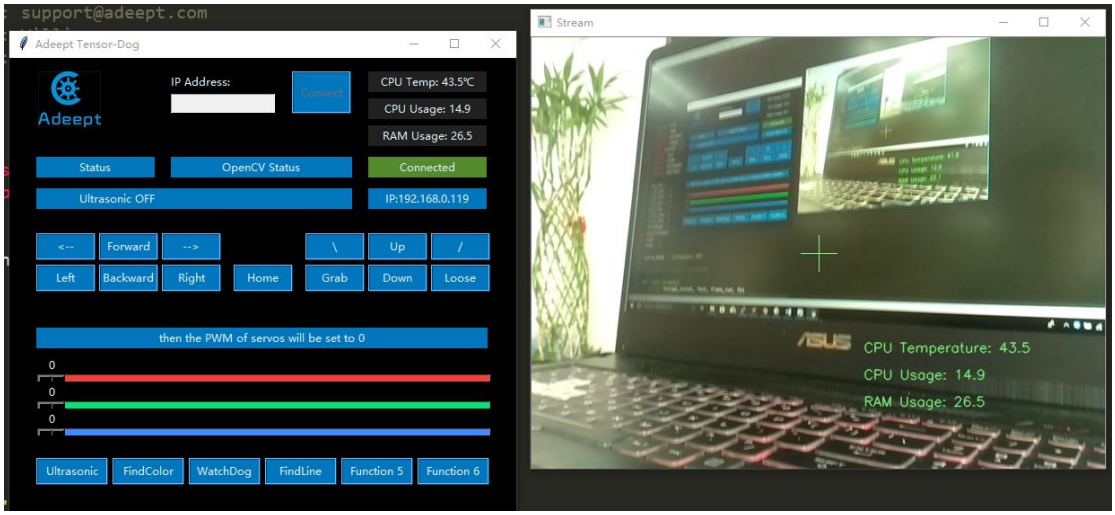


For initial running, you need to enter the IP address of the Raspberry Pi car **IP Address**, then click **Connect**, and the program will connect to the Raspberry Pi.

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 window shows up.



Now you may control the car by the keyboard based on the instructions on the GUI.

OpenCV Color Recognition

By default, the Robot finds the biggest yellow object in its view and follows it. When it gets close enough, it would stop, and if it gets too close to the yellow object, it would go back.

OpenCV Watch Dog Function

If the camera on the robot detects an object moving or changing, the LEDs on the robot will turn red. This feature is developed based on Adrian Rosebrock's OpenCV code on pyimagesearch.com. You can also learn more about the OpenCV to gain more fun to play with, such as syncing the captured image to the dropbox after detecting the motion of the object. The example program we provide just makes the LEDs display red however. For other functions, you can install the corresponding packages according to your needs, just by changing the code in FPV.py.

Line Following Mode

The robot can track lines and follow them, proceeding along a preset path that can be altered by moving the lines, and this part of Python program is easy to understand. You can open *findline.py* and learn to write it yourself.

Add More Functions

Function 5 and Function 6 buttons are placeholders for other functions you want to add. This robot is based on raspberry pi so there are a lot more functions you can play with, but some other libraries are required.

We intend to simplify the installation steps as much as possible to lower the barriers for more people. Hence, for example, voice recognition, which requires a large number of lib raries to be installed, will not be provided in the standard program. If you are interested in this, you can try to expand more. We will offer the installation and application methods of other functions in the follow-up tutorials. Please subscribe our Youtube channel for more.

Change LED Color

You can control the colors of the LEDs on the robot in real time by dragging these three sliders. These three sliders correspond to the brightness of the three channels of RGB. In theory, you can create 16,777,216 (256^ 3) kinds of colors through these three sliders.

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 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, you may unplug the power cable. 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 then.

4.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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