

Lesson 29 Remote Control - Introduction to GUI

29.1 Overview

In this lesson, we will introduce the method of controlling the robot through a desktop GUI program written in Python. However, it is not recommended for beginners, as it requires some additional knowledge and experience.

The GUI program is currently only compatible with the **Windows** operating system. Generally, it is named GUI.py and stored in the client directory of the robot software package.

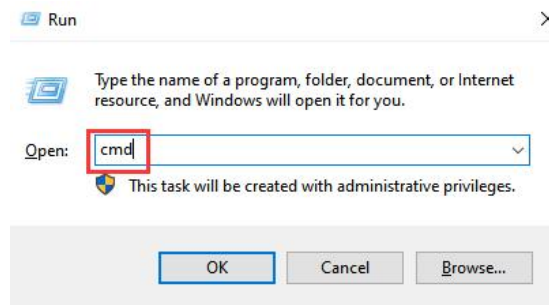
29.2 Installing GUI Dependent Libraries on Windows

Installing Python3

- You need to install Python on your computer to run the program for PC. Since the code of this robot was developed and debugged by Python3, please download the Python3.7 version or higher in case of any error caused by incompatibility.
- Download Python3 at this link: <https://www.python.org/downloads/windows/>
- Double click the installation package to install Python.
- Pay attention to select **Add Python to PATH** when installing.

Install the required dependency libraries.

- Press **Win + R** key, type in "**cmd**", and click **OK** to start cmd.



Installing NumPy

- NumPy is a basic software package for scientific calculation through Python. OpenCV needs to use some of its functions.
- Type in the command below to install NumPy:

```
pip3 install numpy
```

```
r-Pro\Client> pip3 install numpy
Requirement already satisfied: numpy in d:\python\lib\site-packages (1.24.4)
WARNING: You are using pip version 20.2.3; however, version 25.0.1 is available.
You should consider upgrading via the 'd:\python\python.exe -m pip install --upg
rade pip' command.
```

Installing OpenCV

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

```
r-Pro\Client> pip3 install opencv-contrib-python
Requirement already satisfied: opencv-contrib-python in d:\python\lib\site-packa
ges (4.10.0.84)
Requirement already satisfied: numpy>=1.17.0; python_version >= "3.7" in d:\pyth
on\lib\site-packages (from opencv-contrib-python) (1.24.4)
WARNING: You are using pip version 20.2.3; however, version 25.0.1 is available.
You should consider upgrading via the 'd:\python\python.exe -m pip install --upg
rade pip' command.
```

Installing zmq and pybase64

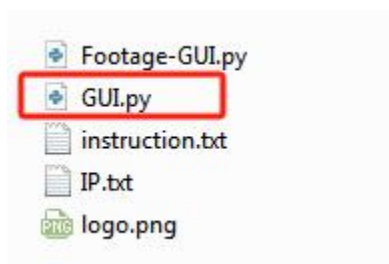
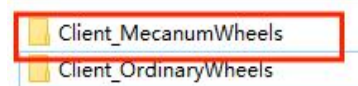
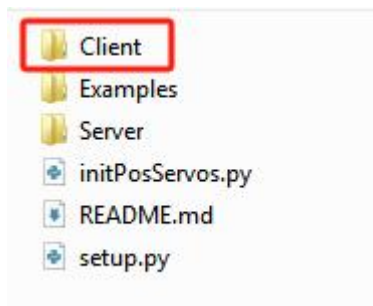
- zmq and pybase64 are the libraries for real time video

```
pip3 install zmq pybase64
```

```
r-Pro\Client> pip3 install zmq pybase64
Requirement already satisfied: zmq in d:\python\lib\site-packages (0.0.0)
Requirement already satisfied: pybase64 in d:\python\lib\site-packages (1.4.0)
Requirement already satisfied: pyzmq in d:\python\lib\site-packages (from zmq) (
26.2.0)
WARNING: You are using pip version 20.2.3; however, version 25.0.1 is available.
You should consider upgrading via the 'd:\python\python.exe -m pip install --upg
rade pip' command.
```

GUI Client Program

The GUI.py is included in the code file of the robot



You can also download this code from GitHub:

https://github.com/adeept/Adeept_4WD_Smart_Car_for_RPi

29.3 Introducing GUI Control Program

The web terminal and GUI are not connected. Therefore, to control the robot via GUI, you need to manually run **GUIServer.py** on Raspberry Pi. (similar to manually running **WebServer.py**, the only difference is the **GUIServer.py** program)

1. Terminate the auto-run program of **WebServer.py** on Raspberry Pi:

```
sudo killall python3
```

```
pi@raspberrypi:~ $ sudo killall python3
```

2. Run the **GUIServer.py** program:

```
sudo python3 Adeept_4WD_Smart_Car_for_RPi/Server/Server_MecanumWheels/GUIServer.py
```

```
pi@raspberrypi:~ $ sudo python3 Adeept_4WD_Smart_Car_for_RPi/Server/Server_MecanumWheels/GUIServer.py
/usr/lib/python3/dist-packages/gpiozero/input_devices.py:852: PWMSoftwareFallback: For more accurate readings, use the
pigpio pin factory. See https://gpiozero.readthedocs.io/en/stable/api_input.html#distancesensor-hc-sr04 for more info
warnings.warn(PWMSoftwareFallback(
loop
```

After **GUIServer.py** run successfully on Raspberry, run **GUI.py** on Windows.

3. Run **GUI.py** in cmd. If you right click on the **GUI.py** file in the folder, there may be an error message.

Access the folder of the robot program:

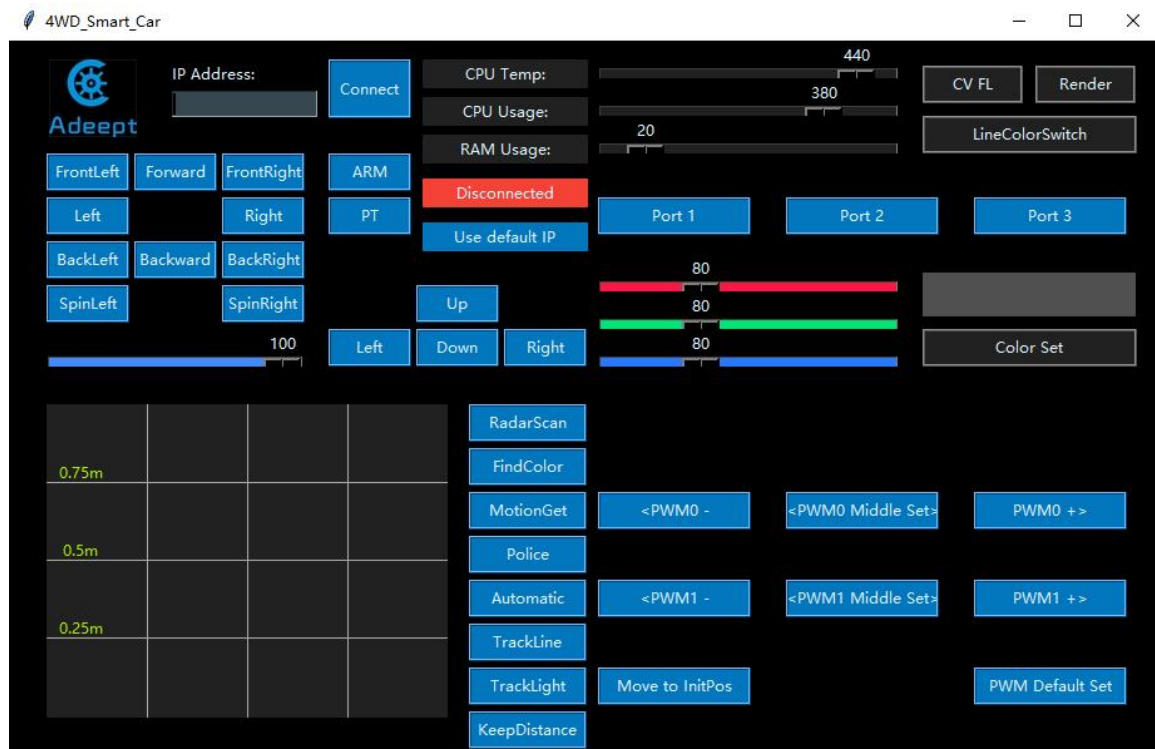
```
C:\Users\ASUS>cd /d E:\Adeapt_4WD_Smart_Car_Kit_for_RPi\Code\Client\Client_MecanumWheels
E:\Adeapt_4WD_Smart_Car_Kit_for_RPi\Code\Client\Client_MecanumWheels>
```

Run the **GUI.py** program (run it after accessing the "Client" folder, or there may be an error).

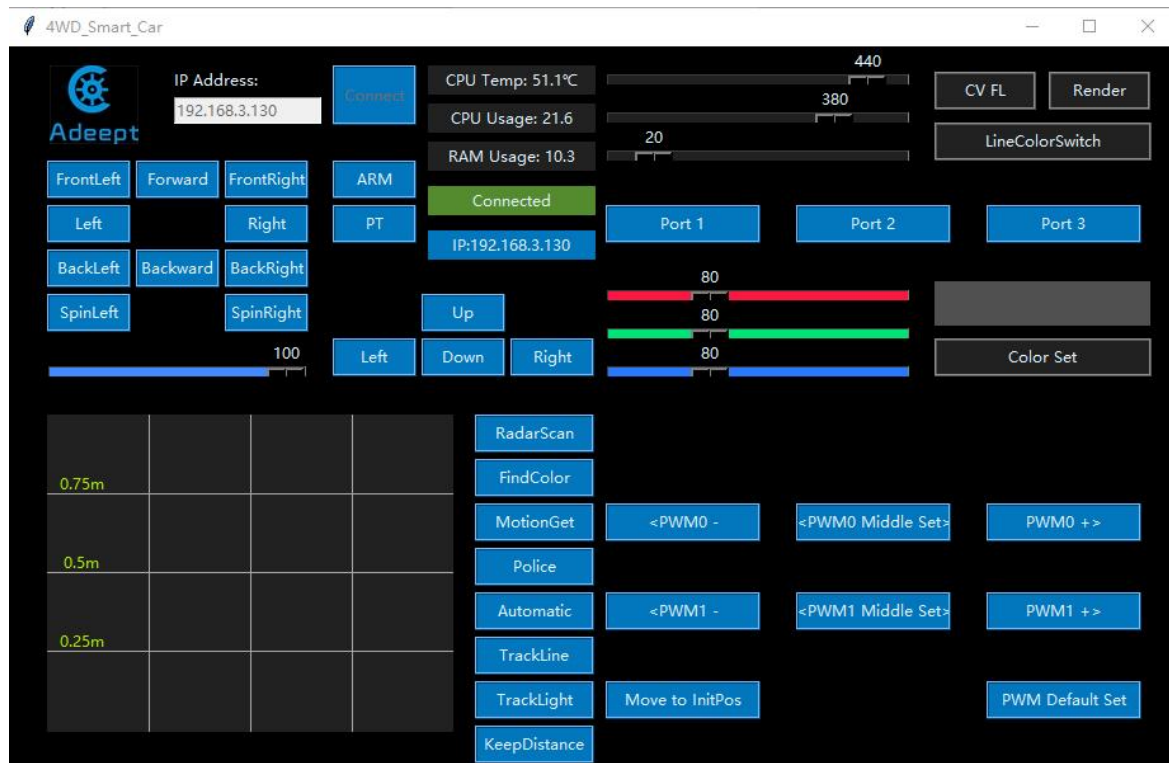
```
python GUI.py
```

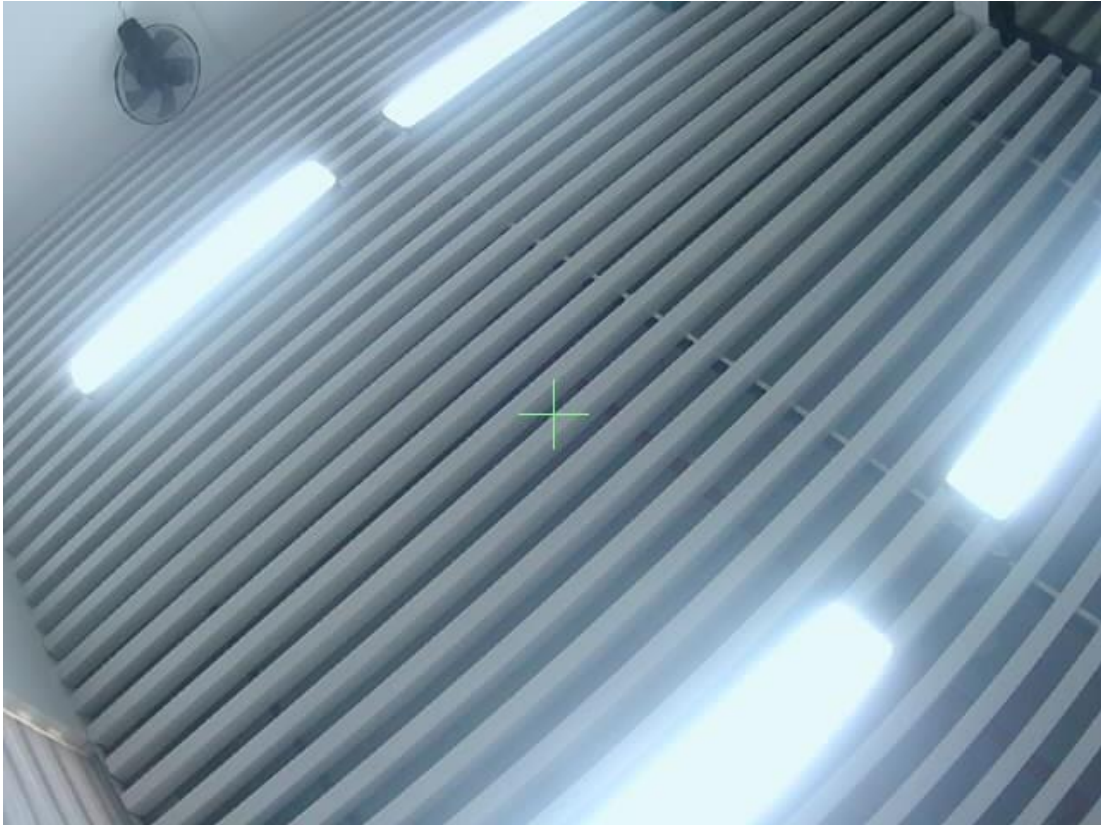
```
E:\Adeapt_4WD_Smart_Car_Kit_for_RPi\Code\Client\Client_MecanumWheels>python GUI.py
E:\Adeapt_4WD_Smart_Car_Kit_for_RPi\Code\Client\Client_MecanumWheels\GUI.py:193: DeprecationWarning: setDaemon() is depr
ecated, set the daemon attribute instead
  fps_threading.setDaemon(True) # 'True' means it is a front thread, it w
ould close when the mainloop() closes
```

The GUI interface will appear after run successfully.



- Enter the IP address of the Raspberry Pi in the GUI on PC, click Connect, and you can control the robot now. For instance, enter **192.168.3.130**





The operation instructions are as follows:

Button	Instruction	Describe
Forward/The W key on the keyboard	forward/DS	move forward
Backward/The S key on the keyboard	backward/DS	move backward
Left/The A key on the keyboard	left/TS	move left
Right/The D key on the keyboard	right/TS	move right
FrontLeft/The Q key on the keyboard	forward-left/DS	move forward-left
FrontRight/The E key on the keyboard	forward-right/DS	move forward-right

BackLeft/The Z key on the keyboard	backward-left/DS	move backward-left
BackRight/The C key on the keyboard	backward-right/DS	move backward-right
SpinLeft/The 1 key on the keyboard	rotate-left/DS	Rotate left
SpinRight/The 2 key on the keyboard	rotate-right/DS	Rotate right
speed	wsB X	Adjusting speed
UP/The I key on the keyboard	up/UDstop	The robotic head turns up
LEFT/The J key on the keyboard	lookleft/LRstopjj	The robotic head turns left
DOWN/The K key on the keyboard	down/UDstop	The robotic head turns down
RIGHT/The L key on the keyboard	lookright/LRstop	The robotic head turns right
CV FL	CVFL/stopCV	Switch video tracking line function
LineColorSwitch	CVFLColorSet 0/CVFLColorSet 255	Switch to search for white lines on black or black lines on white.
L1	CVFLL1 X	Set the height of L1 auxiliary line
L2	CVFLL2 X	Set the height of L2 auxiliary line
RadarScan	scan	Used to perform the ultrasound scan function and display

		the scan results
<PWM0 Turn Left	SiLeft 0	Click the button to control the 0 channel servo to rotate clockwise.
PWM0 Turn Right>	SiRight 0	Click the button to control the 0 channel servo to rotate counterclockwise
<PWM0 Middle set>	PWMMS 0	Click the button to control the 0 channel servo to 90 degrees
<PWM1 Turn Left	SiLeft 1	Click the button to control the 1 channel servo to rotate clockwise.
PWM1 Turn Right>	SiRight 1	Click the button to control the 1 channel servo to rotate counterclockwise
<PWM1 Middle set>	PWMMS 1	Click the button to control the 1 channel servo to 90 degrees
Move to InitPos	PWMINIT	Move the servo to its initial position
PWM Default Set	PWMD	Set the PWM of the servo to the default setting
CPU Temp		Shows the temperature of the

		Raspberry Pi CPU
CPU Usage		Shows the usage of the Raspberry Pi CPU
RAM Usage		Shows the usage of the Raspberry Pi memory
MotionGet	motionGet/stopCV	Switch to monitor mode, the robot stops moving and reacts to the moving objects detected by the camera, which are framed in the video module.
Automatic	automatic/automaticOff	Switch to automatic obstacle avoidance mode
Police	police/policeOff	Make the WS2812 LED lights on the robot flash alternately in red and blue.
TrackLine	trackLine/trackLineOff	Implement line tracking function using a 3-channel infrared module.
KeepDistance	keepDistance/keepDistanceOff	Implementing a distance maintenance function using an ultrasonic module
		Implementing the

TrackLight	trackLight/trackLightOff	light tracking function using a light-tracking module
FindColor	findColor/stopCV	Turn on/off the color detection function.
Color Set	{'title': 'findColorSet', 'data': [r,g,b]}	Select the color to be detected
Port 1	Switch_1_on/Switch_2_off	Control the LED1 light to turn on and off
Port 2	Switch_2_on/Switch_2_off	Control the LED2 light to turn on and off
Port 3	Switch_3_on/Switch_3_off	Control the LED3 light to turn on and off
ARM	AR	In this mode, the three functions of "RadarScan", sand "Automatic" cannot be used
PT	PT	All functions can be used in this mode