

Lesson 21 Remote Control - Introduction to GUI

21.1 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.

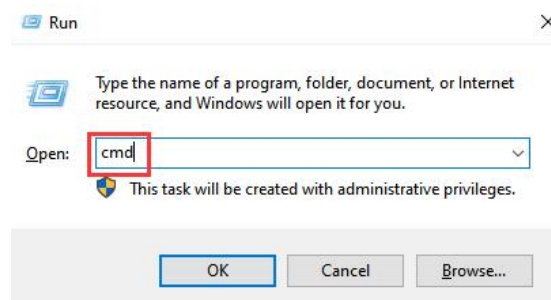
21.2 Installing GUI Dependent Libraries on Windows

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 --up
grade 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 --up
grade 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 --up
grade pip' command.
```

GUI Client Program

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

Client	2025/3/21 10:02
Examples	2025/3/18 15:36
Server	2025/3/20 19:39
initPosServos.py	2025/3/10 15:25
README.md	2025/2/10 18:13
setup.py	2025/3/19 11:40
Footage-GUI.py	2025/4/16 10:39
GUI.py	2025/4/16 19:22
IP.txt	2025/4/17 18:51
logo.png	2024/4/7 10:23

You can also download this code from GitHub: https://github.com/adeept/Adeept_DarkPaw-V3

21.3 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_DarkPaw-V3/Server/GUIServer.py
```

```
pi@raspberrypi:~ $ sudo python3 Adeept_DarkPaw-V3/Server/GUIServer.py
[2:08:19.569884610] [29250] INFO Camera camera_manager.cpp:313 libcamera v0.3.0+65-6ddd79b5
[2:08:19.580357338] [29253] INFO RPI pisp.cpp:695 libpisp version v1.0.6 b567f0455680 17-06-2024 (10:25:56)
[2:08:19.595581765] [29253] INFO RPI pisp.cpp:1154 Registered camera /base/axi/pcie@120000/rp1/i2c@80000/ov5647@36 to CFE
device /dev/media1 and ISP device /dev/media0 using PiSP variant BCM2712_C0
[2:08:19.597994151] [29250] WARN V4L2 v4l2_pixelformat.cpp:344 Unsupported V4L2 pixel format RPBP
[2:08:19.598783891] [29250] INFO Camera camera.cpp:1183 configuring streams: (0) 640x480-RGB888 (1) 640x480-GBRG_PISP_COMP
[2:08:19.598903039] [29253] INFO RPI pisp.cpp:1450 Sensor: /base/axi/pcie@120000/rp1/i2c@80000/ov5647@36 - Selected sensor
format: 640x480-SGBRG10_1X10 - Selected CFE format: 640x480-PC1g
mpu6050 connected
mpu6050 is connected and related functions are available.
192.168.3.31
waiting for connection...
```

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: \Code\Adeept_DarkPaw-V3\Client

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

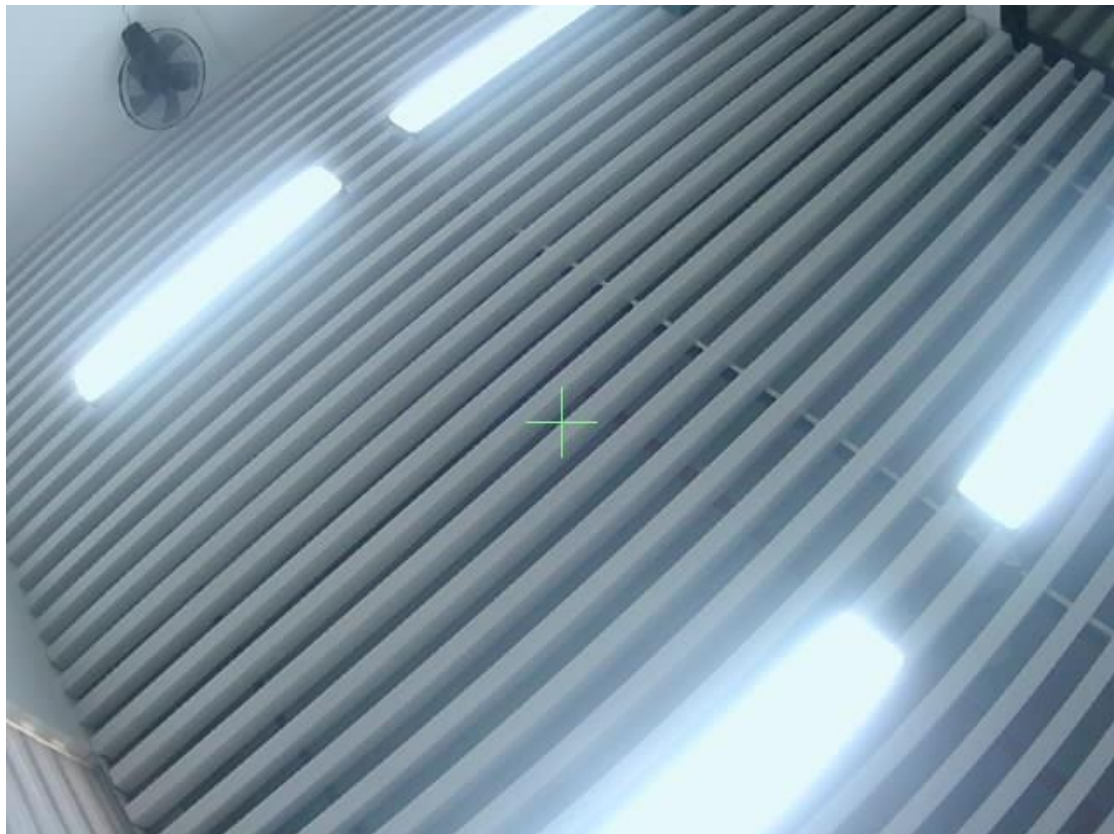
```
python GUI.py
```

```
E:\adeept\ADR016\Adeept_DarkPaw-U2.0-2025\Adeept_DarkPaw_Quadraped_Robot\Code\Adeept_DarkPaw-U3\Client>python GUI.py
```

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 **192.168.3.31**



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	turn left
Right/The D key on the keyboard	right/TS	turn right
STAND UP/The U key on the keyboard	StandUp	Stand up – whole robot body rises.
UP/The I key on the keyboard	up	Camera view moves upwards, by lifting the forelegs and lowering the hind legs.
STAY LOW/The O key on the keyboard	StayLow	Lie down – whole robot body gets low.
LEAN-L/The J key on the keyboard	Lean_L	Robot tilts towards the left.
DOWN/The K key on the keyboard	down	Camera view moves downwards, by lifting the hind legs and lowering the forelegs.

LEAN-R/The L key on the keyboard	Lean_R	Robot tilts towards the right.
Home	home	Click the button to control all channels servo 90 degrees
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
WatchDog	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.
Police	police/policeOff	Make the WS2812 LED lights on the robot flash alternately in red and blue.
Steady	steadyCamera/steadyCameraOff	Control the camera to remain level
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