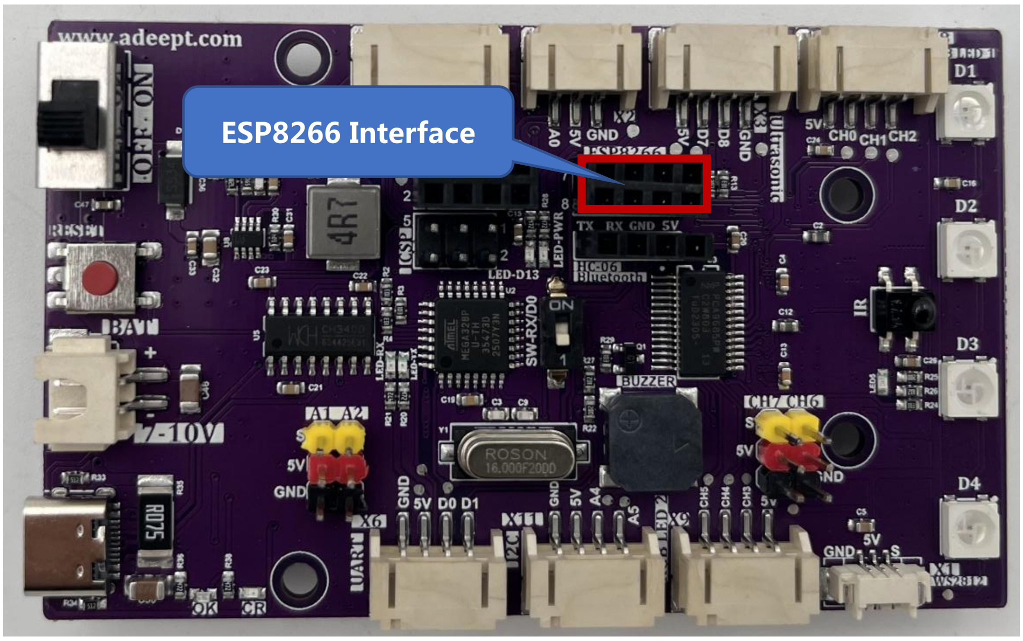
# Lesson 22 Remote Control- Introduction to GUI

## 22.1 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.

## 22.2 Install of ESP8266 Module



## 22.3 Configure the Usage Environment on the PC

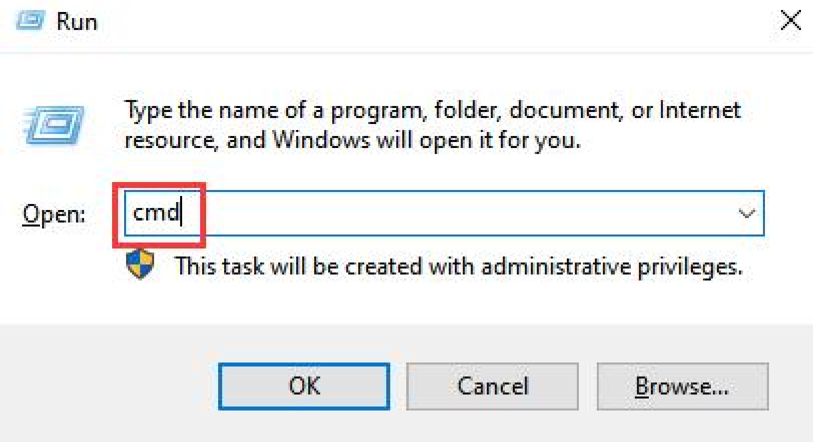
- You need to install Python on your computer to run the program for PC. Since the code of this robot was developed and debugged by Python3, please download the Python3.7 version or higher in case of any error caused by incompatibility.
- Download Python3 at this link: https://www.python.org/downloads/windows/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

- Pay attention to select Add Python to PATH when installing.

### Installing pySerial

- **pySerial** encapsulates the serial communication module, supporting Linux, Windows, BSD (may support all operating systems that support POSIX), Python (Java) and IconPython (.NET and Mono). The **pySerial** module encapsulates access to the serial port.

- Press Win + R key, type in "**cmd**", and click OK to start **cmd**. (MAC users do it in the terminal.)



Run

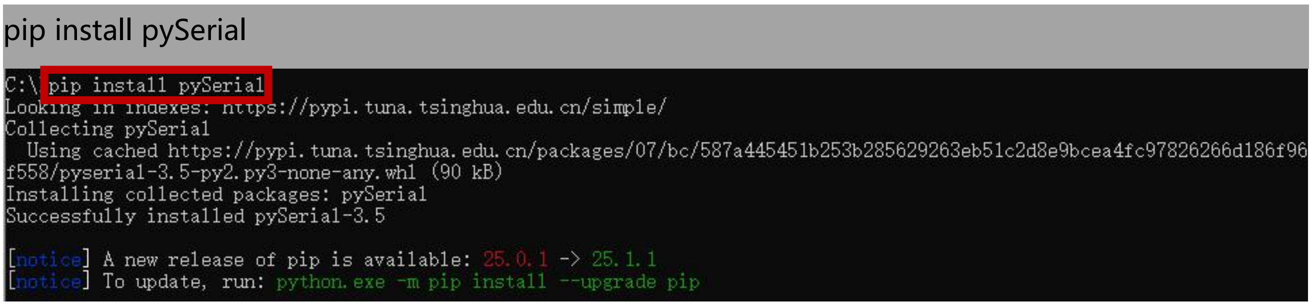
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

Open: cmd

This task will be created with administrative privileges.

- Type in the command below to install **pySerial**:

```
pip install pySerial
```

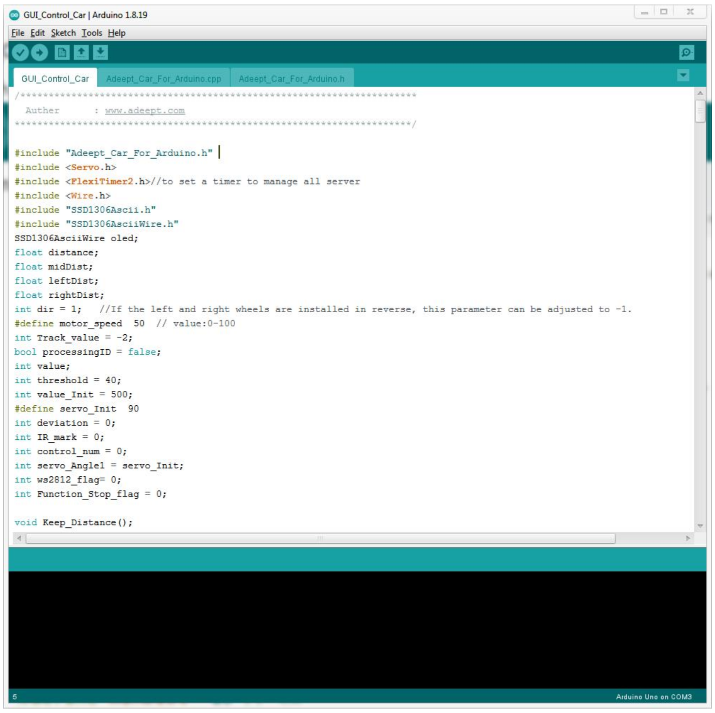


```
C:\pip install pySerial
Looking in indexes: https://pypi.tuna.tsinghua.edu.cn/simple/
Collecting pySerial
  Using cached https://pypi.tuna.tsinghua.edu.cn/packages/07/bc/587a445451b253b285629263eb51c2d8e9bcea4fc97826266d186f96
f558/pyserial-3.5-py2.py3-none-any.whl (90 kB)
Installing collected packages: pySerial
Successfully installed pySerial-3.5

[notice] A new release of pip is available: 25.0.1 -> 25.1.1
[notice] To update, run: python.exe -m pip install --upgrade pip
```

## 22.4 Upload the Program to the Arduino Car

1. Connect your computer and Adeept Robot Control Board (Arduino Board) with a USB cable.

2. Open "**13_Remote_Control_Ordinary\GUI_Control\GUI_Control_Car**" folder in "\Code", double-click "GUI_Control_Car.ino".


GUI_Control_Car | Arduino 1.8.19
File Edit Sketch Tools Help
GUI_Control_Car
Adeept_Car_For_Arduino.cpp
Adeept_Car_For_Arduino.h
Arduino Uno on COM3

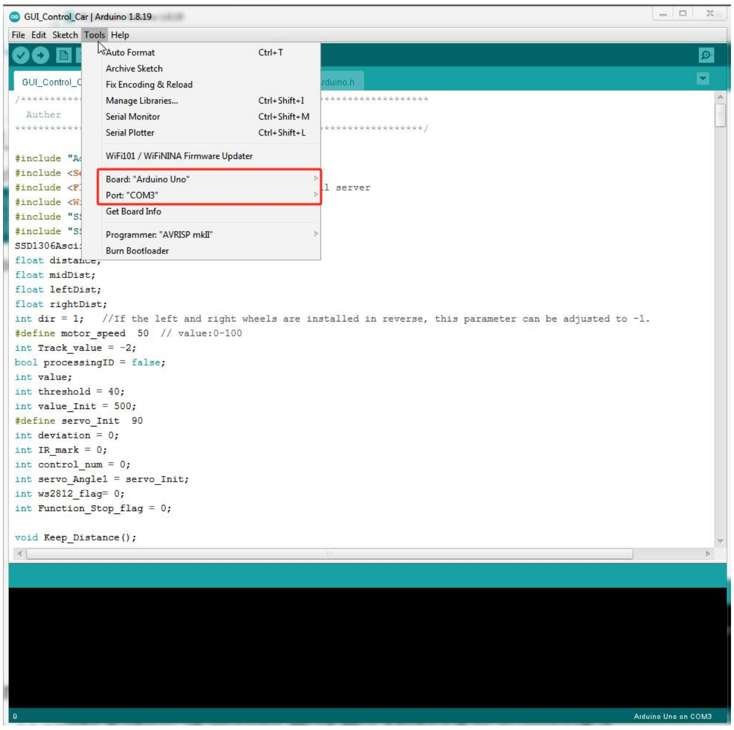
```
/***********************************************************************
  Auther      : www.adeept.com
***********************************************************************/

#include "Adeept_Car_For_Arduino.h"
#include <Servo.h>
#include <FlexiTimer2.h>//to set a timer to manage all server
#include <Wire.h>
#include "SSD1306Ascii.h"
#include "SSD1306AsciiWire.h"
SSD1306AsciiWire oled;
float distance;
float midDist;
float leftDist;
float rightDist;
int dir = 1;   //If the left and right wheels are installed in reverse, this parameter can be adjusted to -1.
#define motor_speed  50  // value:0-100
int Track_value = -2;
bool processingID = false;
int value;
int threshold = 40;
int value_Init = 500;
#define servo_Init  90
int deviation = 0;
int IR_mark = 0;
int control_num = 0;
int servo_Angle1 = servo_Init;
int ws2812_flag= 0;
int Function_Stop_flag = 0;

void Keep_Distance();
```

3. Select development board and serial port.

Board: Tools--->Board--->Arduino AVR Boards--->Arduino Uno

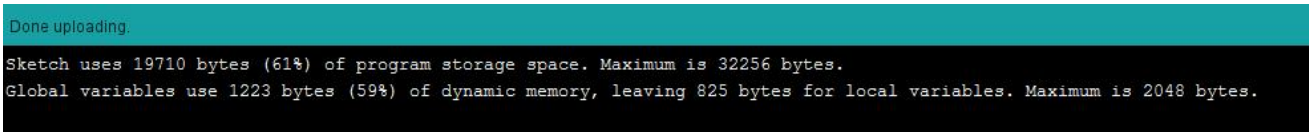
Port: Tools --->Port--->COMx

Note: The port number will be different in different computers.


GUI_Control_Car | Arduino 1.8.19
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino Uno"
Port: "COM3"
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
Arduino Uno on COM3

```
float midDist;
float leftDist;
float rightDist;
int dir = 1;   //If the left and right wheels are installed in reverse, this parameter can be adjusted to -1.
#define motor_speed  50  // value:0-100
int Track_value = -2;
bool processingID = false;
int value;
int threshold = 40;
int value_Init = 500;
#define servo_Init  90
int deviation = 0;
int IR_mark = 0;
int control_num = 0;
int servo_Angle1 = servo_Init;
int ws2812_flag= 0;
int Function_Stop_flag = 0;

void Keep_Distance();
```

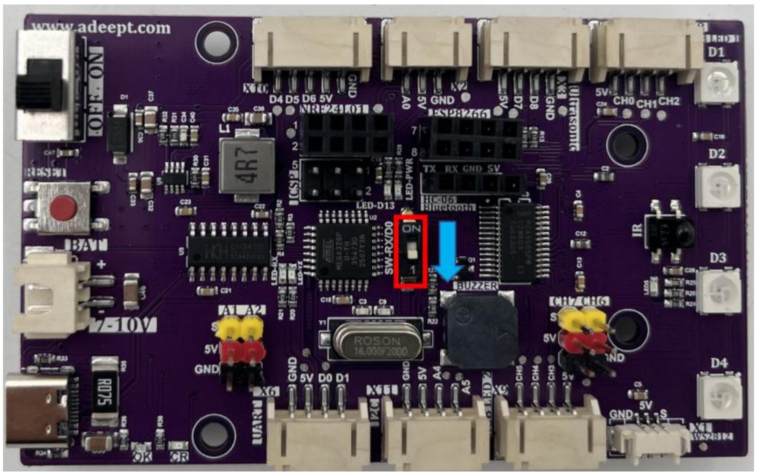
4. After opening, click → to upload the code program to the Arduino. If there is no error warning in the console below, it means that the Upload is successful.



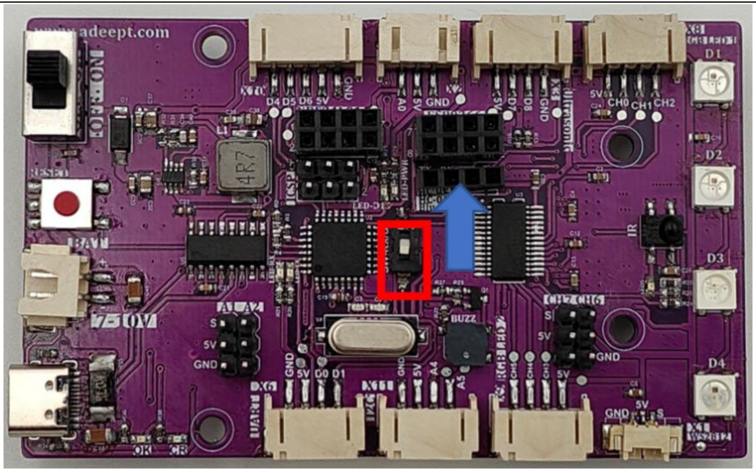
```
Done uploading.
Sketch uses 19710 bytes (61%) of program storage space. Maximum is 32256 bytes.
Global variables use 1223 bytes (59%) of dynamic memory, leaving 825 bytes for local variables. Maximum is 2048 bytes.
```

**Note:** When the ESP8266 module transmits data to the Arduino, it needs to occupy the RX interface of the Arduino, and when the Arduino uploads the program, it also needs to occupy the RX interface. The RX interface cannot satisfy both functions at the same time, so a switch is needed to distinguish them.

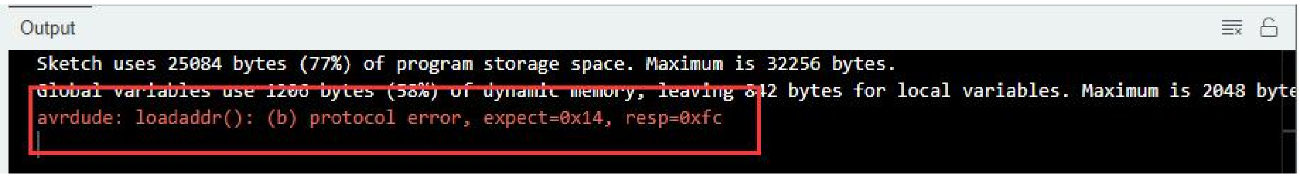
When the switch is flipped downward, the ESP8266 module is disconnected from the RX interface, and the program can be uploaded normally.



When the switch is flipped upward, the RX interface is connected to the ESP8266, and the ESP8266 module will continue to occupy the RX interface. At this time, the program cannot be uploaded normally.

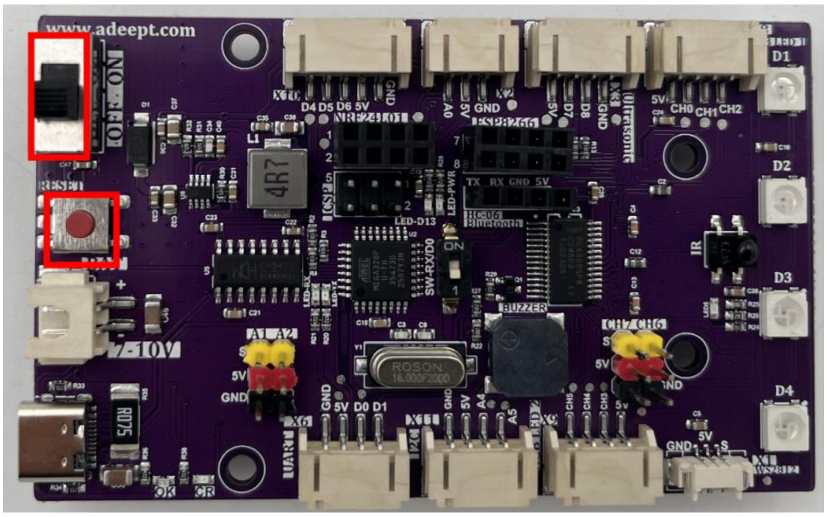


If the following error messages also appear, this may cause the program upload to fail. Please try to press the "RESET" button, or try to turn off the power switch and then turn on the power switch.

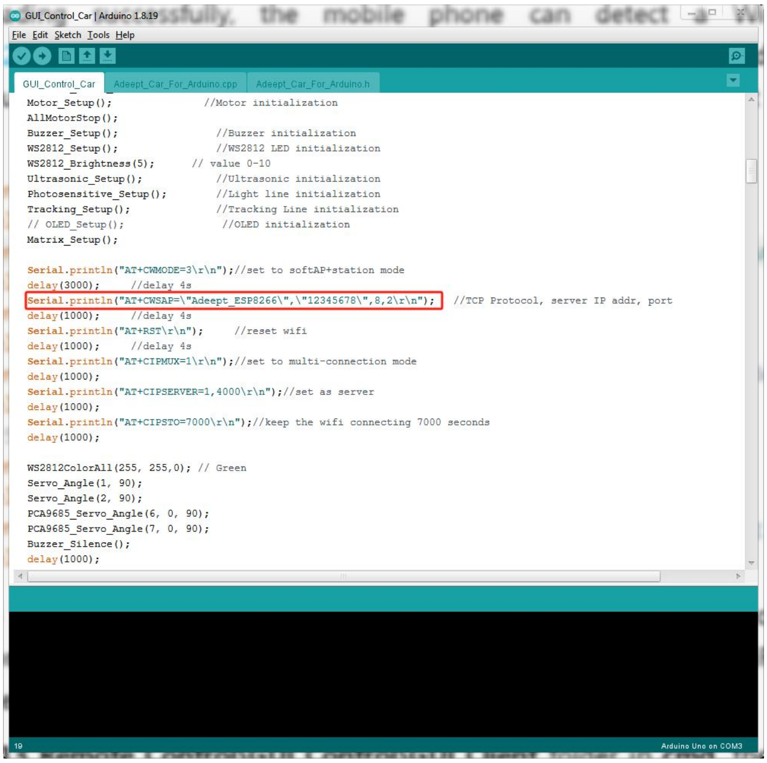


Output

```
Sketch uses 25084 bytes (77%) of program storage space. Maximum is 32256 bytes.
Global variables use 1206 bytes (58%) of dynamic memory, leaving 842 bytes for local variables. Maximum is 2048 byte
avrdude: loadaddr(): (b) protocol error, expect=0x14, resp=0xfc
```



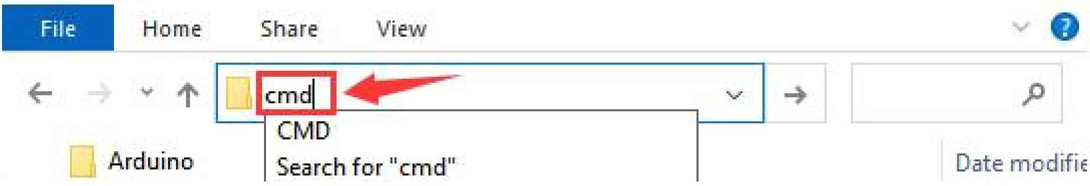
5. After uploading successfully, the mobile phone can detect a WiFi name named "Adeept_ESP8266", and the WiFi password is "12345678". The WiFi name and password can be modified through the procedure below. Modifications to the program are not recommended for initial use.


GUI_Control_Car | Arduino 1.8.19
File Edit Sketch Tools Help
GUI_Control_Car
Adeept_Car_For_Arduino.cpp
Adeept_Car_For_Arduino.h
19
Arduino Uno on COM3

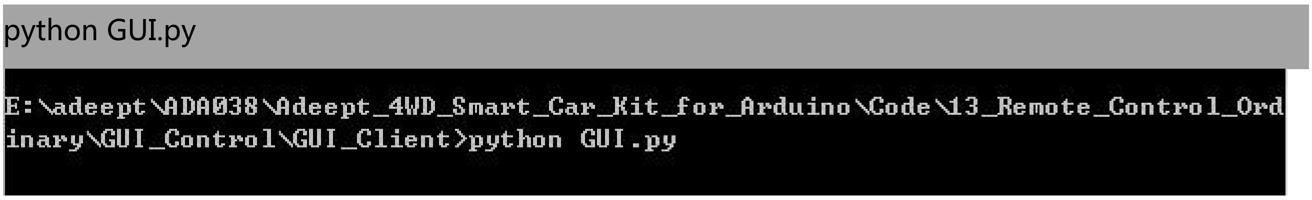
```
Motor_Setup();              //Motor initialization
AllMotorStop();
Buzzer_Setup();               //Buzzer initialization
WS2812_Setup();               //WS2812 LED initialization
WS2812_Brightness(5);      // value 0-10
Ultrasonic_Setup();           //Ultrasonic initialization
Photosensitive_Setup();       //Light line initialization
Tracking_Setup();             //Tracking Line initialization
// OLED_Setup();               //OLED initialization
Matrix_Setup();

Serial.println("AT+CWMODE=3\r\n");//set to softAP+station mode
delay(3000);     //delay 4s
Serial.println("AT+CWSAP=\"Adeept_ESP8266\",\"12345678\",8,2\r\n");  //TCP Protocol, server IP addr, port
delay(1000);     //delay 4s
Serial.println("AT+RST\r\n");     //reset wifi
delay(1000);     //delay 4s
Serial.println("AT+CIPMUX=1\r\n");//set to multi-connection mode
delay(1000);
Serial.println("AT+CIPSERVER=1,4000\r\n");//set as server
delay(1000);
Serial.println("AT+CIPSTO=7000\r\n");//keep the wifi connecting 7000 seconds
delay(1000);

WS2812ColorAll(255, 255,0); // Green
Servo_Angle(1, 90);
Servo_Angle(2, 90);
PCA9685_Servo_Angle(6, 0, 90);
PCA9685_Servo_Angle(7, 0, 90);
Buzzer_Silence();
delay(1000);
```

6. Use PC to connect to "Adeept_ESP8266" WiFi. Since this WiFi can only be used for communication between the PC and ESP8266, after the PC is connected to WiFi, it cannot access the external network (you cannot use the PC to access the Internet).

7. Enter the **\13_Remote_Control_Ordinary\GUI_Control\GUI_Client** folder in **cmd**, then run the **GUI.py** program in CMD.



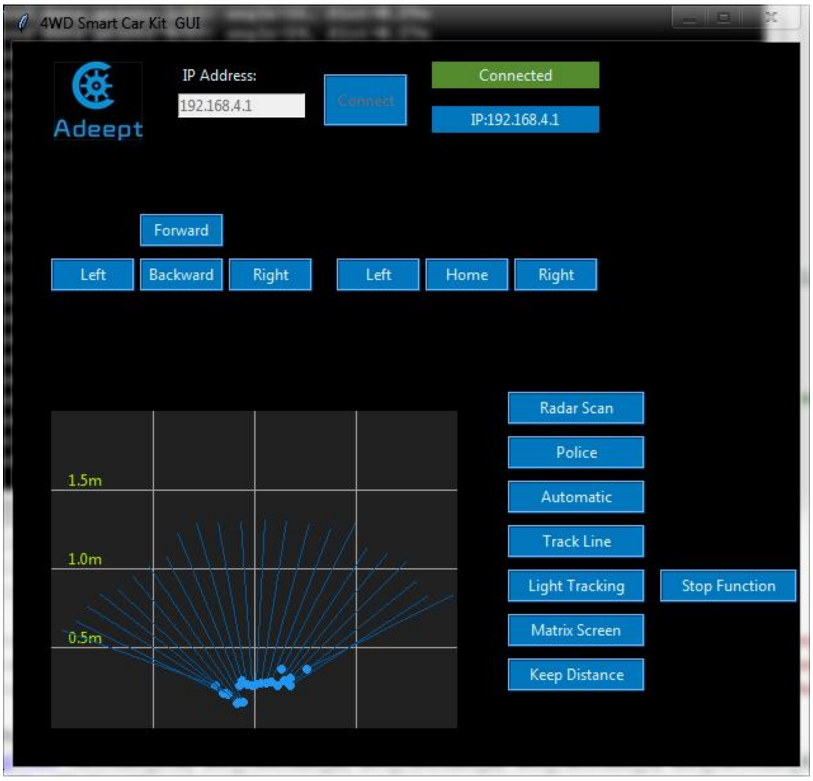
```
python GUI.py
```



```
E:\adeept\ADA038\Adeept_4WD_Smart_Car_Kit_for_Arduino\Code\13_Remote_Control_Ord
inary\GUI_Control\GUI_Client>python GUI.py
```

Enter the IP address, then click "**Connect**".

IP Address: 192.168.4.1



IP Address: 192.168.4.1

The operation instructions are as follows:

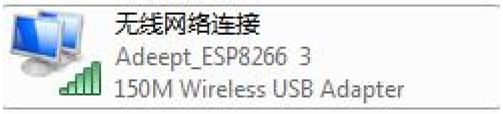
| Button | Instruction | Describe |
|---|---|---|
| Forward/The **W** key on the keyboard | forward/DS | Car moving forward |
| Backward/The **S** key on the keyboard | backward/DS | Car backwards |
| Left/The **A** key on the keyboard | turn_left/TS | Turn left in the car |
| Right/The **D** key on the keyboard | turn_right/TS | Turn right in the car |
| Left/The **J** key on the keyboard | lookleft/LRstop | Head left turn |
| Right/The **L** key on the | lookright/LRstop | Head to the right |

| | | |
|---|---|---|
| keyboard | | |
| Home | home | Head back to the middle position |
| Radar Scan | scan | Used to perform the ultrasound scan function and display the scan results |
| Automatic | automatic | Switch to automatic obstacle avoidance mode |
| Police | police | Make the WS2812 LED lights on the robot flash alternately in red and blue. |
| Track Line | trackLine | Implement line tracking function using a 3-channel infrared module. |
| Light Tracking | lightTracking | Light Tracking Function |
| Matrix Screen | matrix | Matrix screen lights up |
| Keep Distance | KD | Keep distance |
| Stop Function | StopFunction | Stop Function |

## Q&A

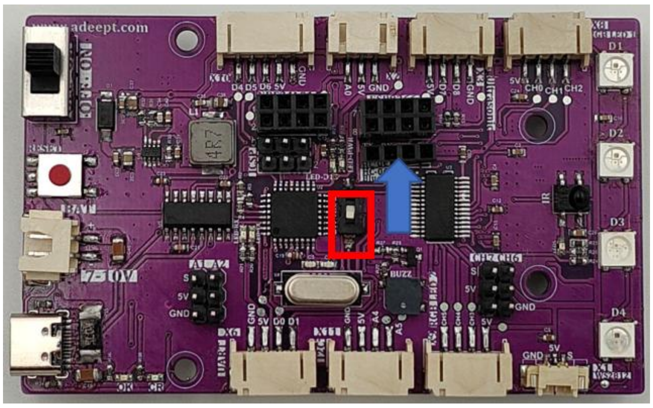
### If the GUI cannot be opened or operated:

1. Please check whether you are connected to the WiFi named "**Adeept_ESP8266**".



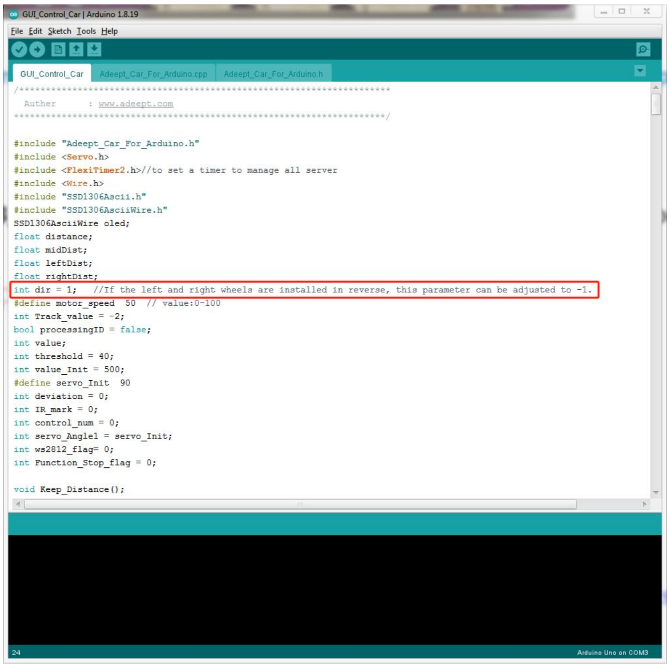
无线网络连接
Adeept_ESP8266 3
150M Wireless USB Adapter

2. Check whether the RX/D0 switch is correctly turned on.



## If the rotation direction of the wheels is opposite to the actual operation, please perform the following steps:

Go to the ‘**Code\13_Remote_Control_Ordinary\GUI_Control\GUI_Control_Car**’ folder, open the ‘**GUI_Control_Car.ino**’ file, and modify the parameter ‘**dir=-1**’ .


GUI_Control_Car | Arduino 1.8.19
File Edit Sketch Tools Help
GUI_Control_Car
Adeept_Car_For_Arduino.cpp
Adeept_Car_For_Arduino.h

```
/**********************************************************************
  Auther      : www.adeept.com
**********************************************************************/


#include "Adeept_Car_For_Arduino.h"
#include <Servo.h>
#include <FlexiTimer2.h>//to set a timer to manage all server
#include <Wire.h>
#include "SSD1306Ascii.h"
#include "SSD1306AsciiWire.h"
SSD1306AsciiWire oled;
float distance;
float midDist;
float leftDist;
float rightDist;
int dir = 1;   //If the left and right wheels are installed in reverse, this parameter can be adjusted to -1.
#define motor_speed  50  // value:0-100
int Track_value = -2;
bool processingID = false;
int value;
int threshold = 40;
int value_Init = 500;
#define servo_Init  90
int deviation = 0;
int IR_mark = 0;
int control_num = 0;
int servo_Angle1 = servo_Init;
int ws2812_flag= 0;
int Function_Stop_flag = 0;

void Keep_Distance();
```