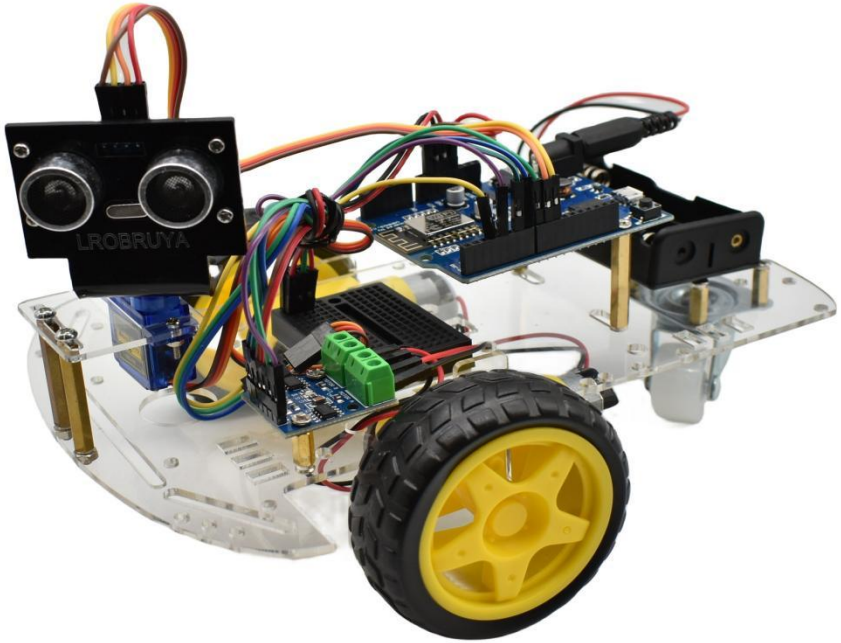
ESP8266 WIFI CAR


LROBRUYA

Contents

Preface

Company Profile

Founded in 2014, Shenzhen Lonten Technology Co., Ltd. focuses on the design, research production of Electronics Module for robotics related products. Consisting of professional researchers and skilled engineers, our R&D team constantly strives for creative function and excellent user experience. The company's R&D investments on arduino kits raspberry pi kits, as well as 3D printer and robots that back up STEAM education.

Customer Service

Our self-owned factory is certificated with BSCI and SO, covering an area of 5,000 square meters, and achieving an annual production capacity of over 10,000 units. Our products are all certified to CE, FCC, and ROHS standards, have exported to more than 100 countries including, but not limited to France, the United States of America, Australia, Russia, the United Kingdom, Germany, Singapore, Egypt, and India, bringing technological innovation to all walks of life.

By the way, We also look forward to hearing from you and any of your critical comment or suggestions. Pls email us by lonten3@qq.com or info@lontentech.com， if you have any questions or suggestions. As a continuous and fast growing company. We keep striving our best to offer you excellent products and quality service.

Our Store

store: https://www.lontentech.com/

Brand: LONTEN

Product Catalog

https://www.lontentech.com/collections/steam-robot

Tutorial

This tutorial include codes,libraries and lessons. It is designed for beginners.

How to Install Arduino IDE

Introduction

The Arduino Integrated Development Environment (IDE) is the software side of the Arduino platform.
In this Project, you will learn how to setup your computer to use Arduino and how to set about the Projects that follow.
The Arduino software that you will use to program your Arduino is available for Windows, Mac and Linux. The installation process is different for all three platforms and unfortunately there is a certain amount of manual work to install the software.

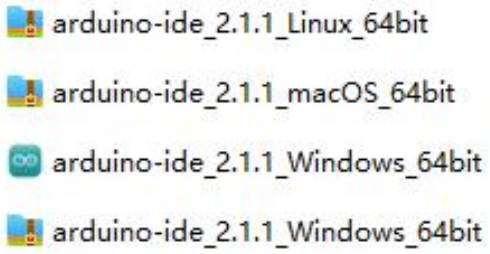
STEP 1: Go to https://www.arduino.cc/en/software.

The version available at this website is usually the latest version, and the actual version may be newer than the version in the picture.

STEP2：Download the development software that is compatible with the operating.
system of your computer. Take Windows as an example here.

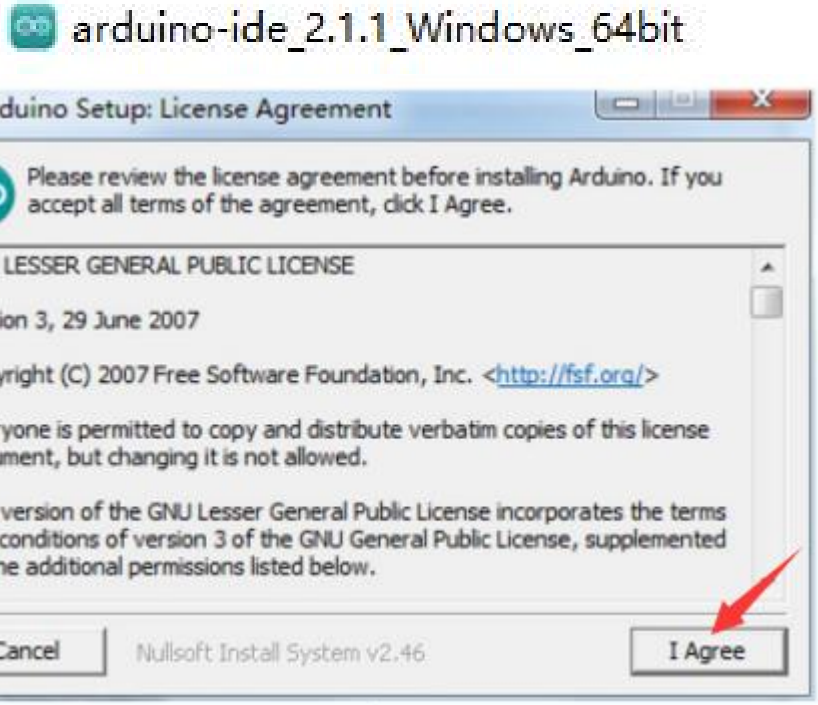
Click Windows Win 10 and newer,64 bits.

Click JUST DOWNLOAD.
Also version 2.1.1 is available in the material we provided, and the versions of our materials are the latest versions when this course was made.

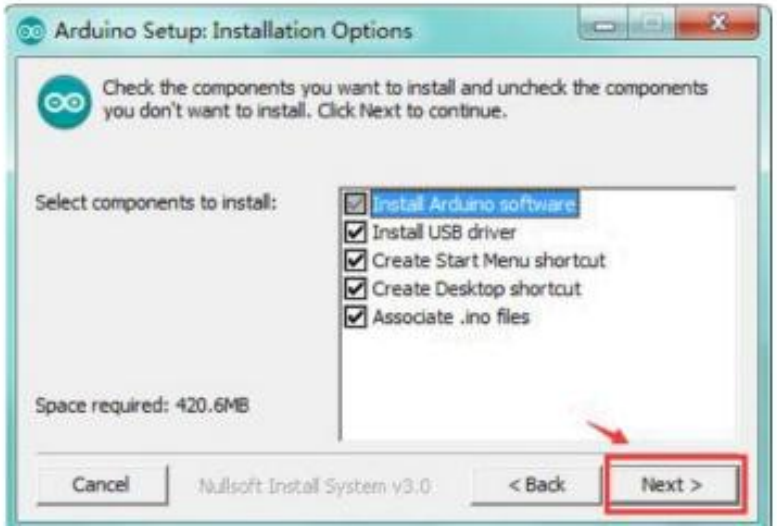


Installing Arduino (Windows)

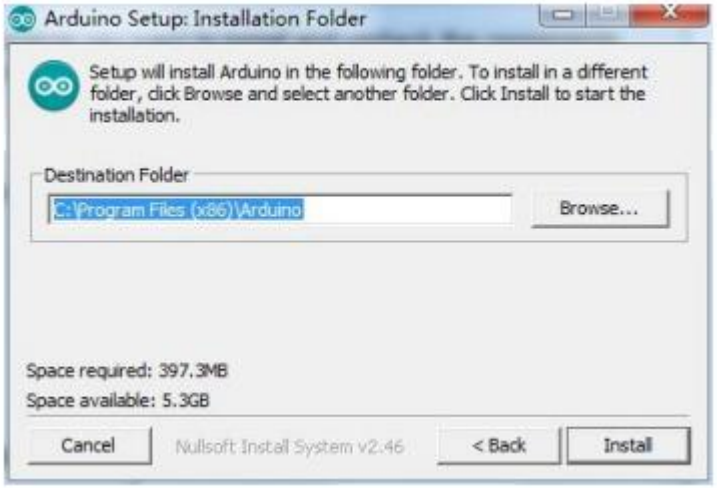
Install Arduino with the exe. Installation package.



Click I Agree to see the following interface.

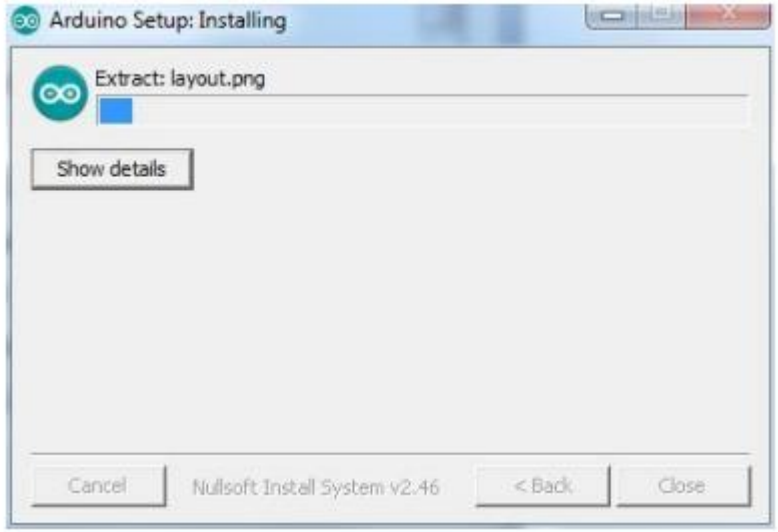


Click Next



You can press Browse… to choose an installation path or directly type in the directory you want.

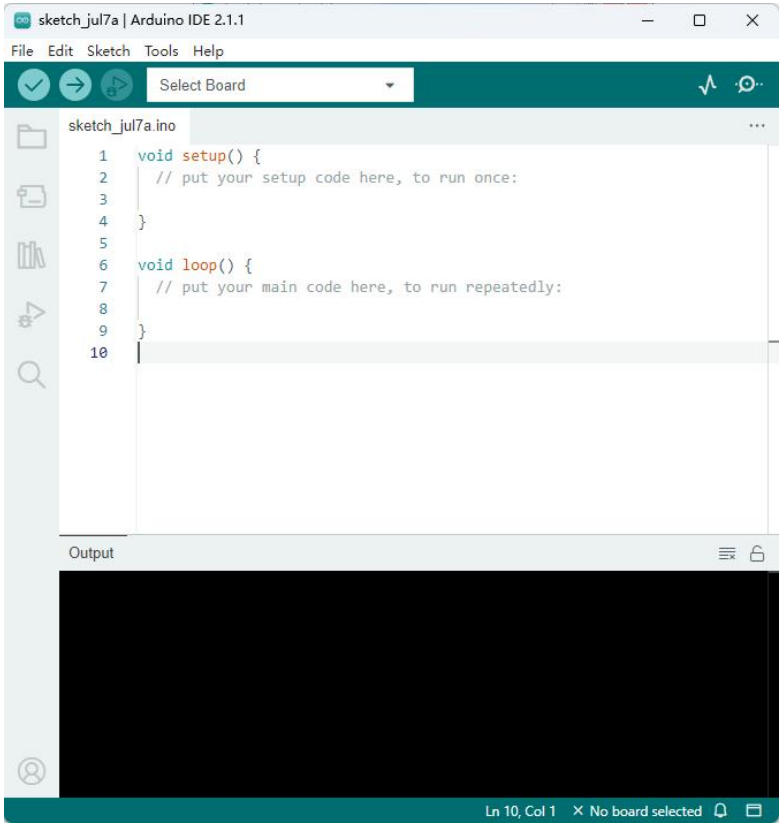
Click Install to initiate installation



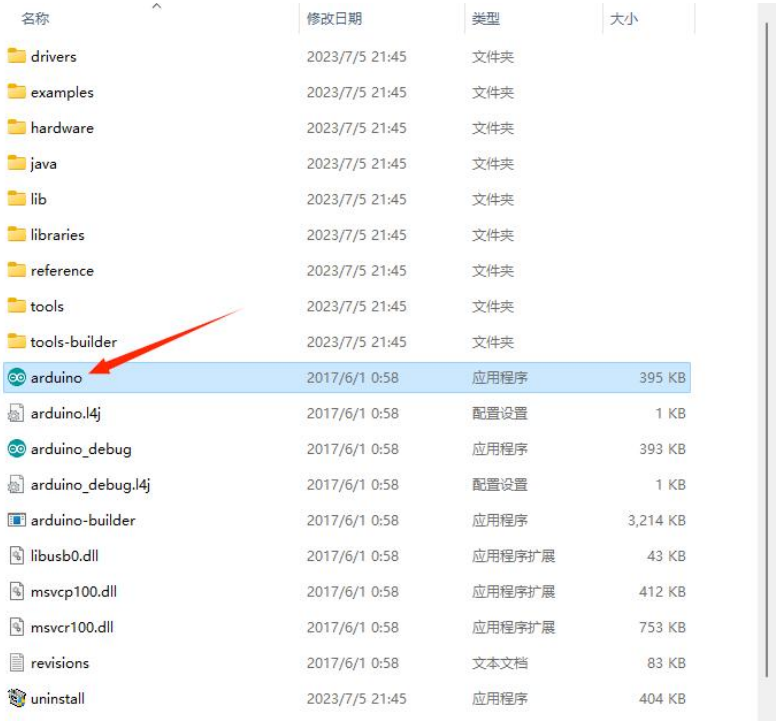
Finally, the following interface appears, click Install to finish the installation.

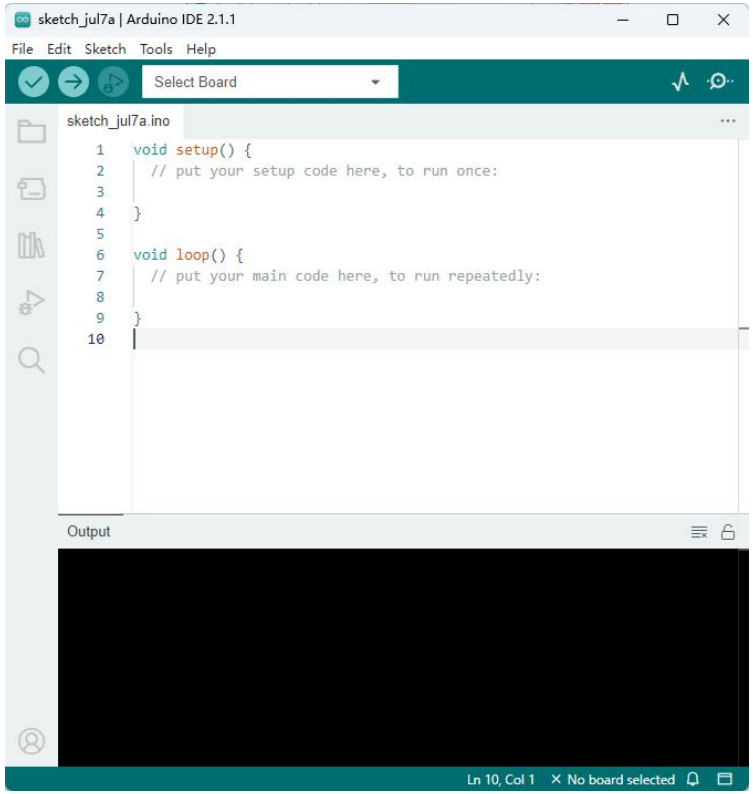
Next, the following icon appears on the desktop

Double-click to enter the desired development environment



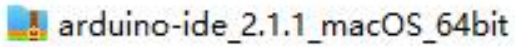
You may directly choose the installation package for installation and skip the contents below and jump to the next section.
But if you want to learn some methods other than the installation package, please continue to read the section.
Unzip the zip file downloaded, Double-click to open the program and enter the desired development environment.


名称
修改日期
类型
大小
drivers 2023/7/5 21:45 文件夹
examples 2023/7/5 21:45 文件夹
hardware 2023/7/5 21:45 文件夹
java 2023/7/5 21:45 文件夹
lib 2023/7/5 21:45 文件夹
libraries 2023/7/5 21:45 文件夹
reference 2023/7/5 21:45 文件夹
tools 2023/7/5 21:45 文件夹
tools-builder 2023/7/5 21:45 文件夹
arduino 2017/6/1 0:58 应用程序 395 KB
arduino.l4j 2017/6/1 0:58 配置设置 1 KB
arduino_debug 2017/6/1 0:58 应用程序 393 KB
arduino_debug.l4j 2017/6/1 0:58 配置设置 1 KB
arduino-builder 2017/6/1 0:58 应用程序 3,214 KB
libusb0.dll 2017/6/1 0:58 应用程序扩展 43 KB
msvcp100.dll 2017/6/1 0:58 应用程序扩展 412 KB
msvcr100.dll 2017/6/1 0:58 应用程序扩展 753 KB
revisions 2017/6/1 0:58 文本文档 83 KB
uninstall 2023/7/5 21:45 应用程序 404 KB



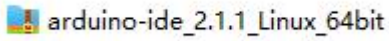
Installing Arduino (Mac OS X)

Download and Unzip the zip file, double click the Arduino.app to enter Arduino IDE; the system will ask you to install Java runtime library if you don't have it in your computer. Once the installation is complete you can run the Arduino IDE.



Installing Arduino (Linux)

You will have to use the make install command. If you are using the Ubuntu system, it is recommended to install Arduino IDE from the software center of Ubuntu.

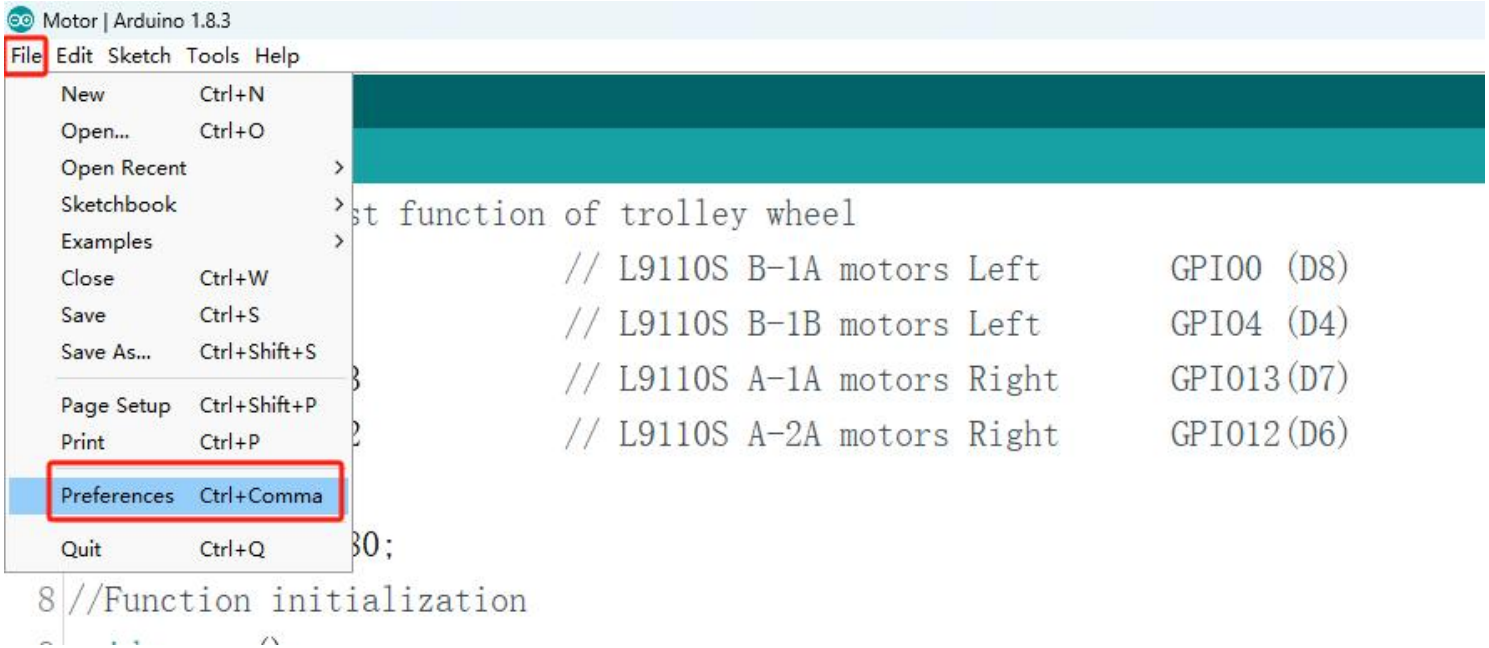


How to Install ESP8266 Add in Arduino IDE

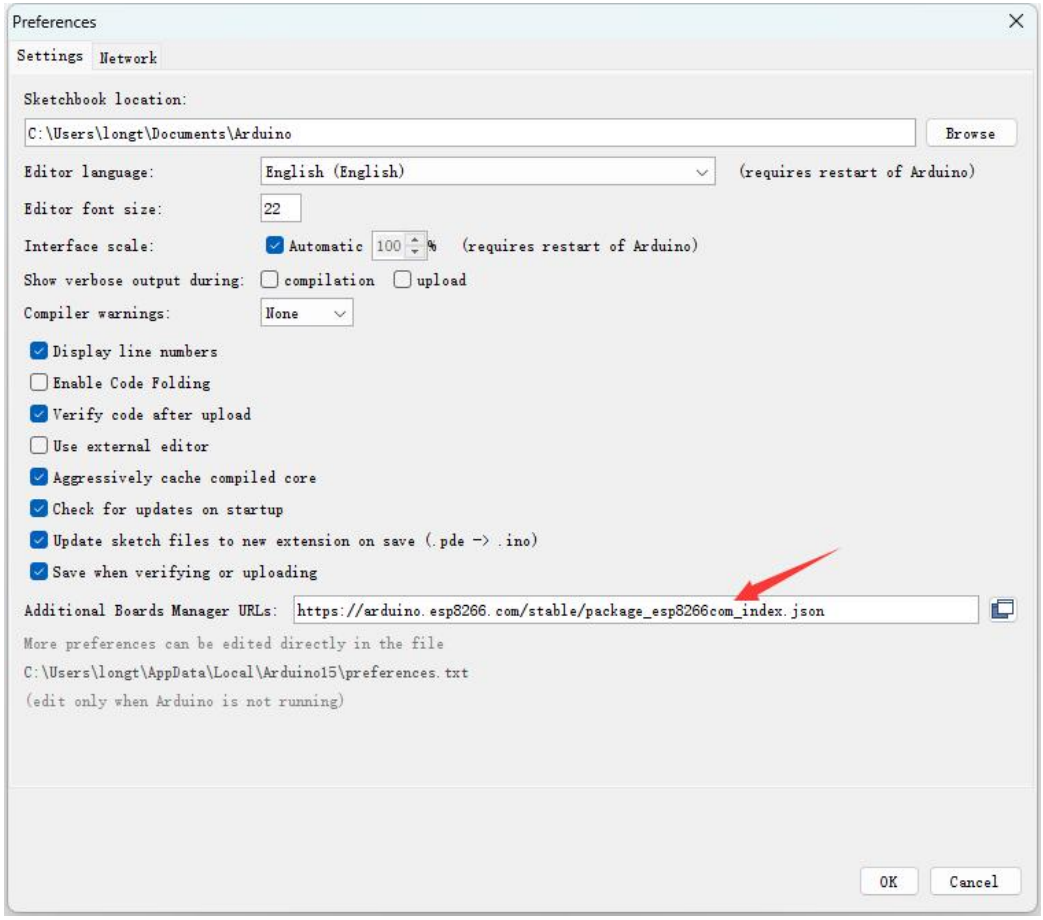
Add ESP8266 board in Arduino IDE

Add board resource connection in “Preferences”

Click **File** > **Preferences** to open the Preferences window

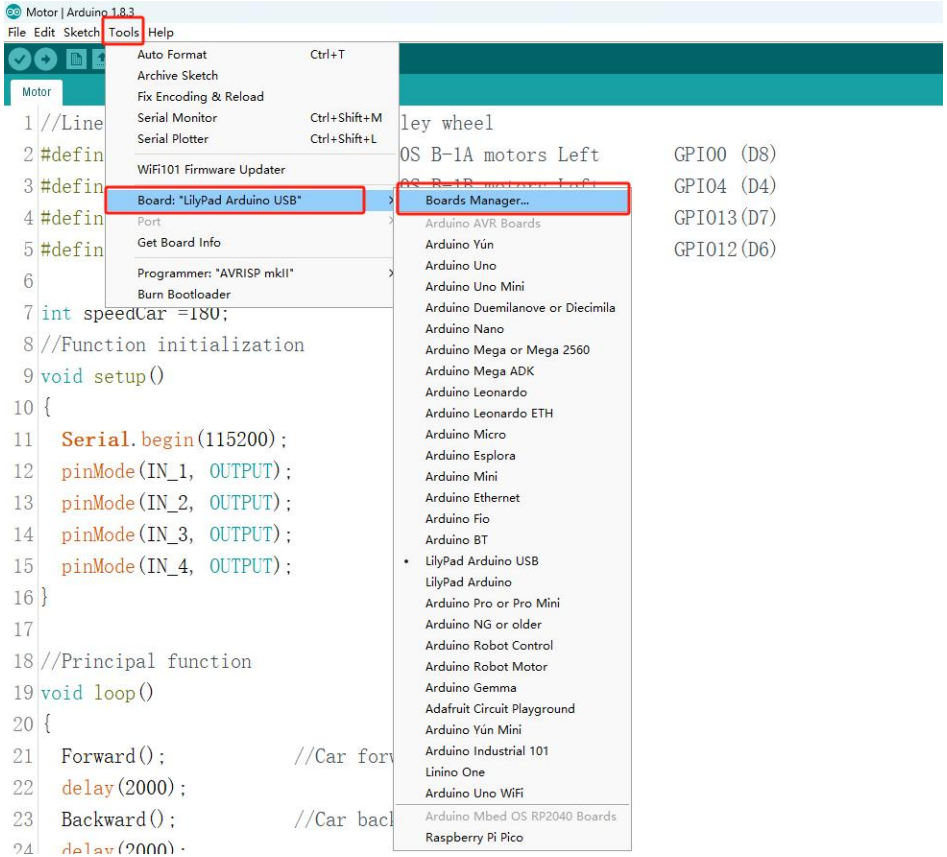


Copy and paste the following resource links to "Board Management URLs", and click OK to save after completion.
https://arduino.esp8266.com/stable/package_esp8266com_index.json

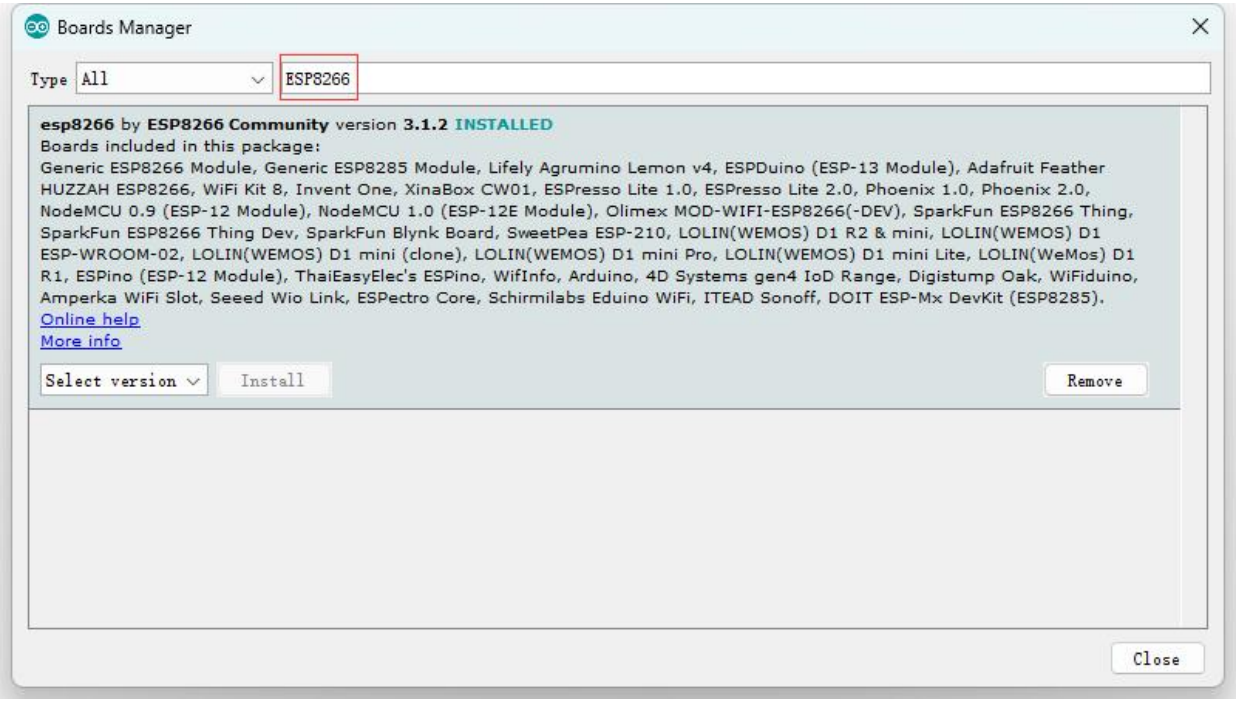


Search and install ESP8266

Open "Board Management"

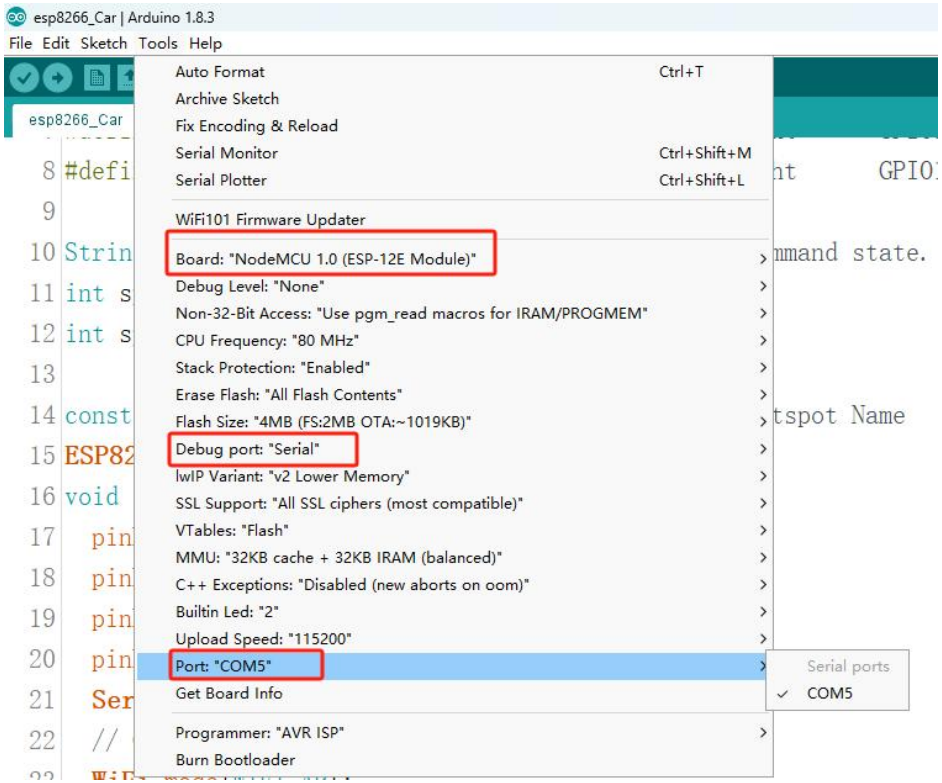


Enter "ESP8266" in the search bar, click "install" to install (make sure the network is smooth)



Check that the board is installed successfully

You can see "esp8266" appearing under "Board"



Add the library in Arduino IDE

How to install other libraries in Arduino IDE

Once you are familiar with the Arduino software and using the built-in features, you may want to extend the capabilities of the Arduino with additional libraries.

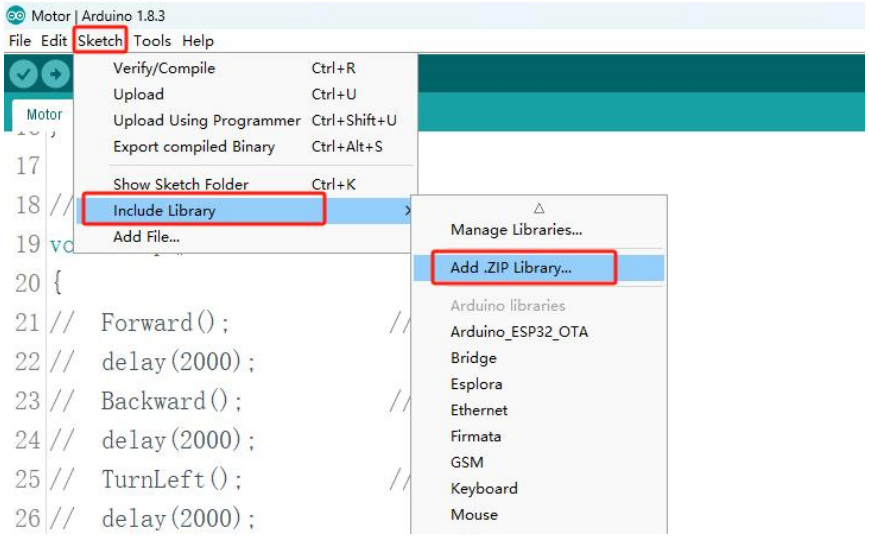
What are Libraries?

A library is a set of code that allows you to easily connect to sensors, displays, modules, and more. For example, the LiquidCrystal library allows you to easily interact with character LCD displays. There are thousands of libraries available for download directly through the Arduino IDE, all of which you can find in the Library Manager.

Import .zip library

Libraries are usually distributed as ZIP files or folders. The name of the folder is the name of the library. Inside this folder will contain a .cpp file, a .h file and usually a keywords.txt file, examples folder and other files required by the library. Starting with version 1.0.5, you can install 3rd party libraries in the IDE. Do not unzip the downloaded library, leave it as is.

In the Arduino IDE, navigate to Sketch > Include Library > Add .ZIP Library and at the top of the dropdown, select the "Add .ZIP Library" option.



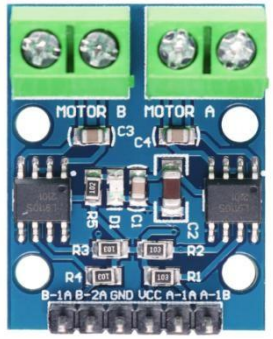
The system will prompt you to select the library to add , navigate to the path location of the saved *servo* .zip file in the computer (*Libraries\servo.zip*) as shown in the figure below and open it .

Lesson1 Let the car move

Description

The content of this section mainly understands the principle of the motor and the motor drive module, and masters how to control the car robot to complete forward, backward, left turn, and right turn walking through programming.

Motor drive module L9110S



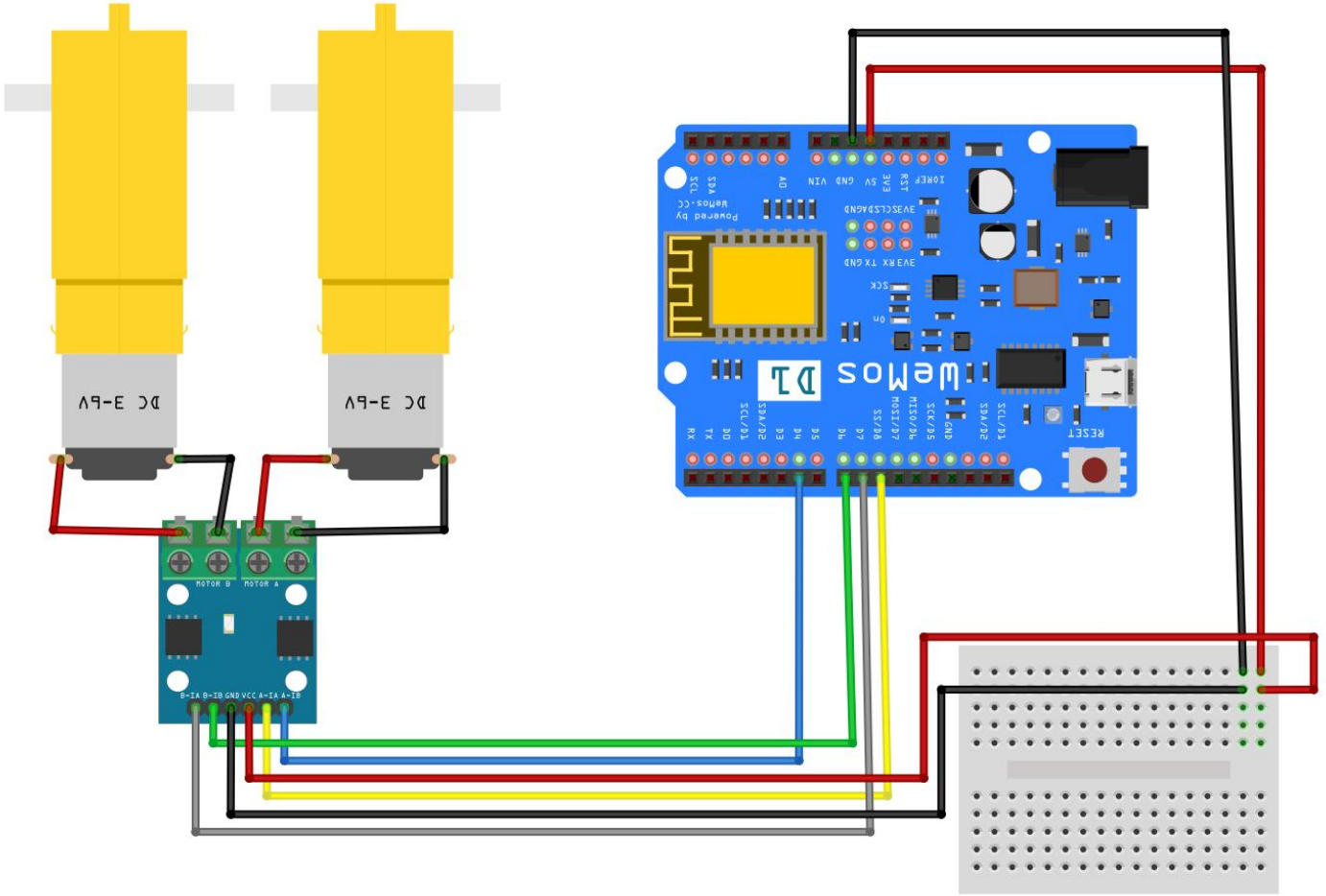
1. Double L9110S chip
2. The working voltage of the motor is between 2.5v-12v, and the maximum working current is 0.8A;
3. It can drive two DC motors or one 4-wire 2-phase stepping motor at the same time.
4. PCB size: 2.8cm *2.1cm ultra-small size, suitable for assembly
5. With fixed mounting holes, diameter: 3mm

How does the driver module L9110S work?

Through B-1A (PIN 7) / B- 2A (PIN 6) / A-1A (PIN 8) / A-1B (PIN 4) output high and low levels or output pwm to control the forward and reverse rotation of the motor . Here pwm value range (0~255), such as analogWrite(PIN,180).

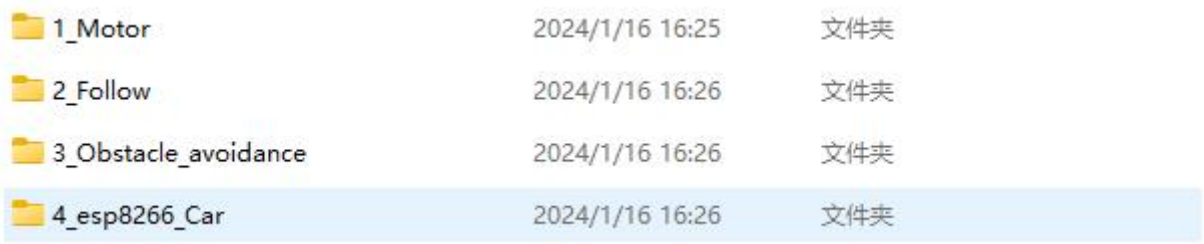
State of motion	B-1A (PIN 7)	B-2A (PIN 6)	A-1A (PIN8)	A-1B (PIN 4)
Forward	HIGH	LOW	LOW	HIGH
Backward	LOW	HIGH	HIGH	LOW
Turn Left	HIGH	LOW	HIGH	LOW
Turn Right	LOW	HIGH	LOW	HIGH
stop	LOW	LOW	LOW	LOW

Circuit diagram

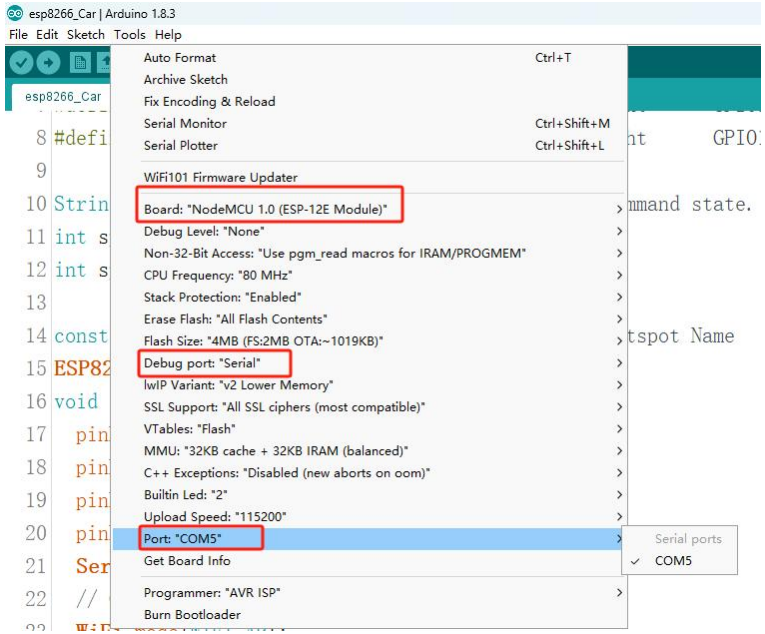


Code burning

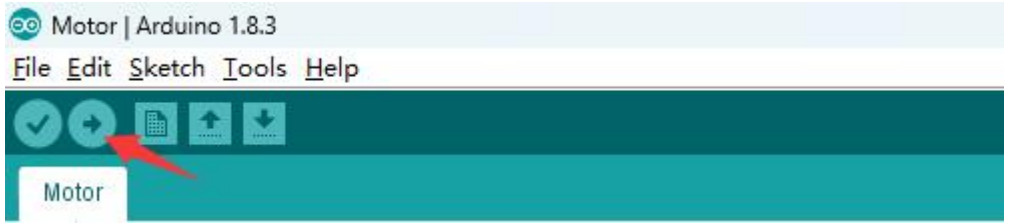
Open the code file (folder path: Code\1_Motor\Motor\Motor.ino)



Use the USB cable to connect the control board to the computer and check that the Board Type and Serial Port settings are correct.



Select NodeMCU1.0 for the board type and COM5 for the serial port here . The serial port will actually appear different, although COM 5 is selected here , it could be COM3 or COM4 on your computer. Then, click the upload button and wait for the upload to complete.



After the code is burned successfully, you can see that the car performs forward, backward, left turn and right turn movements.

Lesson2 Follow the car

Description

Ultrasonic distance measurement is a very useful and widely used measurement method. This section mainly understands the working principle of the ultrasonic module, masters the connection of the ultrasonic circuit and realizes the following function of the car through programming.

Ultrasonic

How does ultrasonic work?

1. Transmitter (trig pin) sends signal: high-frequency sound;
2. When the signal hits an object, it will be reflected;
3. Receiver (echo pin): Receive the signal reflected from it.

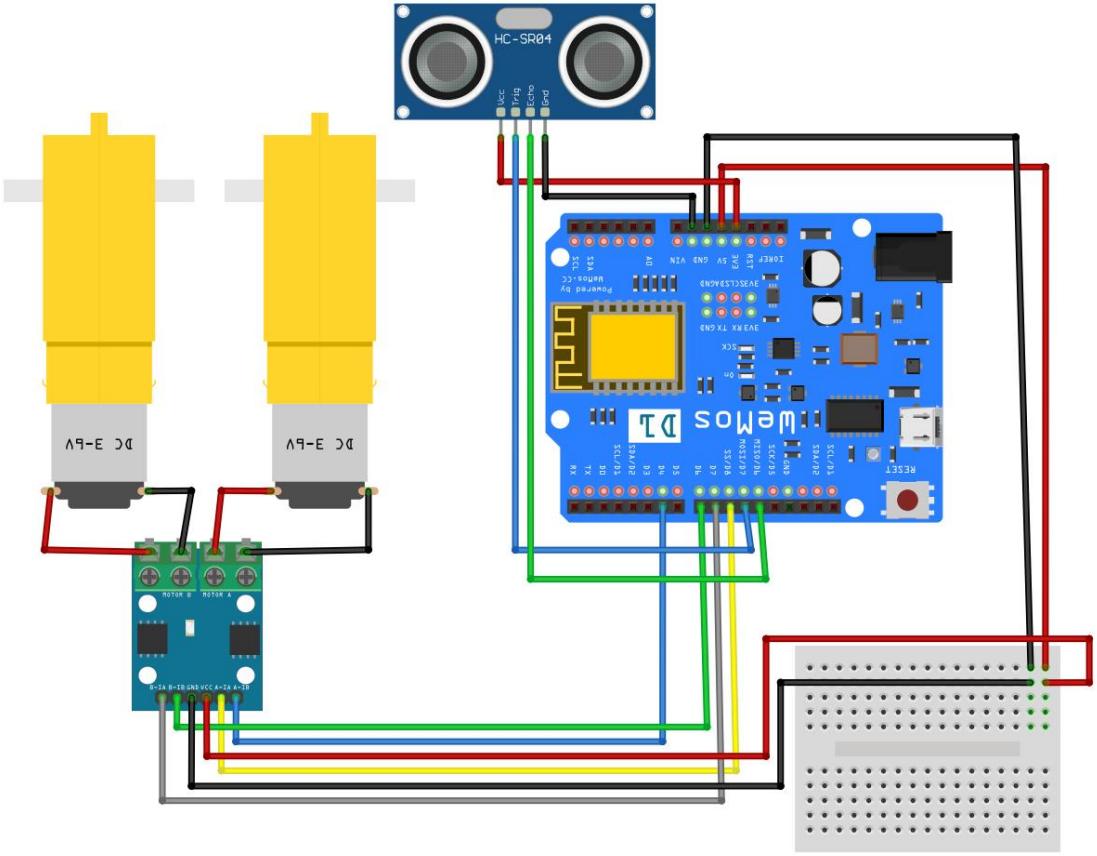
There are many methods of ultrasonic distance measurement. The principle of this system in ultrasonic measurement is: detect the transmission time of the ultrasonic wave from the ultrasonic transmitter through the gas medium to the receiver, multiply this time by the speed of sound in the air, and obtain the sound propagation time distance.

The ultrasonic transmitter emits ultrasonic waves in a certain direction, and the MCU starts timing at the same time. The ultrasonic waves are emitted in the air, and return immediately when encountering obstacles on the way, and the ultrasonic receiver stops timing immediately after receiving the reflected waves. According to the time T recorded by the timer , the distance (S) from the launch point to the obstacle can be calculated.

formula: $S = V * T/2$

Four factors limit the maximum measurable distance of an ultrasound system: the amplitude of the ultrasound waves, the texture of the reflector, the angle between the reflected and incident sound waves, and the sensitivity of the receiving transducer. The ability of the receiving transducer to receive the sound pulse directly will determine the minimum measurable distance.

Circuit diagram



Lesson3 Obstacle avoidance car

Description

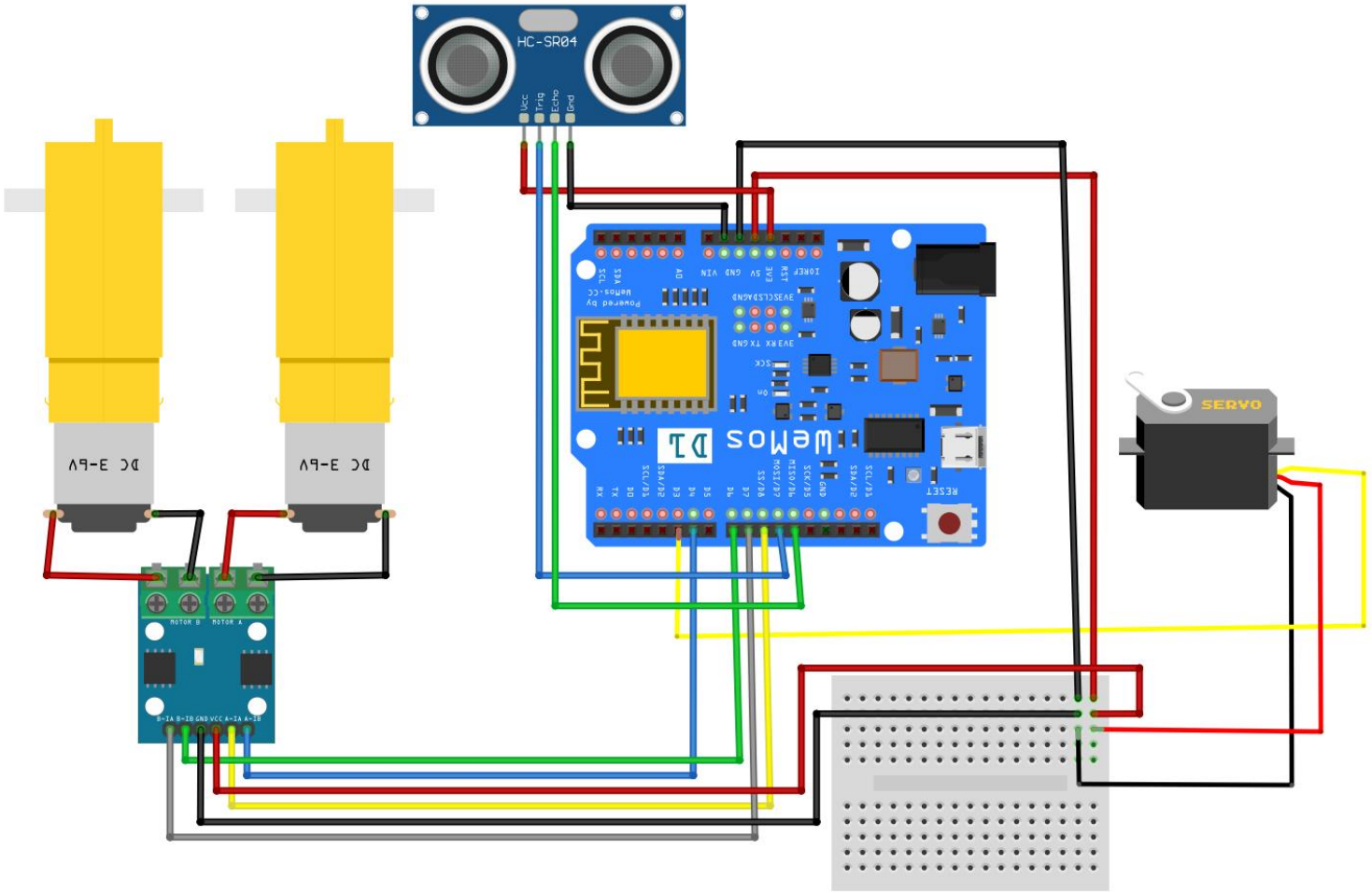
In the previous section, we have understood and learned the relevant knowledge of the ultrasonic module. In this section, we will add the steering gear to control the ultrasonic rotation function, and master the principle of the obstacle avoidance car , and finally realize the obstacle avoidance function through programming.

Servo

The steering gear (servo motor) control pulse signal period is 20MS pulse width modulation signal (PWM), the pulse width is from 0.5ms to 2.5ms, and the corresponding steering position changes linearly from 0 to 180 degrees.

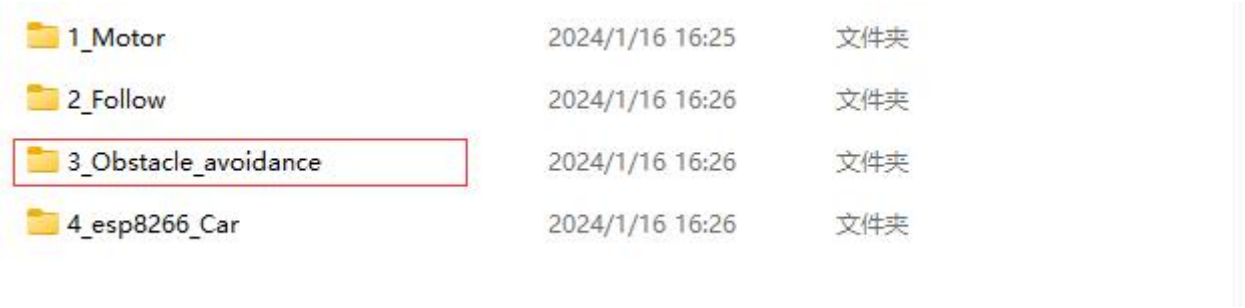
There is a reference circuit inside the steering gear, which generates a pulse signal with a period of 20ms and a width of 1.5ms. There is a comparator that compares the external signal with the reference signal to determine the direction and magnitude, thereby generating a motor rotation signal.

Circuit diagram



Code Analysis

Open the code file (folder path: Code\3_Obstacle_avoidance\Obstacle_avoidance\Obstacle_avoidance.ino)



Principle of obstacle avoidance:

When it is judged that the distance between the ultrasonic wave and the obstacle in front (variable cm) is less than the set value (< set_dis), let the car stop for 200ms, that is, call the stop function Stop(), and the steering gear will drive the ultrasonic wave to turn left and obtain the distance between the left ultrasonic wave and the obstacle. The distance between them is saved to the variable leftDis. Similarly, the ultrasonic wave turns right again to obtain the distance and saves it to the variable rightDis, and finally the steering gear returns to the front. By comparing the distance between the left and right sides, let the car drive to the side with the larger distance. If the maximum distance is less than 10cm, then the car will back and forth and then turn to avoid obstacles.

Create a new obstacle avoidance function avoidance(int set_dis) with parameters. First, save the distance in front of the ultrasonic detection to the internal variable cm.

```
/*
* Function: Obstacle avoidance
* Parameter: set_dis sets the obstacle avoidance distance
*/
void avoidance(int set_dis) {
  myservo.write(90);  //Steering engine back to center
  //Obtain the distance between the cart and the obstacle and store it in cm
  cm = GetDistance();
```

Determine if an obstacle is encountered ahead (cm<set_dis), and save the left and right distances obtained by ultrasonic

waves to leftDis and rightDis.

```
if (cm <= set_dis) {
  Stop();                    //Stop the car
  delay(200);
  myservo.write(140);
  leftDis = GetDistance();  // Measure the distance between the left obstacle and the car, and store the measurement data in leftDis
  delay(200);
  myservo.write(90);
  delay(100);
  myservo.write(40);
  rightDis = GetDistance();  // Record the range data on the right side of the trolley
  delay(200);
  myservo.write(90);
```

When the distance to the right is greater, turn right. If the maximum distance is less than 10, then back up and then turn right.

```
//The right is more distant from the obstacle than the Left
if (leftDis < rightDis) {
  if (rightDis < 10) {
    Backward();
    delay(300);
    TurnRight();
    delay(200);
  } else {
    TurnRight();
    delay(200);
  }
}
```

In the same way, you can get the code when turning left

```
//The left is more distant from the obstacle than the Right
else if (leftDis > rightDis) {
  if (leftDis < 10) {
    Backward();
    delay(300);
    TurnLeft();
    delay(200);
  } else {
    TurnLeft();
    delay(200);
  }
}
```

Finally keep going straight when there are no obstacles.

```
} else {
  Forward();
}
```

Lesson4 ESP8266 WiFi Car

Description

The Esp8266 main controller has a powerful WiFi function, and the WiFi hotspot can be released by setting the AP mode through programming, and another device can be connected to the hotspot to realize the remote control function.

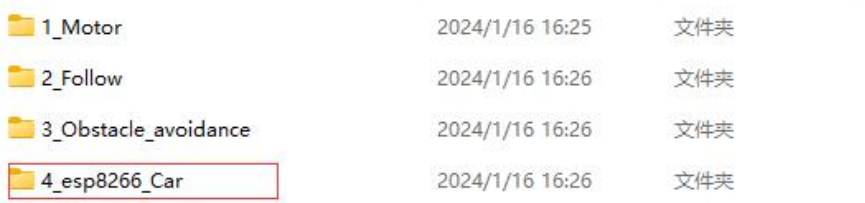
WiFi remote control principle

The car with the esp8266 main control can release the WiFi hotspot after uploading the corresponding code. For example, the name of the WiFi hotspot in this project is: lrobruya ESP8266 Car. After connecting the hotspot with the device with the command function APP, the remote control command can be sent, and the car receives it. Execute the corresponding action after receiving the command. During the connection process, you need to enter an IP address to complete the device connection, and once the connection is successful, it means that your network service has been switched to the esp8266 hotspot instead of your GPRS network, and you are only able to control the car but not Internet situation.

Regarding the installation of APP, there are different installation methods on different devices, please check the documentation in the folder "APP".

Code upload

Open the code file (path:Code\4_esp8266_Car\esp8266_Car\esp8266_Car.ino)



board type NodeMCU1.0 and serial port COM5 in ArduinoIDE . Click the upload button "upload" and wait for the upload to complete.

Code Analysis

Import required library files

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
```

Set the character variable String command to receive the command and two speed variables speedCar (one big and one small form a speed difference turn, where 1.5 is the difference multiple relationship, which can be adjusted according to the actual situation)

```
String command;             //String to store app command state.
int speedCar = 200;         // 0~255.
int speed_low = speedCar/1.5;
```

Set the WiFi hotspot name variable and instantiate the network service with port 80

```
const char* ssid = "lrobruya ESP8266 Car"; //wifi Hotspot Name
ESP8266WebServer server(80);
```

Set WiFi mode to AP mode and WiFi name setting

```
WiFi.mode(WIFI_AP);
WiFi.softAP(ssid);
```

After the connection is successful, the IP address is printed and can be viewed on the serial monitor.

```
IPAddress myIP = WiFi.softAPIP();
Serial.println("AP IP address: ");
Serial.print(myIP);
```

Start the web server and receive the returned html file function HTTP_handleRoot

```
// Starting WEB-server
server.on ( "/", HTTP_handleRoot );
server.onNotFound ( HTTP_handleRoot );
server.begin();
```

```
void HTTP_handleRoot(void) {
  if( server.hasArg("State") ){
    Serial.println(server.arg("State"));
  }
  server.send ( 200, "text/html", "" );
  delay(1);
}
```

Execute service interaction within the loop function loop() and save the obtained command status value to the variable command

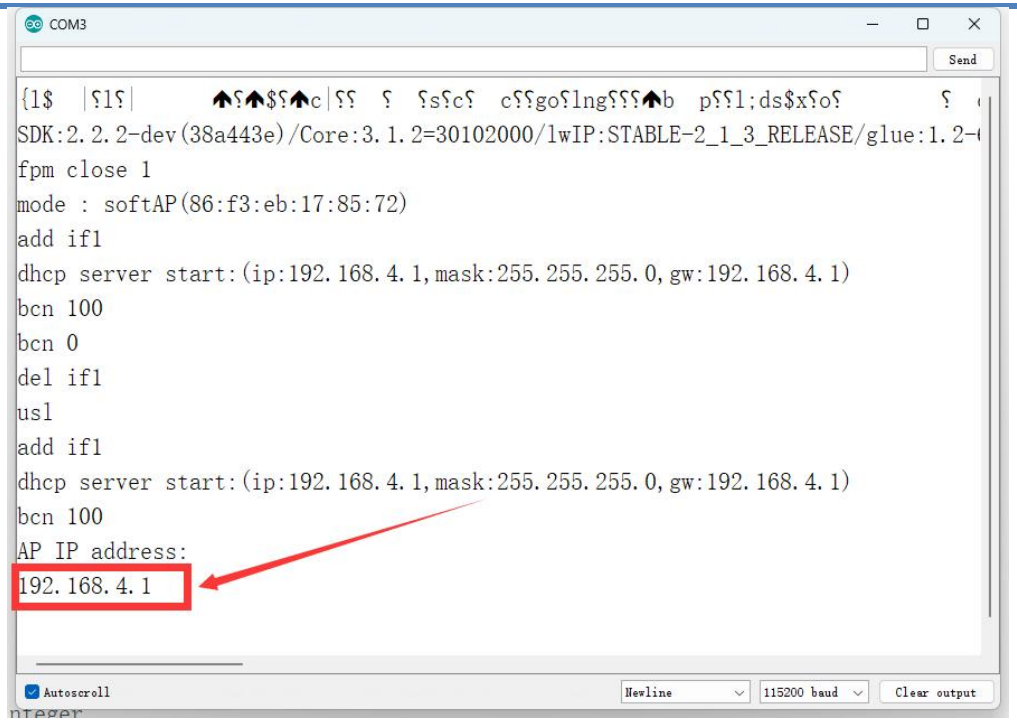
```
void loop() {
  server.handleClient();
  command = server.arg("State");
```

Execute corresponding movement according to the received command value. Different letters represent different movement directions, and 0~9 represent different speeds.

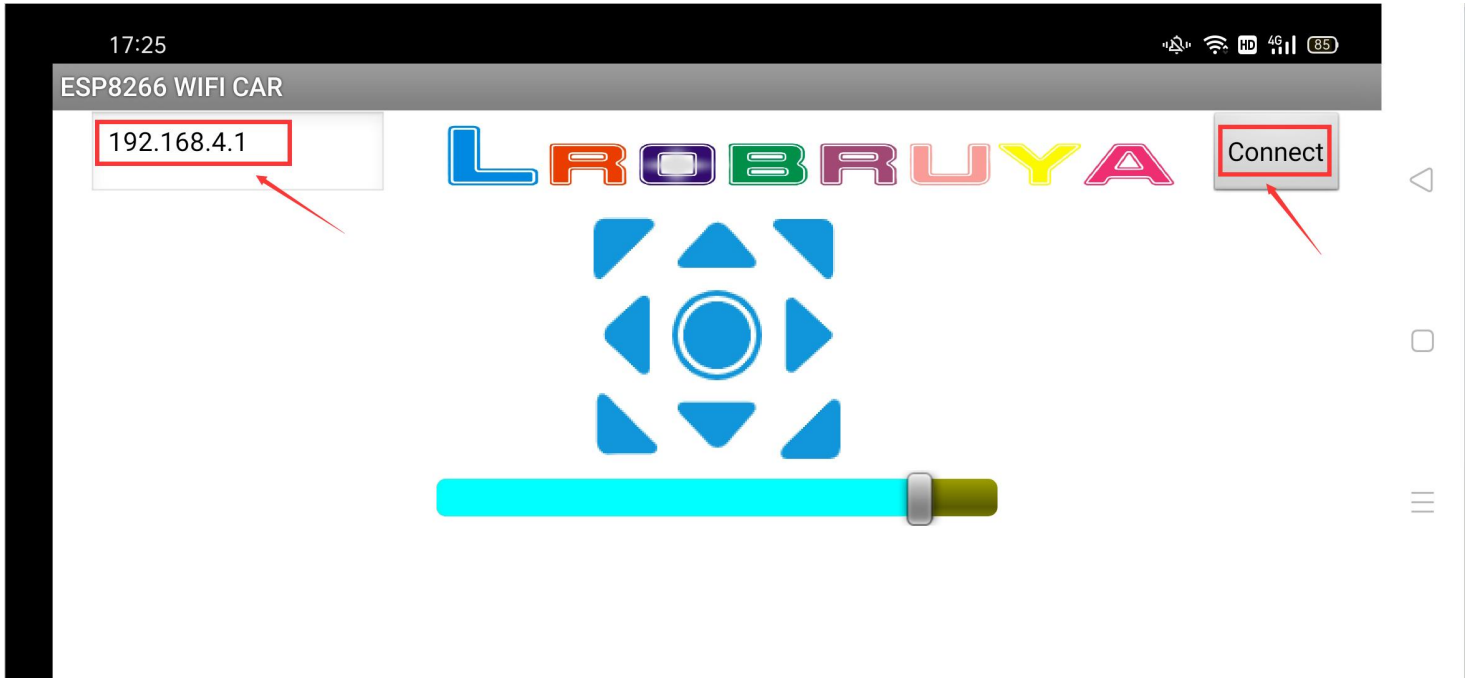
```
    if (command == "F") Forward();
    else if (command == "B") Backward();
    else if (command == "L") TurnLeft();
    else if (command == "R") TurnRight();
    else if (command == "I") goAheadRight();
    else if (command == "G") goAheadLeft();
    else if (command == "J") goBackRight();
    else if (command == "H") goBackLeft();
    else if (command == "S") Stop();
    else speedCar = atoi(command.c_str());//Convert string type to integer
```

APP Use

Firstly, after downloading the code, open the serial port and see the IP address of the car.



Then open the mobile app we provide (only on Android). Before using the app, you need to first connect to the car's WIFI, named **lrobruya ESP8266 Car**. Then enter the car's IP address on the app interface, click the connect button, and you can control the car's operation,the sliding bar can change the speed of the car.


17:25
ESP8266 WIFI CAR
192.168.4.1
LROBRUYA
Connect