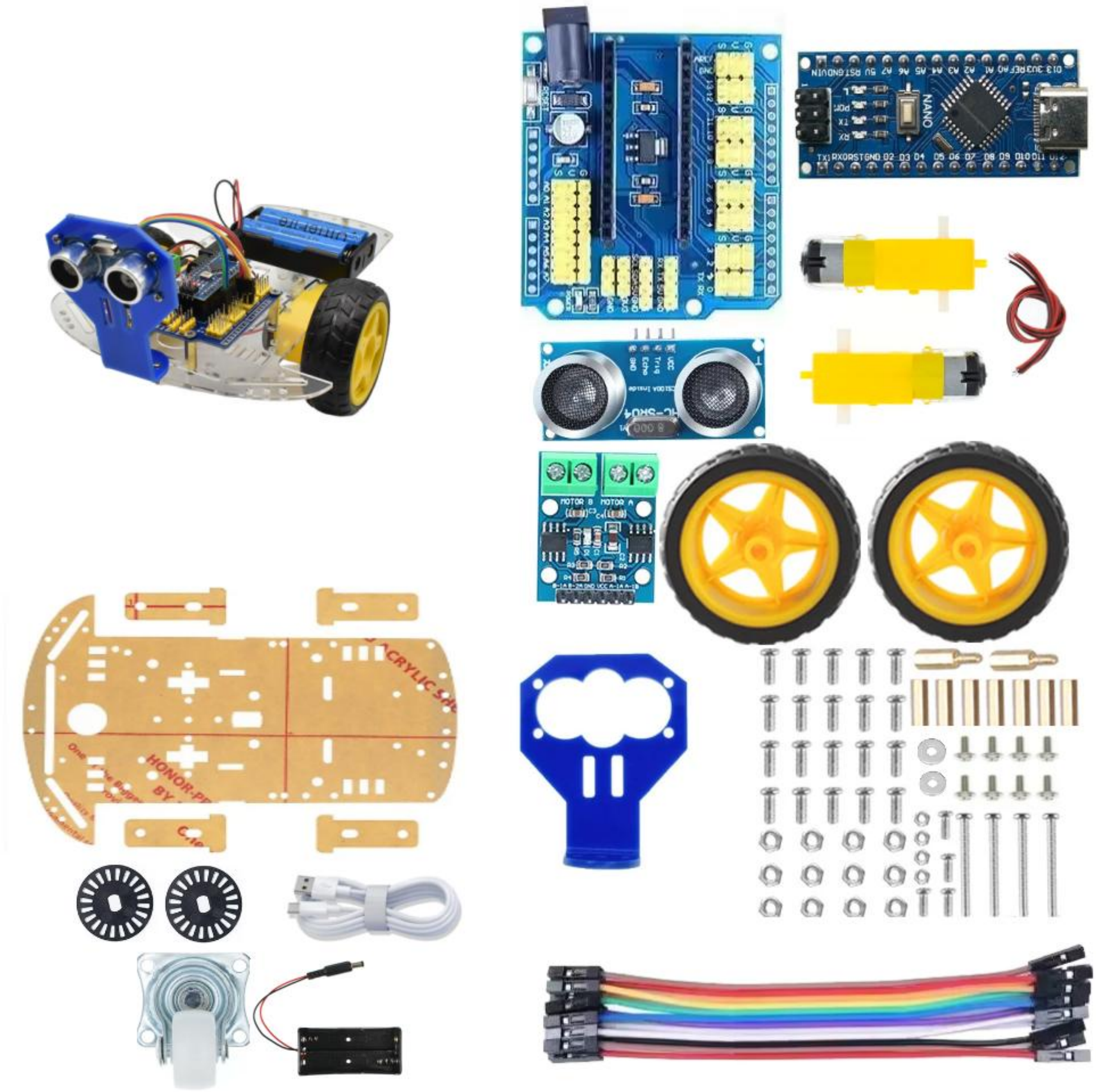
LROBRUYA

Mini DIY obstacle avoidance car



Content

Lesson 0 Installing Arduino IDE

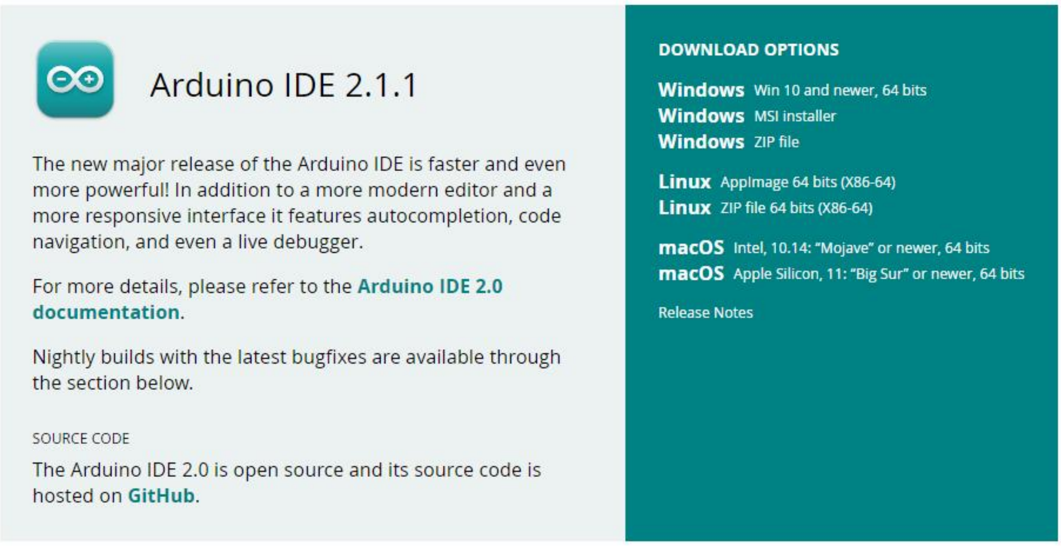
Introduction

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.



Arduino IDE 2.1.1

The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger.

For more details, please refer to the **Arduino IDE 2.0 documentation**.

Nightly builds with the latest bugfixes are available through the section below.

SOURCE CODE

The Arduino IDE 2.0 is open source and its source code is hosted on **GitHub**.

DOWNLOAD OPTIONS

Windows Win 10 and newer, 64 bits
Windows MSI installer
Windows ZIP file

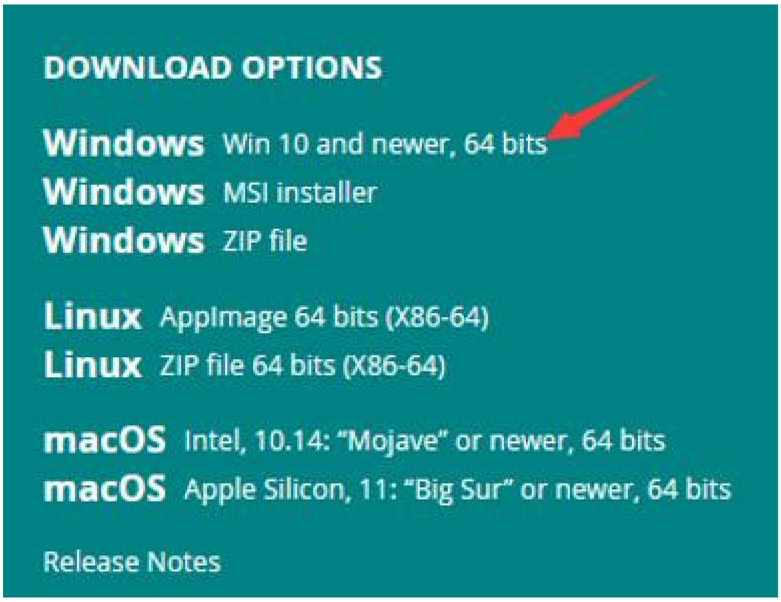
Linux AppImage 64 bits (X86-64)
Linux ZIP file 64 bits (X86-64)

macOS Intel, 10.14: "Mojave" or newer, 64 bits
macOS Apple Silicon, 11: "Big Sur" or newer, 64 bits

Release Notes

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.



DOWNLOAD OPTIONS

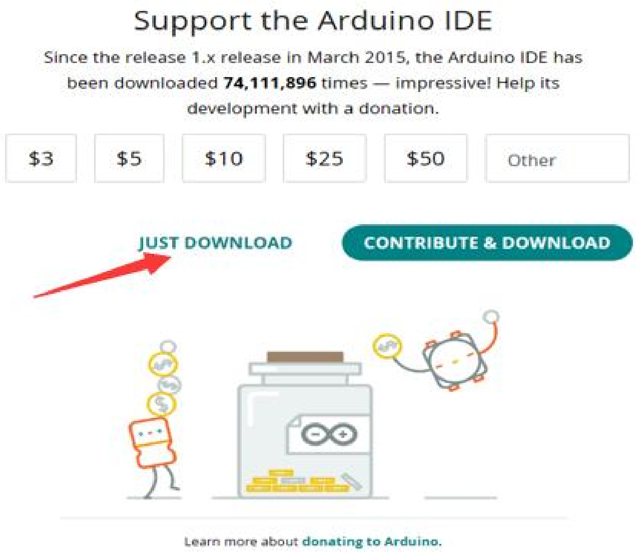
Windows Win 10 and newer, 64 bits
Windows MSI installer
Windows ZIP file

Linux AppImage 64 bits (X86-64)
Linux ZIP file 64 bits (X86-64)

macOS Intel, 10.14: "Mojave" or newer, 64 bits
macOS Apple Silicon, 11: "Big Sur" or newer, 64 bits

Release Notes

Click Windows Win 10 and newer,64 bits.

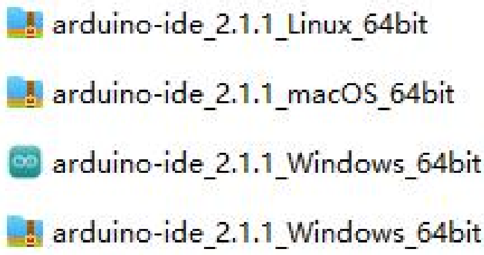


Support the Arduino IDE

Since the release 1.x release in March 2015, the Arduino IDE has been downloaded **74,111,896** times — impressive! Help its development with a donation.

Learn more about donating to Arduino.

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.



arduino-ide_2.1.1_Linux_64bit

arduino-ide_2.1.1_macOS_64bit

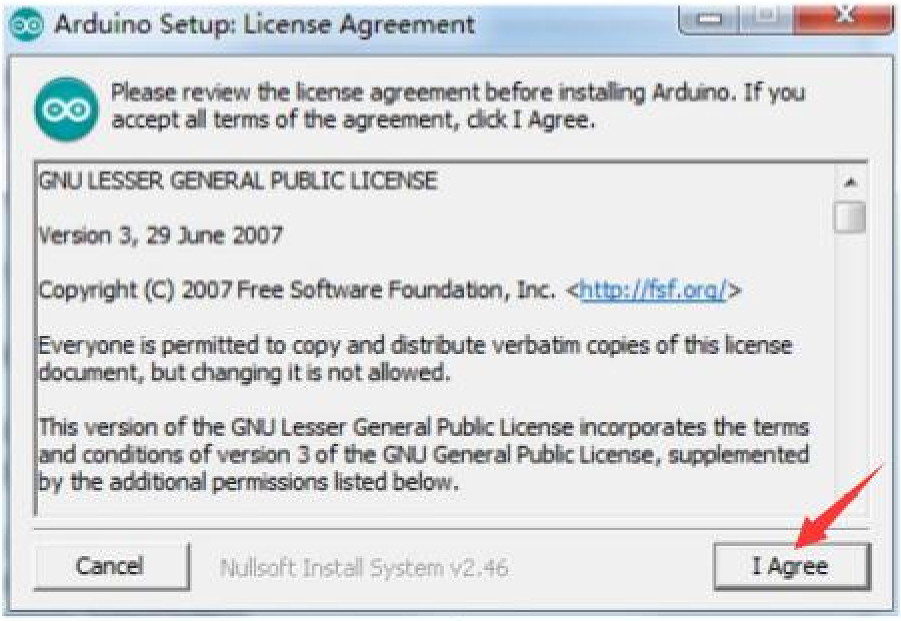
arduino-ide_2.1.1_Windows_64bit

arduino-ide_2.1.1_Windows_64bit

Installing Arduino (Windows)

Install Arduino with the exe. Installation package.

arduino-ide_2.1.1_Windows_64bit



Arduino Setup: License Agreement

Please review the license agreement before installing Arduino. If you accept all terms of the agreement, click I Agree.

GNU LESSER GENERAL PUBLIC LICENSE

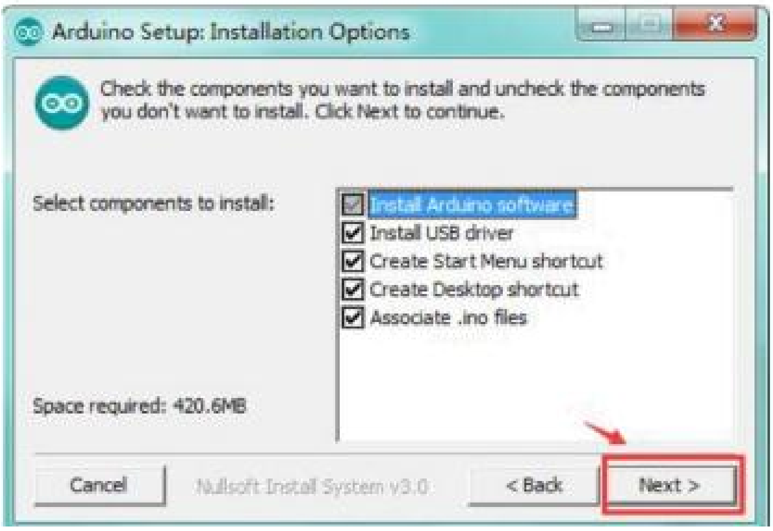
Version 3, 29 June 2007

Copyright (C) 2007 Free Software Foundation, Inc. <http://fsf.org/>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

This version of the GNU Lesser General Public License incorporates the terms and conditions of version 3 of the GNU General Public License, supplemented by the additional permissions listed below.

Click I Agree to see the following interface.



Arduino Setup: Installation Options

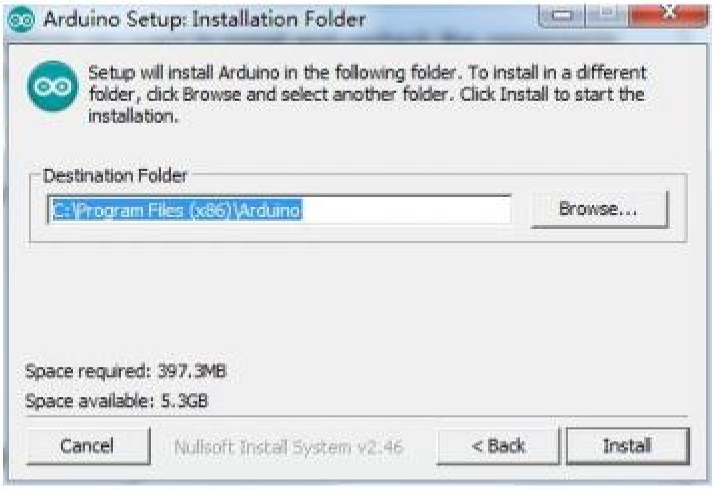
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.

Select components to install:

- ☑ Install Arduino software
- ☑ Install USB driver
- ☑ Create Start Menu shortcut
- ☑ Create Desktop shortcut
- ☑ Associate .ino files

Space required: 420.6MB

Click Next



Arduino Setup: Installation Folder

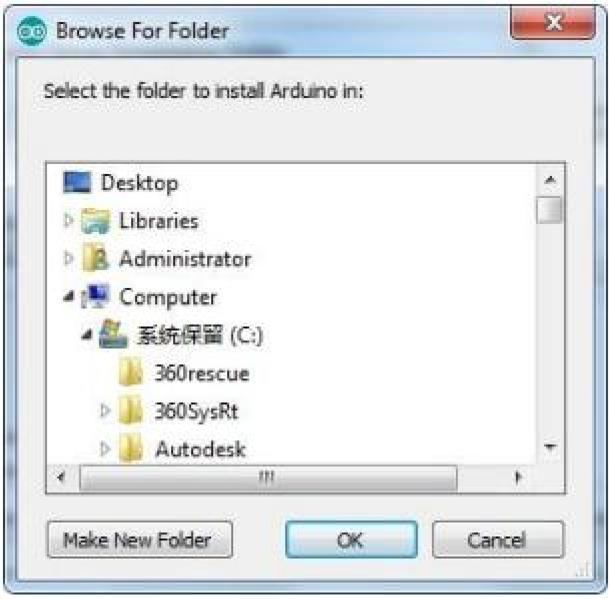
Setup will install Arduino in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

Destination Folder: C:\Program Files (x86)\Arduino

Space required: 397.3MB

Space available: 5.3GB

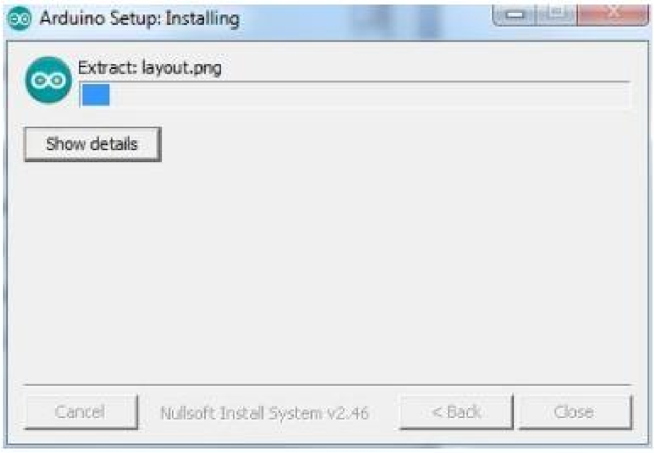
You can press Browse… to choose an installation path or directly type in the directory you want.



Browse For Folder

Select the folder to install Arduino in:

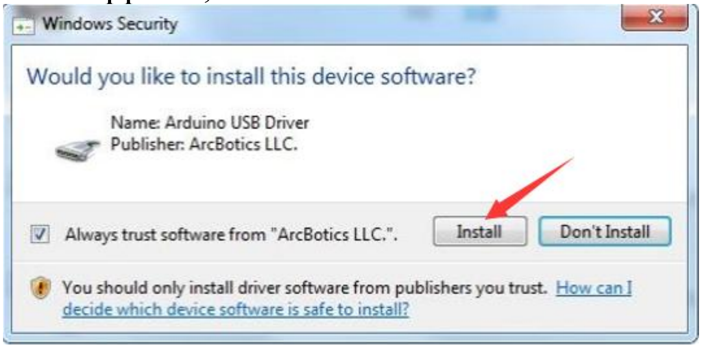
Click Install to initiate installation



Arduino Setup: Installing

Extract: layout.png

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



Windows Security

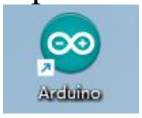
Would you like to install this device software?

Name: Arduino USB Driver
Publisher: ArcBotics LLC.

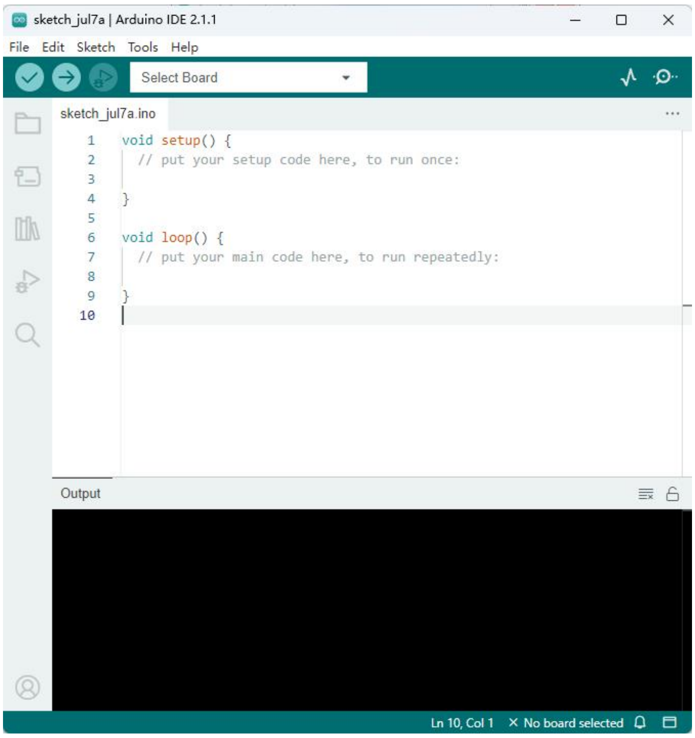
☑ Always trust software from "ArcBotics LLC.".

You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

Next, the following icon appears on the desktop



Double-click to enter the desired development environment



sketch_jul7a | Arduino IDE 2.1.1

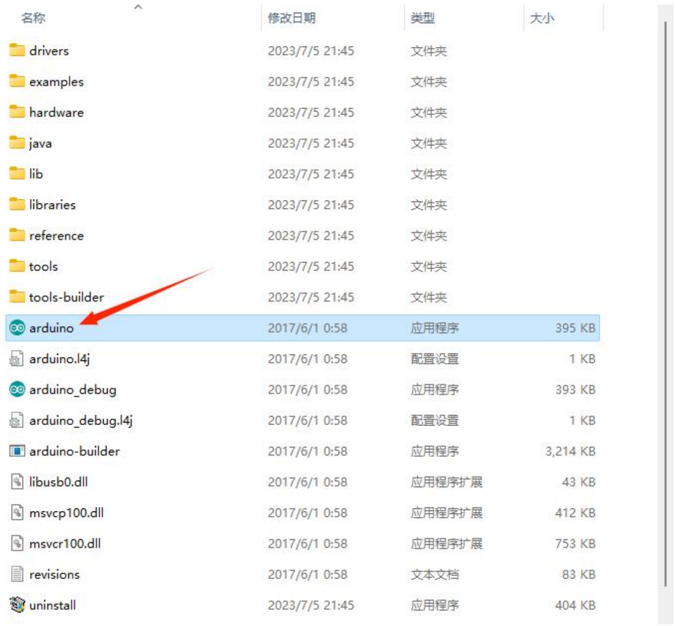
```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}

```

Ln 10, Col 1 × No board selected

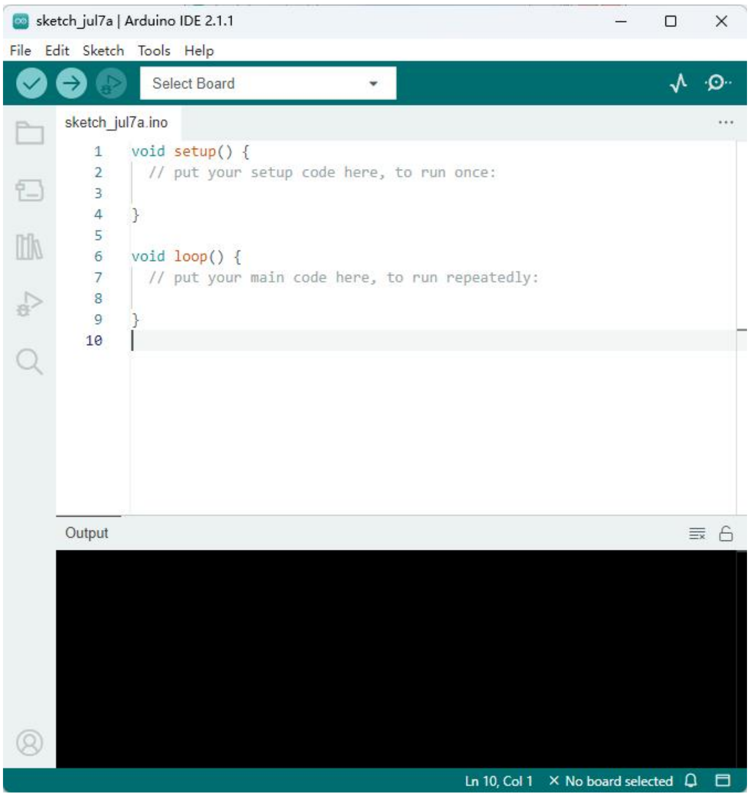
You may directly choose the installation package for installation and skip the contents below and jump to the next section. But if you want to learn some methods other than the installation package, please continue to read the section.

Unzip the zip file downloaded, Double-click to open the program and enter the desired development environment.

arduino-ide_2.1.1_Windows_64bit



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



```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}

```

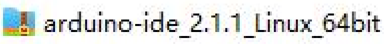
Installing Arduino (Mac OS X)

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.

arduino-ide_2.1.1_macOS_64bit

Installing Arduino (Linux)

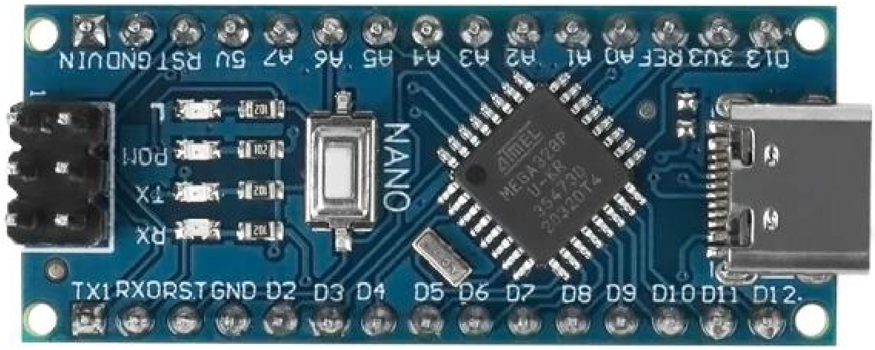
You will have to use the make install command. If you are using the Ubuntu system, it is recommended to install Arduino IDE from the software center of Ubuntu.



arduino-ide_2.1.1_Linux_64bit

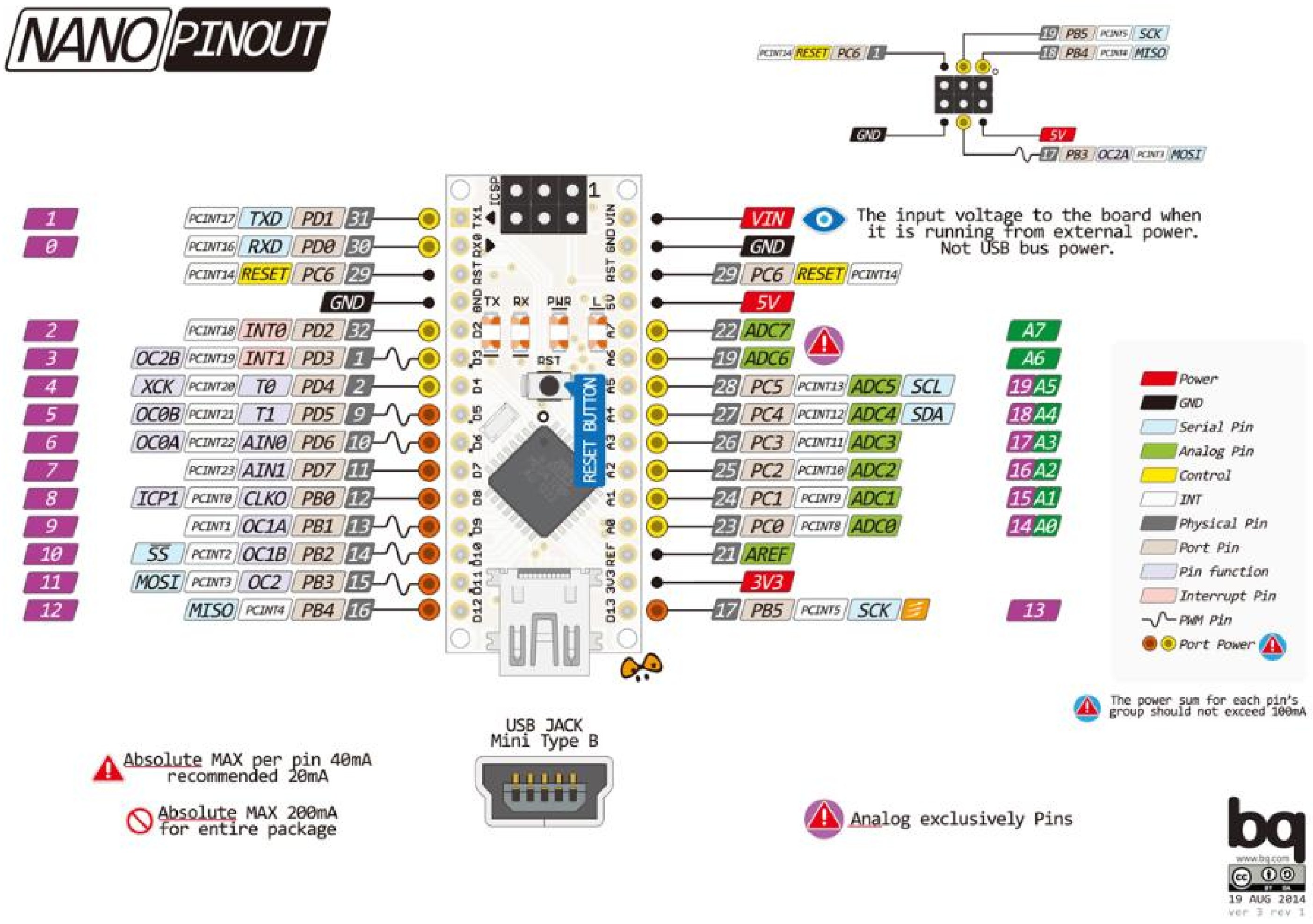
Lesson 1 Type-C NANO development board

Component Introduction



D13 3V3 REF A0 A1 A2 A3 A4 A5 A6 A7 5V RST GND VIN
TX1 RX0 RST GND D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12
NANO
POW
TX
RX

Nano has 8 analog input pins. 22 digital IOs, D represents digital, digital interface; A represents analog, simulating the interface.



Other terminals have special definitions

Serial: 0 (Rx) and 1 (TX). Used to receive (Rx) and send (TX) TTL serial data.

External interrupt: terminals 2 and 3. These external interfaces can be configured to generate interrupts later, which can be triggered when the external low level occurs, or when the rising edge and falling edge occur.

Refer to the attachinterrupt() function for details.

PWM: 3, 5, 6, 9, 10 and 11, provide 8-bit PWM output, using the function of analogwrite().

SPI：10（SS），11（MOSI），12（MISO），13（SCK）。These pins support SPI communication. Although they are supported by hardware, they are not included in Arduino software.

Led: 13, is a built-in LED, connected to pin 13, when the pin input is high voltage, the LED is on, when the output is low voltage, the LED is off.

Nano has eight analog inputs, each with a resolution of 10 bits (i.e. 1024 different possibilities). By default, the measured voltage to ground is 5V. Of course, its upper limit can also be modified through the function of analogreference(). Analog pins 6 and 7 cannot be used as digital ports. In addition, some ports have many special functions

I2C: A4 (SDA) and A5 (SCL). There are other ports on the board.

Aref: reference voltage for analog input, used with ananlogreference().

Reset: pull the potential down and reset the microprocessor. This is used to work when adding an additional board.

Attention:Each pin can only be used for one purpose, for example, after using the SPI bus, D10 and D11 cannot be used for PWM anymore.

Lesson 2 Understanding the ultrasonic module

Component Introduction

Ultrasonic sensor module HC-SR04 provides 2cm-400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.

The basic principle of work:

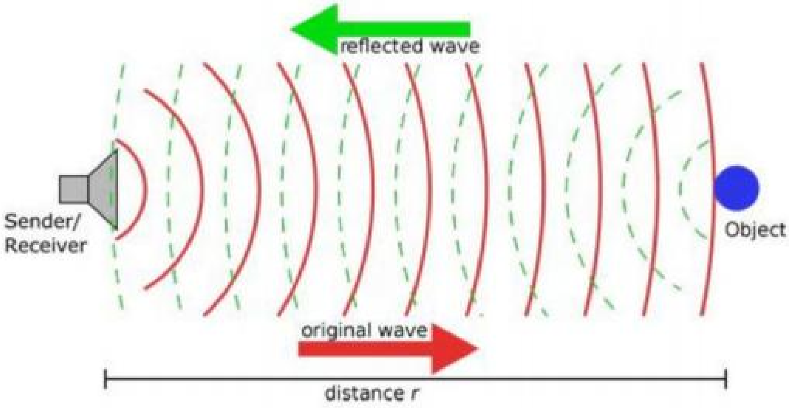
(1) Using IO trigger for at least 10us high level signal

(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic tore turning.

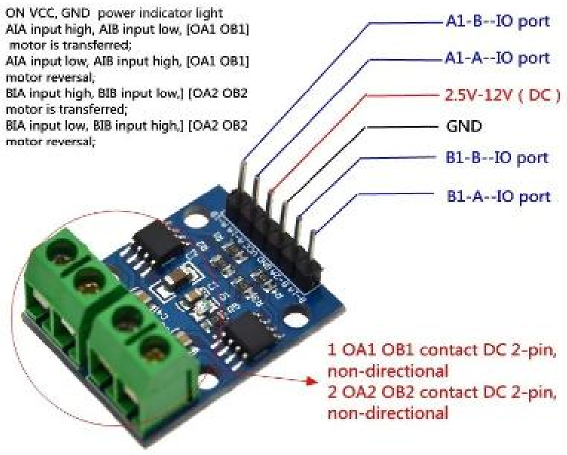
Test distance = (high level time × velocity of sound (340m/s) /2

The Timing diagram is shown below. You only need to supply a short 10us pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: us / 58 = centimeters or us / 148 =inch; or: the range = high level time * velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.



Lesson 3 Understanding L9110S driver module

Component Introduction



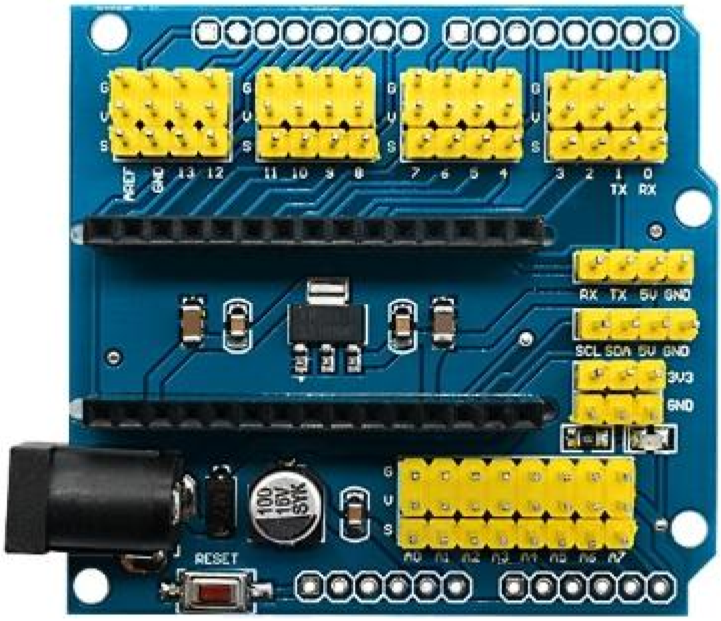
ON VCC, GND power indicator light
AIA input high, AIB input low, [OA1 OB1] motor is transferred;
AIA input low, AIB input high, [OA1 OB1] motor reversal;
BIA input high, BIB input low,] [OA2 OB2 motor is transferred;
BIA input low, BIB input high,] [OA2 OB2 motor reversal;

1 OA1 OB1 contact DC 2-pin, non-directional
2 OA2 OB2 contact DC 2-pin, non-directional

A module description
Motor drive of 1 double l9110s chip
2 module power supply voltage: 2.5-12v
3 suitable motor range: the motor working voltage is between 2.5v-12v, the maximum working current is 0.8A, and the current and voltage of smart car on the market are in this range
4 can drive two DC motors at the same time, or a 4-wire 2-phase stepping motor.
5 PCB size: 2.8cm * 2.1cm ultra small volume, suitable for assembly
6 with fixed mounting hole, diameter:
3mm Module 2 interface description
[description of 6p black curved needle]
1 VCC external 2.5v-12v voltage
2 GND external GND
3 IA1 external MCU IO port
4 IB1 external MCU IO port
5 IA2 external MCU IO port
IB2 external MCU IO port
[description of 4P green terminal]
OA1 ob1 is connected to two pins of DC motor, without direction
Oa2 ob2 is connected to two pins of DC motor, without direction
Three module instructions
When VCC is connected, GND module power indicator is on
IA1 input high level, IA1 input low level, [OA1 ob1] motor forward;
IA1 input low level, IA1 input high level, [OA1 ob1] motor reverses;
IA2 input high level, IA2 input low level, [oa2 ob2] motor forward;
IA2 input low level, IA2 input high level, [oa2 ob2] motor reverses;

Lesson 4 Understanding expansion board

Component Introduction

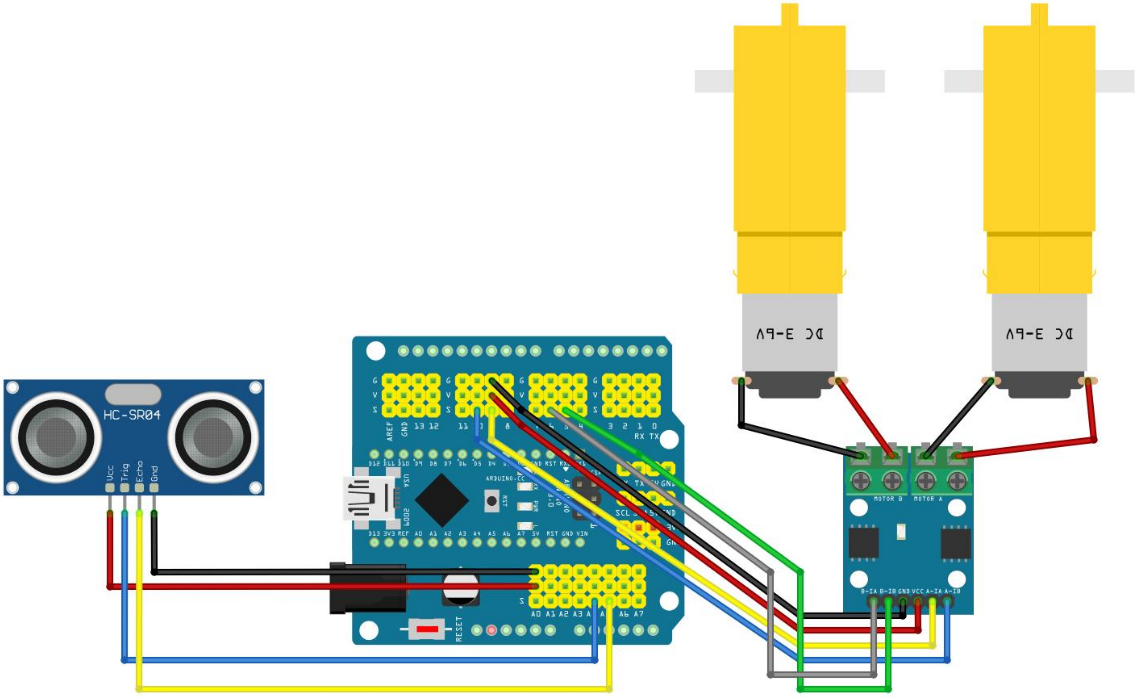


Uno nano multi-purpose expansion board is a sensor expansion board specially designed for Duino nano, which solves the problem of disordered wiring when connecting multiple sensors. It becomes a sharp tool for you to open Duino works.

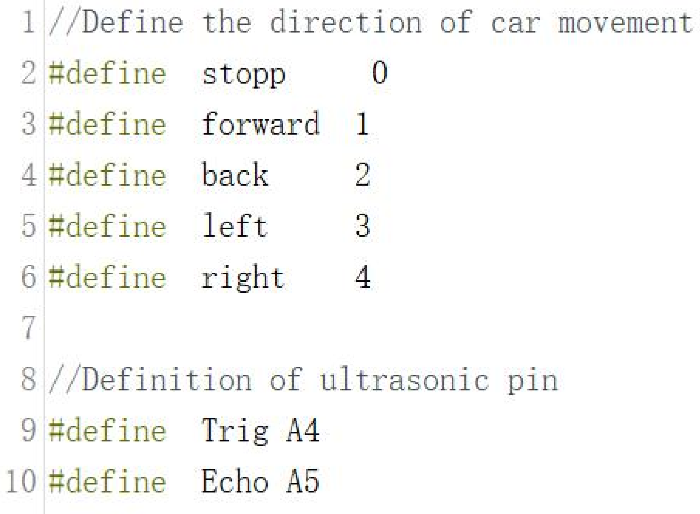
1. Lead out all digital 10 ports and analog 10 ports, and each 10 port has a standard positive and negative power interface.
2. Lead out the 12C interface on the motherboard to facilitate the connection with 12C equipment.
3. Add DC power supply interface. In fact, the power supply current of USB interface on nano board is only 50mA, which is obviously insufficient for equipment with high current, such as steering gear. At this time, the DC power supply interface provides external power supply to ensure the stability of equipment operation.

Lesson 5 Code interpretation

circuit diagram

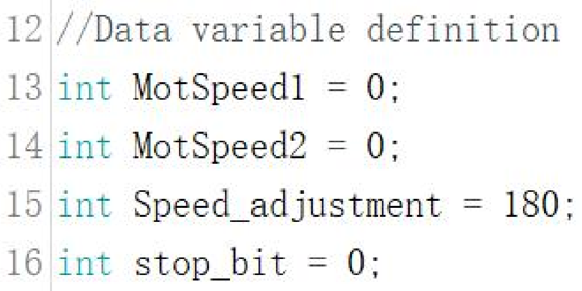


Code macro definition, constant definition, assignment



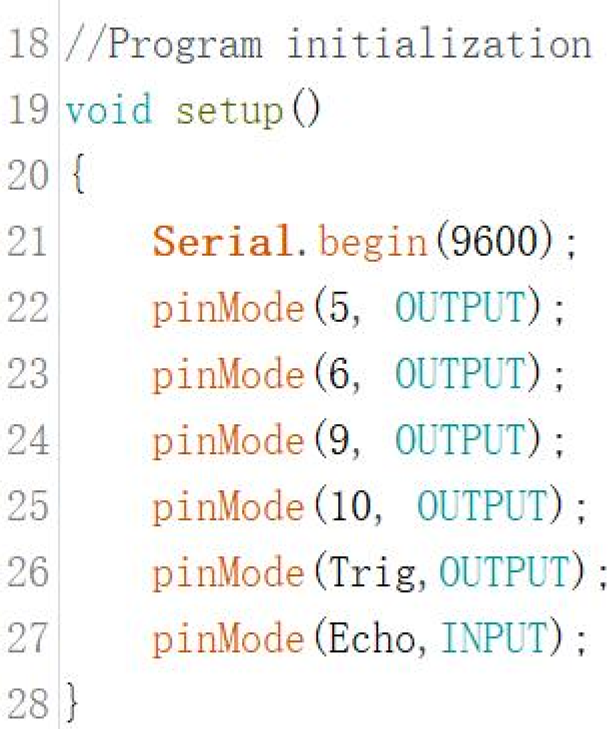
```
//Define the direction of car movement
#define  stopp     0
#define  forward  1
#define  back     2
#define  left     3
#define  right    4

//Definition of ultrasonic pin
#define  Trig A4
#define  Echo A5
```

Data definition, define the required data type



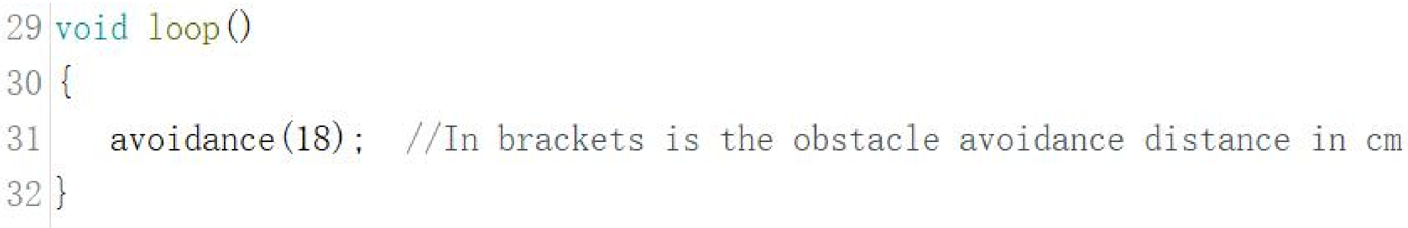
```
//Data variable definition
int MotSpeed1 = 0;
int MotSpeed2 = 0;
int Speed_adjustment = 180;
int stop_bit = 0;
```

Function initialization, define the IO port input and output and the initial value of each data



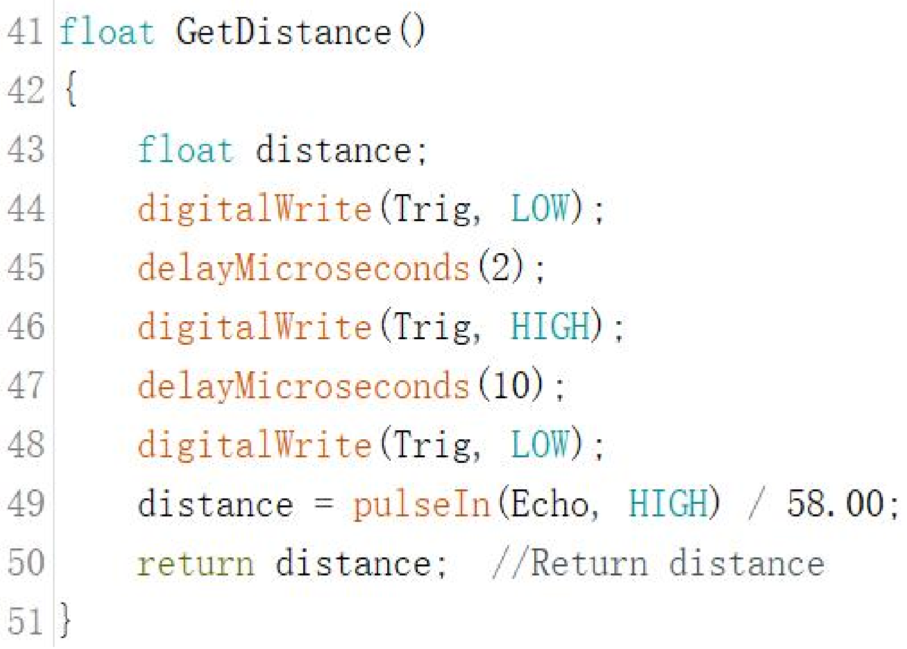
```
//Program initialization
void setup()
{
    Serial.begin(9600);
    pinMode(5, OUTPUT);
    pinMode(6, OUTPUT);
    pinMode(9, OUTPUT);
    pinMode(10, OUTPUT);
    pinMode(Trig,OUTPUT);
    pinMode(Echo,INPUT);
}
```

The main function, where the program starts to run



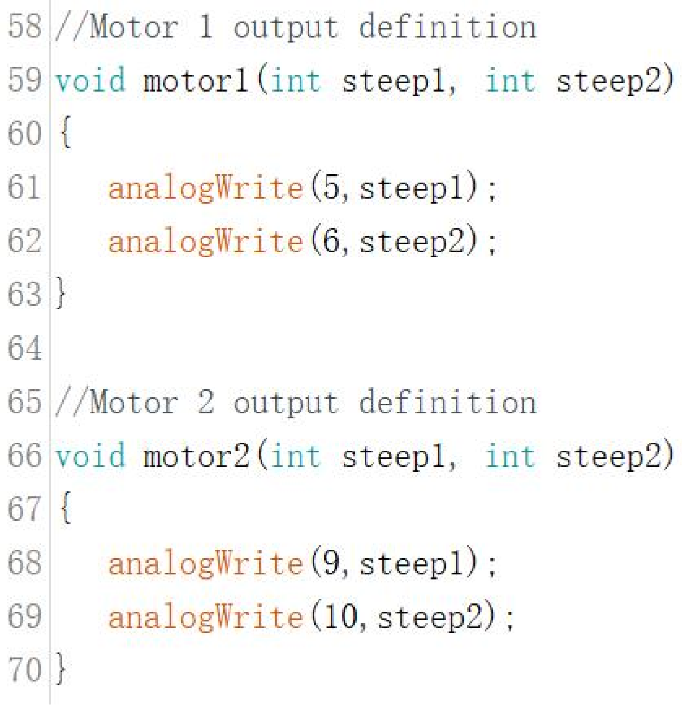
```
void loop()
{
   avoidance(18);  //In brackets is the obstacle avoidance distance in cm
}
```

Ultrasonic ranging function, call this function will return the ranging distance



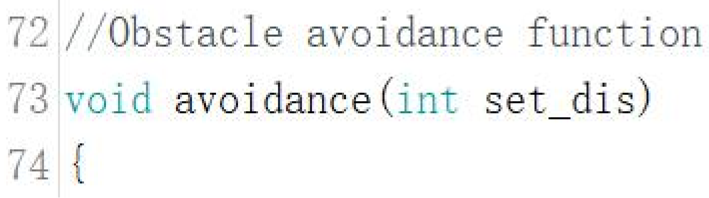
```
float GetDistance()
{
    float distance;
    digitalWrite(Trig, LOW);
    delayMicroseconds(2);
    digitalWrite(Trig, HIGH);
    delayMicroseconds(10);
    digitalWrite(Trig, LOW);
    distance = pulseIn(Echo, HIGH) / 58.00;
    return distance;  //Return distance
}
```

Motor drive function, input step 1 and step 2, step 1 and step 2, the value is 0 ~ 255, 0 when no output, 255 when the maximum output



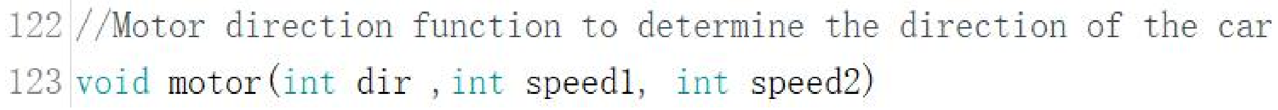
```
//Motor 1 output definition
void motor1(int steep1, int steep2)
{
   analogWrite(5,steep1);
   analogWrite(6,steep2);
}

//Motor 2 output definition
void motor2(int steep1, int steep2)
{
   analogWrite(9,steep1);
   analogWrite(10,steep2);
}
```

Distance and obstacle avoidance processing function, input response distance, avoidance (); The ranging processing function will respond according to the distance



```
//Obstacle avoidance function
void avoidance(int set_dis)
{
```

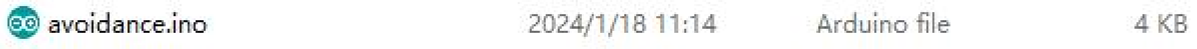
Motor direction function input direction value and speed, you can call the motor drive function, let the motor move in different direction and speed dir: stop, forward, back, left, right.Speed1 & speed2: 0 ~ 255.



```
//Motor direction function to determine the direction of the car
void motor(int dir ,int speed1, int speed2)
```

Lesson 6 Code burning

Double click the code file



avoidance.ino 2024/1/18 11:14 Arduino file 4 KB

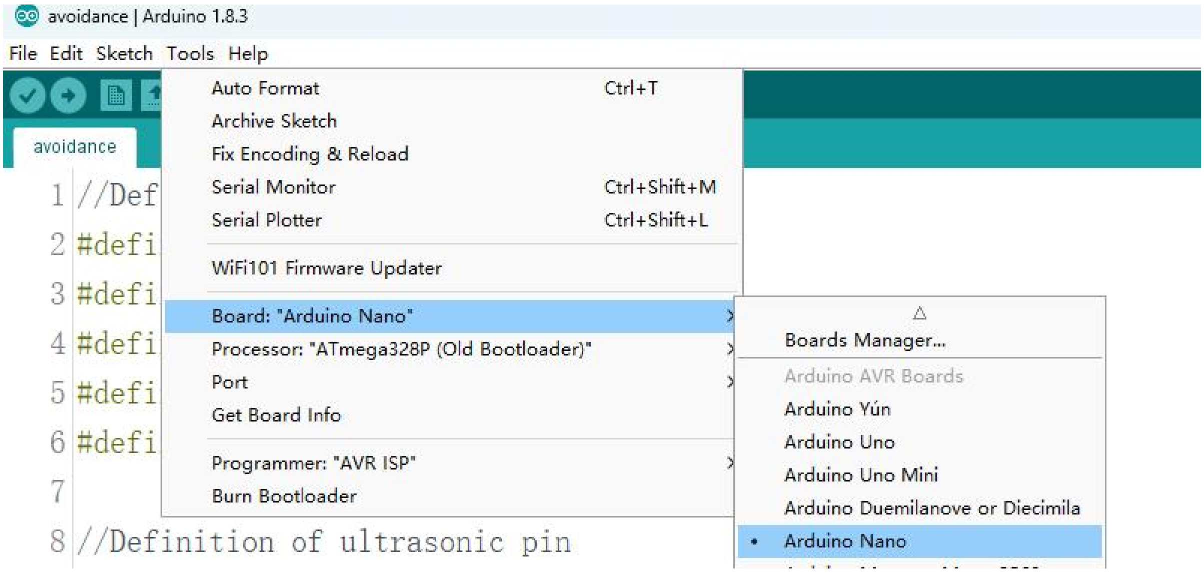
Select Arduino IDE to open the file

AN OPEN PROJECT WRITTEN, DEBUGGED, AND SUPPORTED BY ARDUINO.CC AND THE ARDUINO COMMUNITY WORLDWIDE

LEARN MORE ABOUT THE CONTRIBUTORS OF ARDUINO.CC on arduino.cc/credits

Starting...

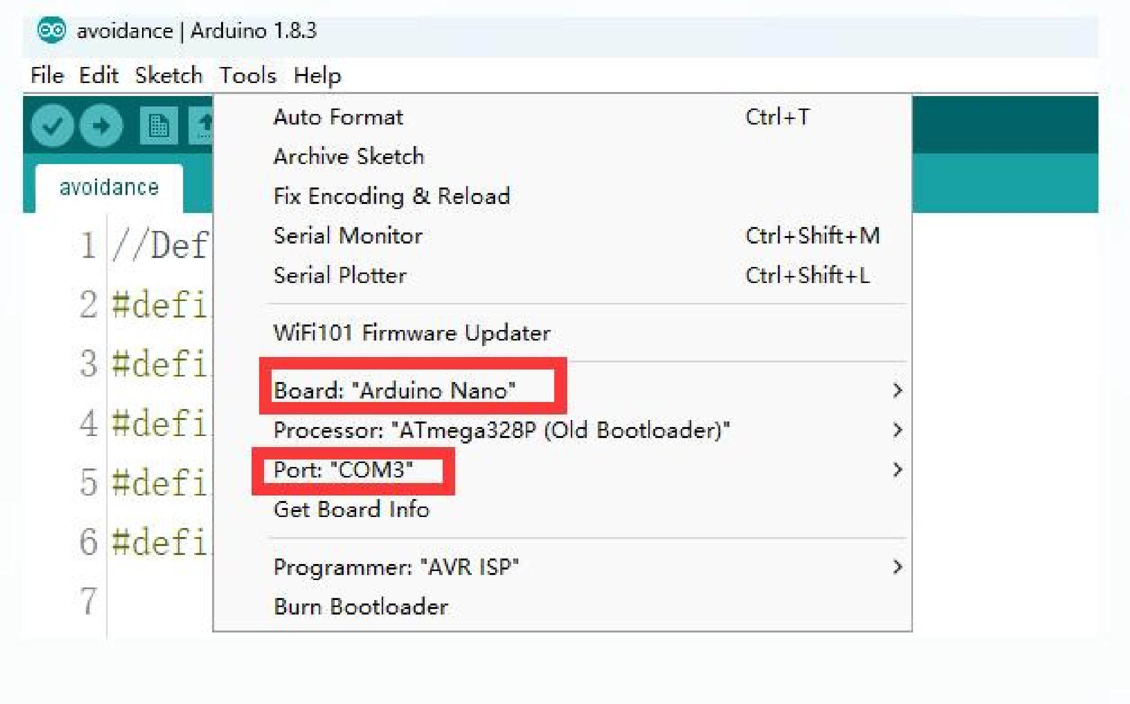
Click Tools to select NANO development board



avoidance | Arduino 1.8.3

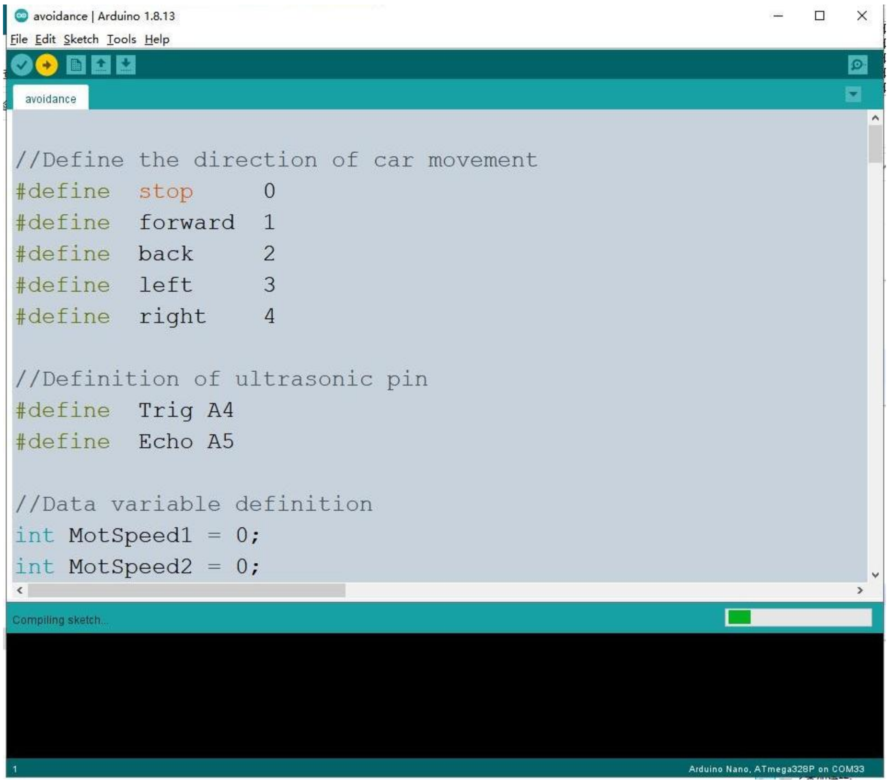
```
//Def
#defi
#defi
#defi
#defi
#defi

//Definition of ultrasonic pin
```

Click the tool to select the port number. The port number can be viewed through the system port number. If there is no port, you can check whether the ch340 driver is installed. If not, you can install the ch340 driver according to lesson 0. If not, you can try to re install or restart the computer



Board: "Arduino Nano"
Processor: "ATmega328P (Old Bootloader)"
Port: "COM3"
Programmer: "AVR ISP"

Check if there is no problem, you can upload the code to the nano development board

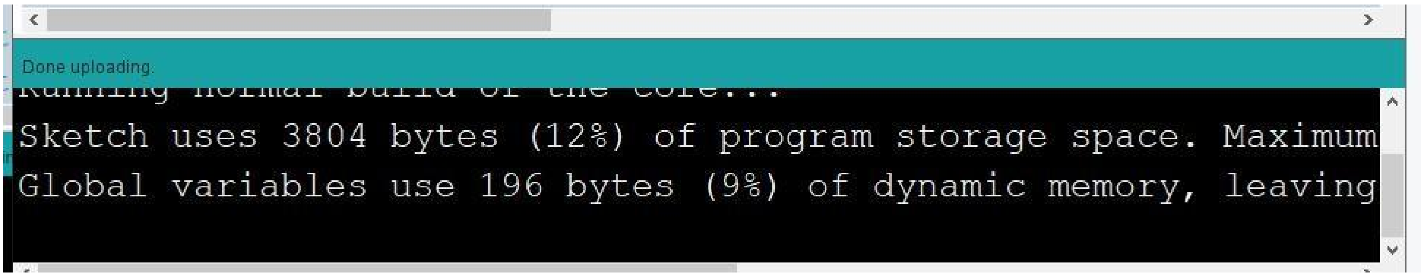


```
//Define the direction of car movement
#define  stop     0
#define  forward  1
#define  back     2
#define  left     3
#define  right    4

//Definition of ultrasonic pin
#define  Trig A4
#define  Echo A5

//Data variable definition
int MotSpeed1 = 0;
int MotSpeed2 = 0;
```

Compiling sketch...

Arduino Nano, ATmega328P on COM33

The display shows that the burning is completed



Done uploading.

```
Running normal build of the core...
Sketch uses 3804 bytes (12%) of program storage space. Maximum
Global variables use 196 bytes (9%) of dynamic memory, leaving
```