Building the Arduino Development Environment

1. Arduino development language

Arduino uses C/C++ to write programs, so before learning Arduino, you need to master the C/C++ language. Although C++ is compatible with the C language, these are two different languages. C is a process-oriented programming language, and C++ is an object-oriented programming language. The early Arduino core library was written in C language. Later, object-oriented ideas were introduced. At present, the latest Arduino core library is written in C and C++.

Generally speaking, the Arduino language refers to a collection of various Application Programming Interfaces (APIs) provided by the Arduino core library files. These APIs are formed by secondary packaging of the lower-level microcontroller support library. For example, the core library of Arduino using AVR microcontroller is the secondary packaging of AVR-Libc (GCC-based AVR support library).

In the traditional development method, multiple registers need to be configured to achieve the corresponding functions. In Arduino, the complicated registers are encapsulated into simple APIs, which can be intuitively controlled, enhancing the readability of the program and improving the development efficiency.

2. Arduino program structure

The Arduino program structure is different from the traditional C/C++ program structure-there is no main() function in the Arduino program. In fact, it is not that there is no main() function in the Arduino program, but that the definition of the main() function is hidden in the core library file of the Arduino.

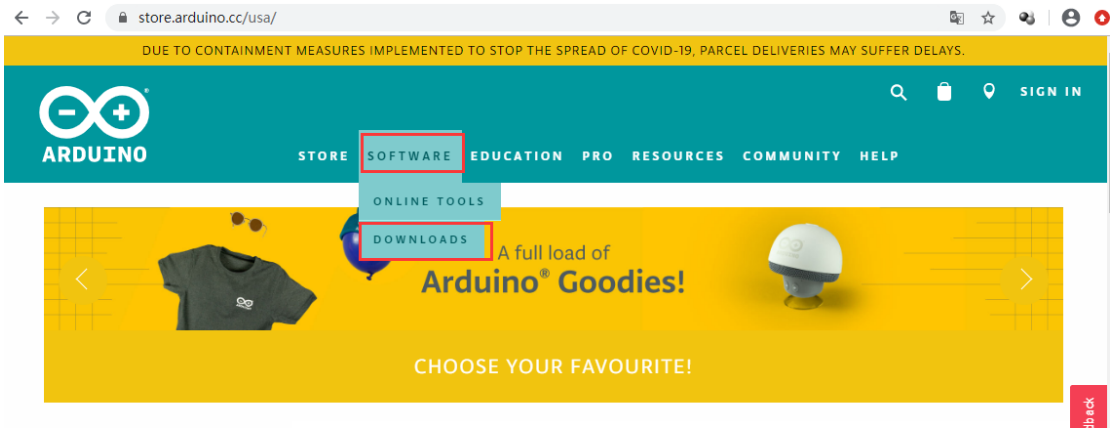
In the development of Arduino, the main function is not directly operated, but the two functions of setup() and loop() are used instead.

3. The construction of the Arduino development environment

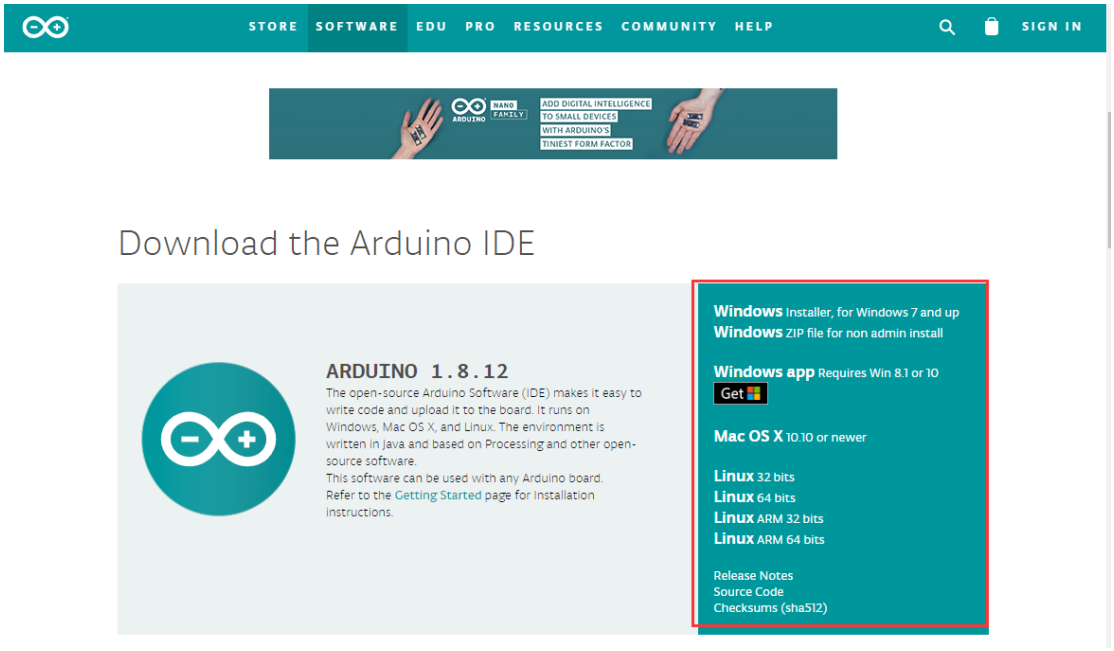
The IDE of the Arduino development environment can be downloaded from the official website. The download address of the Arduino IDE is: **https://store.arduino.cc/usa/**

(1) Install Arduino IDE under Windows

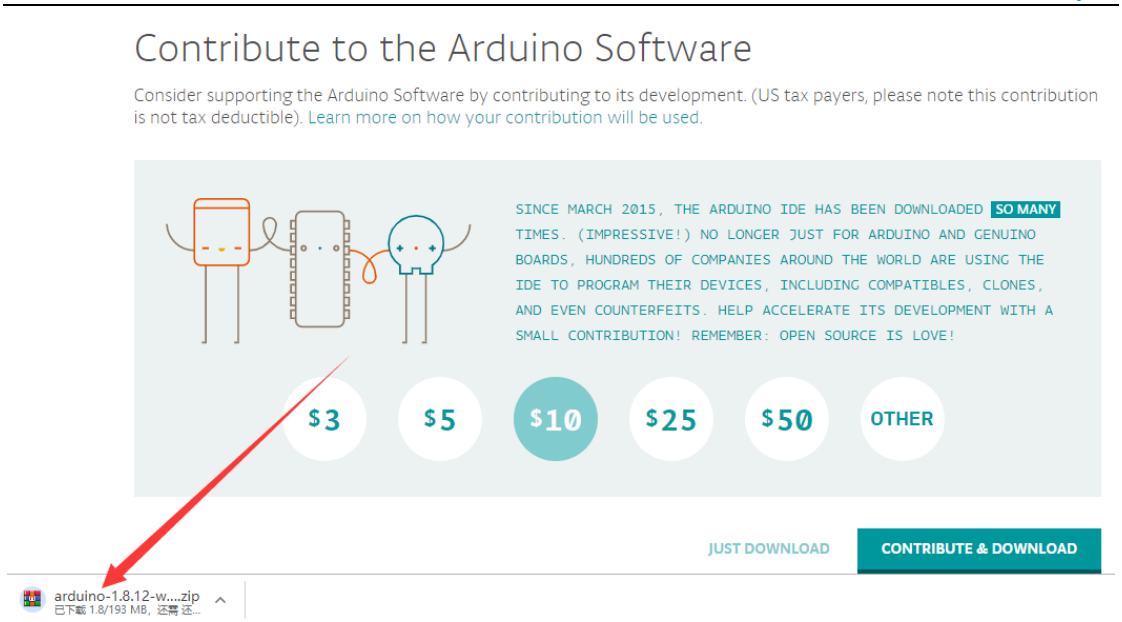
We will teach you how to download and install:
1.Open Google Chrome and enter the URL in the address bar: https://store.arduino.cc/usa/
After successfully opening the interface as shown below, we click DOWNLOADS under SOFTWARE.



2. After jumping to the following interface, slide the mouse to the middle to find the part marked in the red circle. You can find that the official website provides us with installation files for Windows, Mac OS X, and Linux systems.

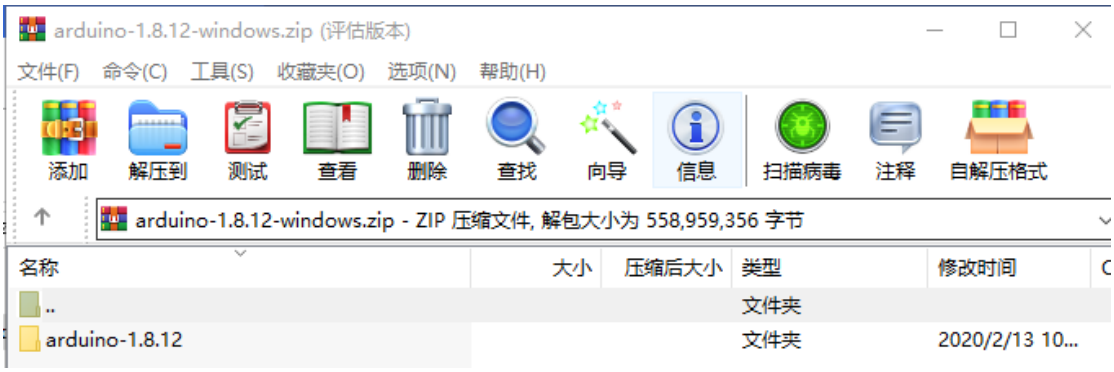


3. We click the installation package of Windows ZIP file for non admin install. After the interface jumps, we select JUST DOWNLOAD. And then start the download. The download status will be displayed in the lower left of Google Chrome. Then we wait for the download to complete.

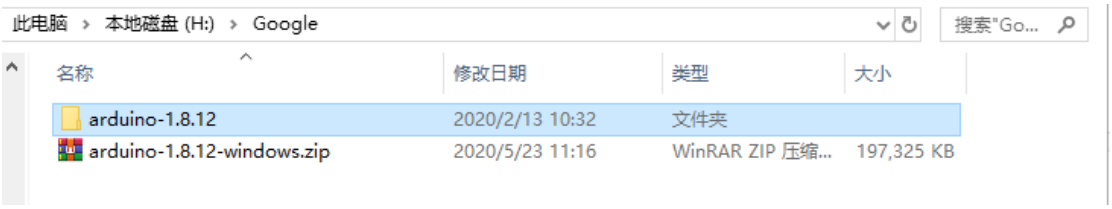


4.After the download is complete, open the folder. There are downloaded compressed installation files:
arduino-1.8.12-windows.zip

5. Double-click to open the file and unzip it.

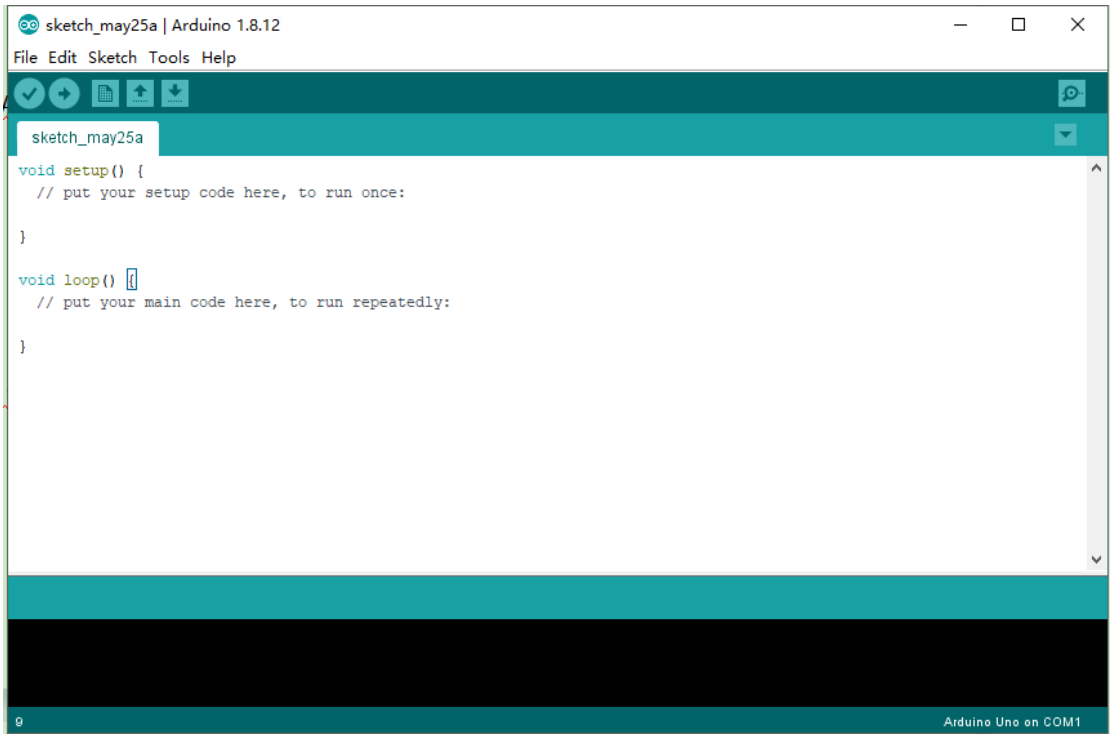


6. The file arduino-1.8.12 appears after decompression. As shown follows;



7. Open the arduino-1.8.12 folder and double-click arduino.exe to open the software.

8. The interface will show as follows after the Arduino software is opened, indicating that our software has been downloaded and installed successfully.



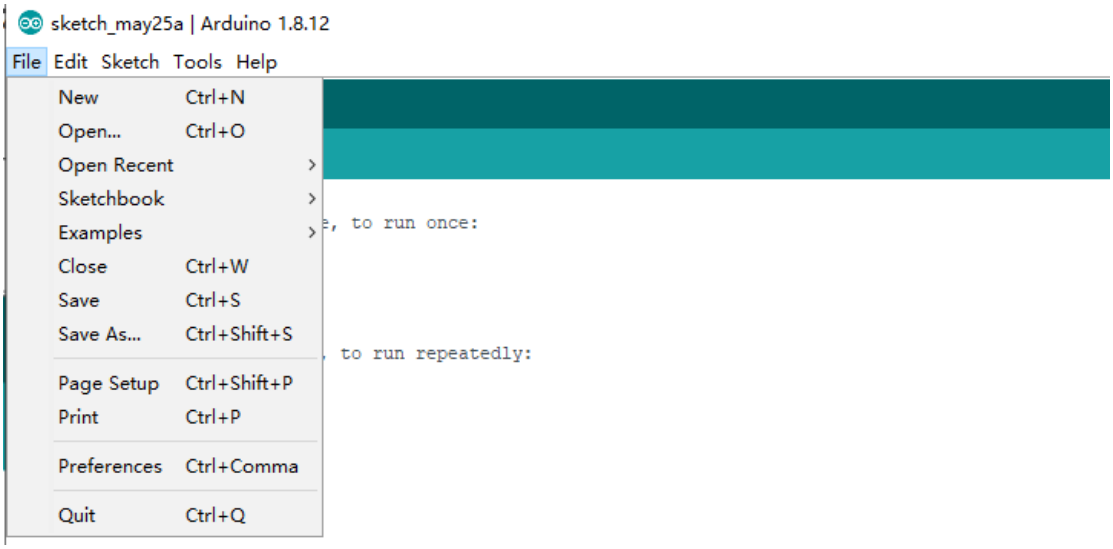
4. Introduction of Arduino software interface

The following figure is the interface introduction of Arduino software

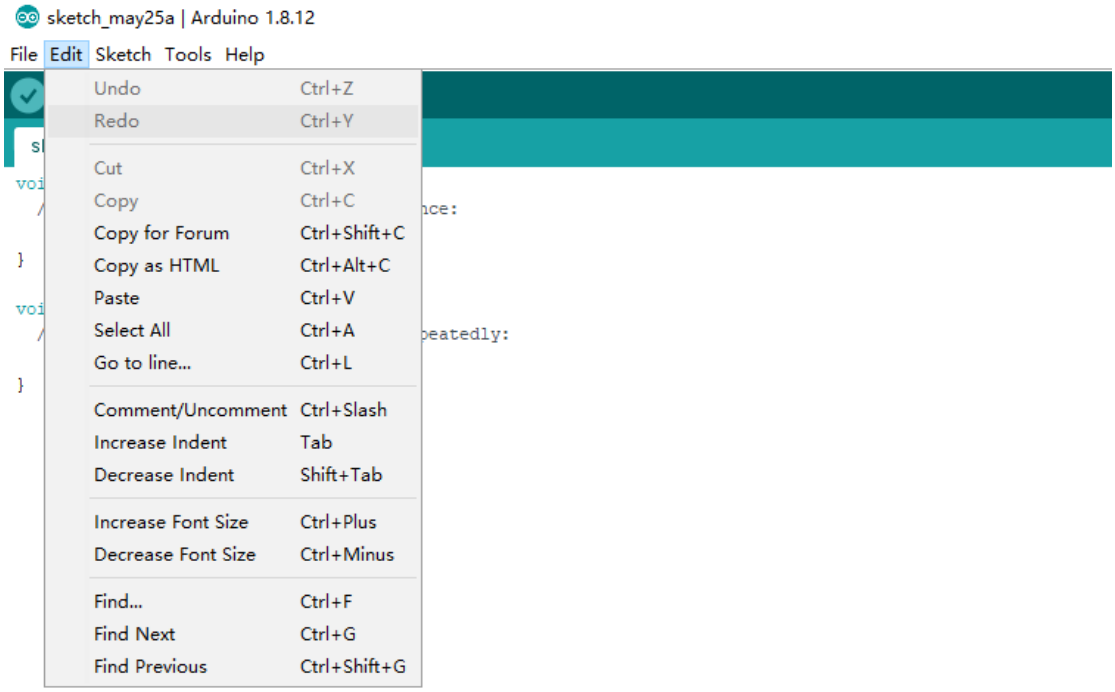
(1) Menu bar

Menu bar contains File, Edit, Sketch, Tools and Help.

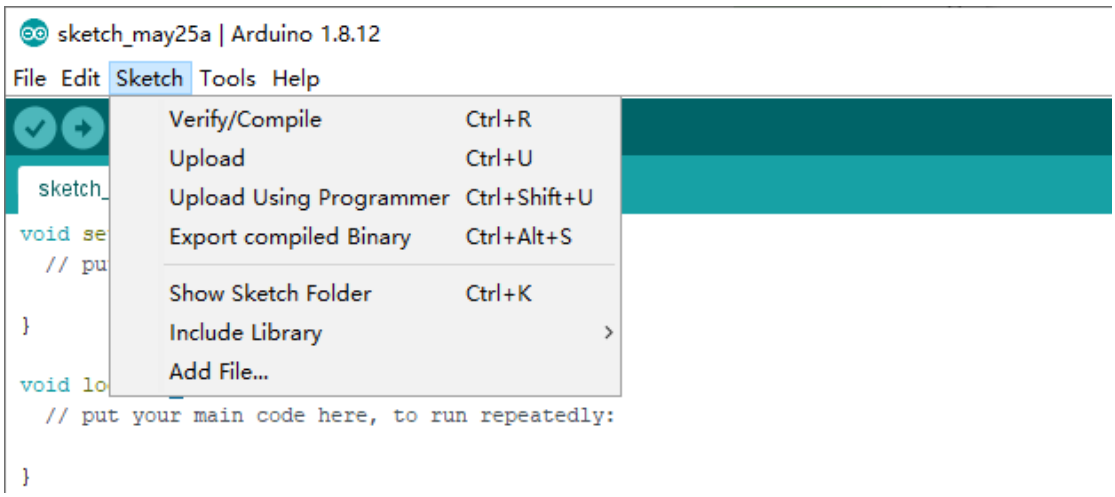
1. "File" can operate new file, open file, save file, close file, save, etc. For the Examples, you can check the official sample program.



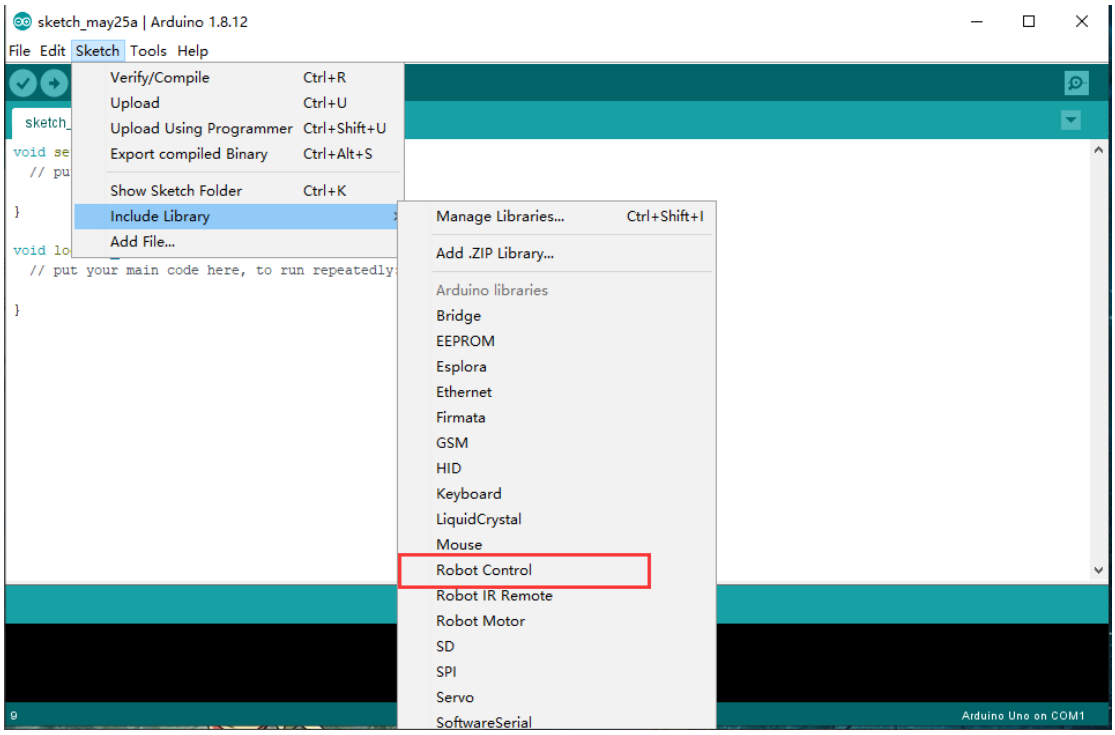
2. "Edit" has the functions for the program code of editing, copying and pasting, commenting, indenting, searching, etc.

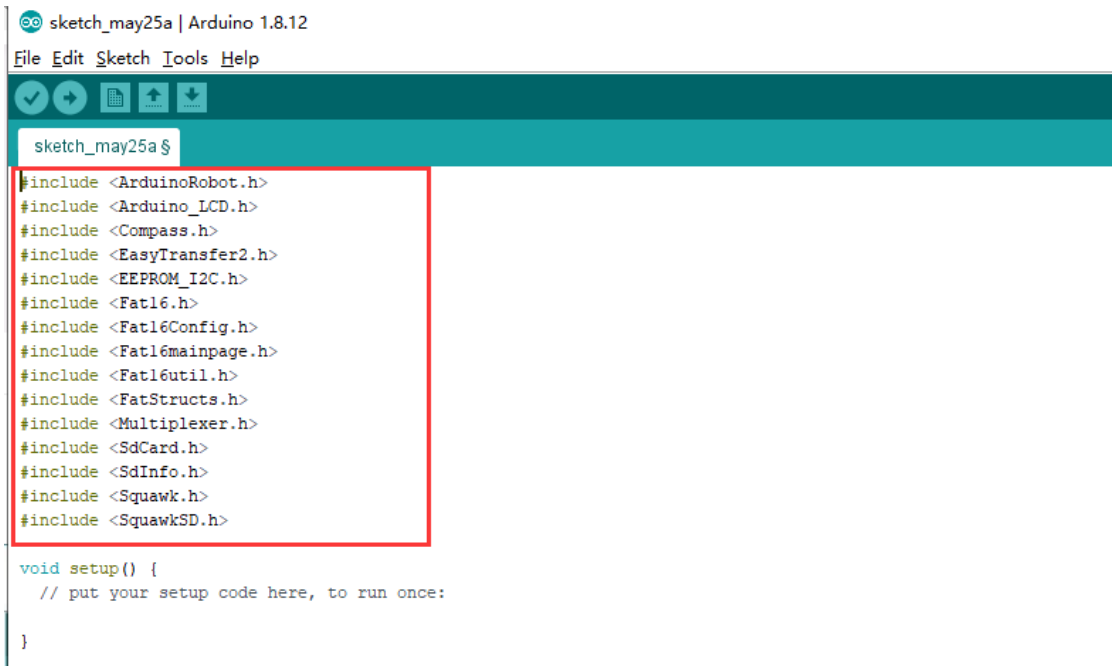


3. Sketch can perform Verify/Compile, Upload and other operations on the written project.

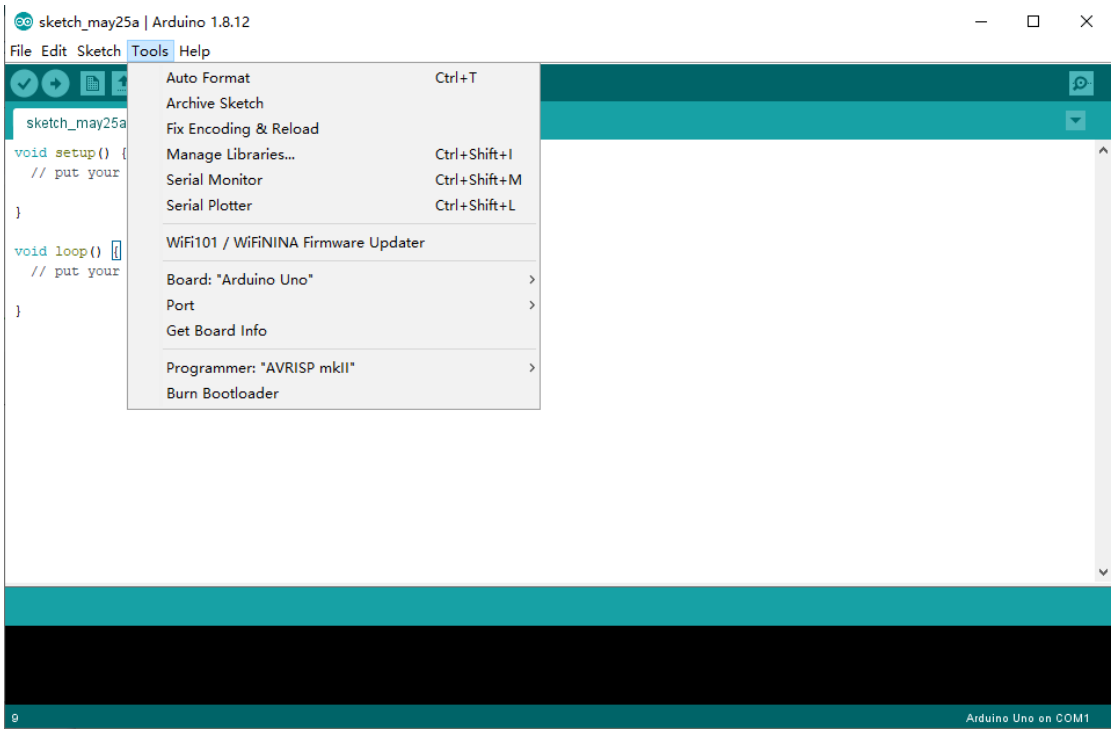


The “Include Library” can load the library. After selecting the library file in the list, the relevant header files are automatically added in the code editing area.

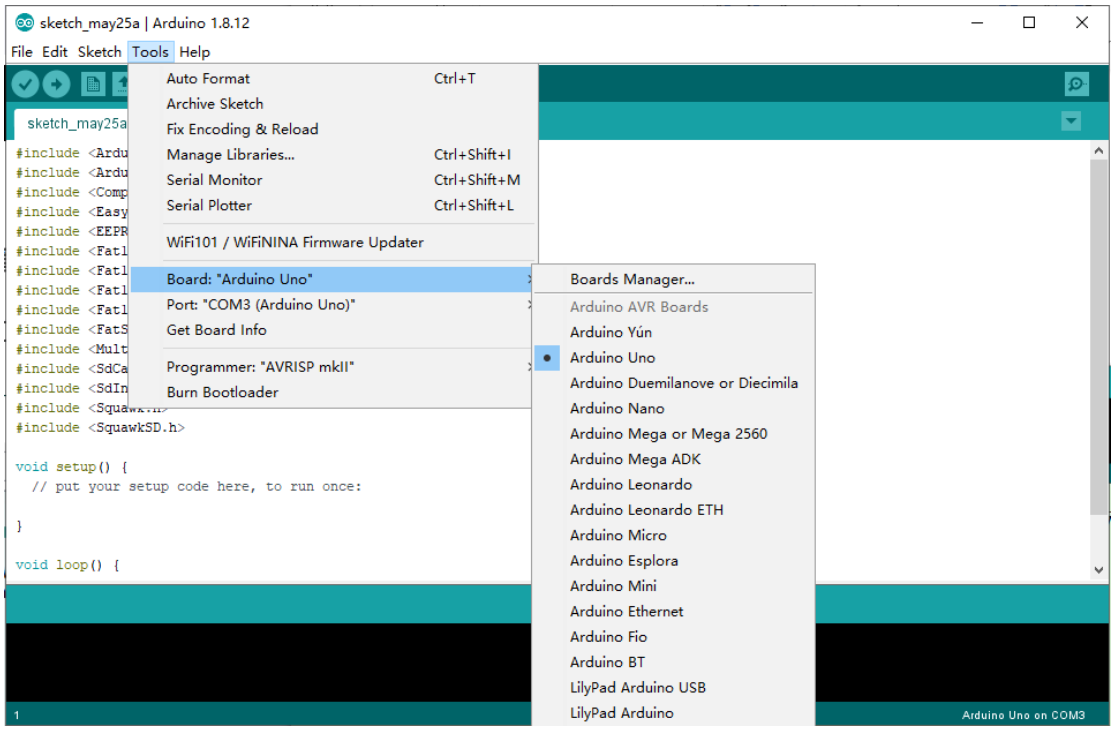




4. Board and Port are often used in "Tools".

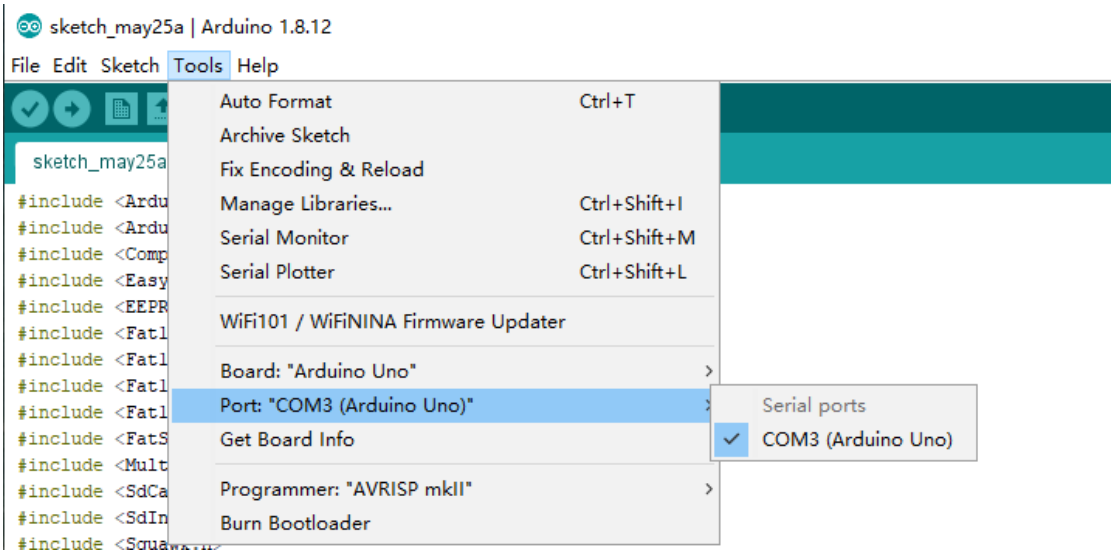


Board can choose different development boards. Our course uses Arduino Uno development board, so we need to choose Arduino Uno. The list contains many Arduino development board models. We choose the corresponding ones according to the model.



Port can set the port used by Arduino IDE to download the program, that is, the port number of the development board connected to the computer. The port

display of each computer is different. When we use the Arduino Uno to connect to the computer, it displays the COM3 port number.



(2) Button bar

Button bar includes functions of Verifying, Uploading, Building New, Opening and Saving.

1. Verify  **:**

Checking and compilation. This button is used to check the correctness of your "syntax" or code. If your code has any syntax errors or undefined variables, an error message will appear at the bottom of the IDE screen. At the same time, the line of error code will be marked with a red background color for easy modification. But if it is correct, you will see the message that the compilation is complete.

2. Upload  **:**

Download the program code to the Arduino development board. It is better to click Verify first, and then click Upload.

3. New  **:**

Open a new program editing window to create a new project.

4. Open  **:**

This button can open an existing draft file. You will use it when you need to open a file that you have downloaded or used before.

5. Save  **:**

Save the program file being edited.

(3) Code editing area

The code editing area is where to write program code and code comments.

(4) Console

The debug window will output information showing various compilation and debugging results. For example, if your code is written incorrectly, you will be prompted about what went wrong.

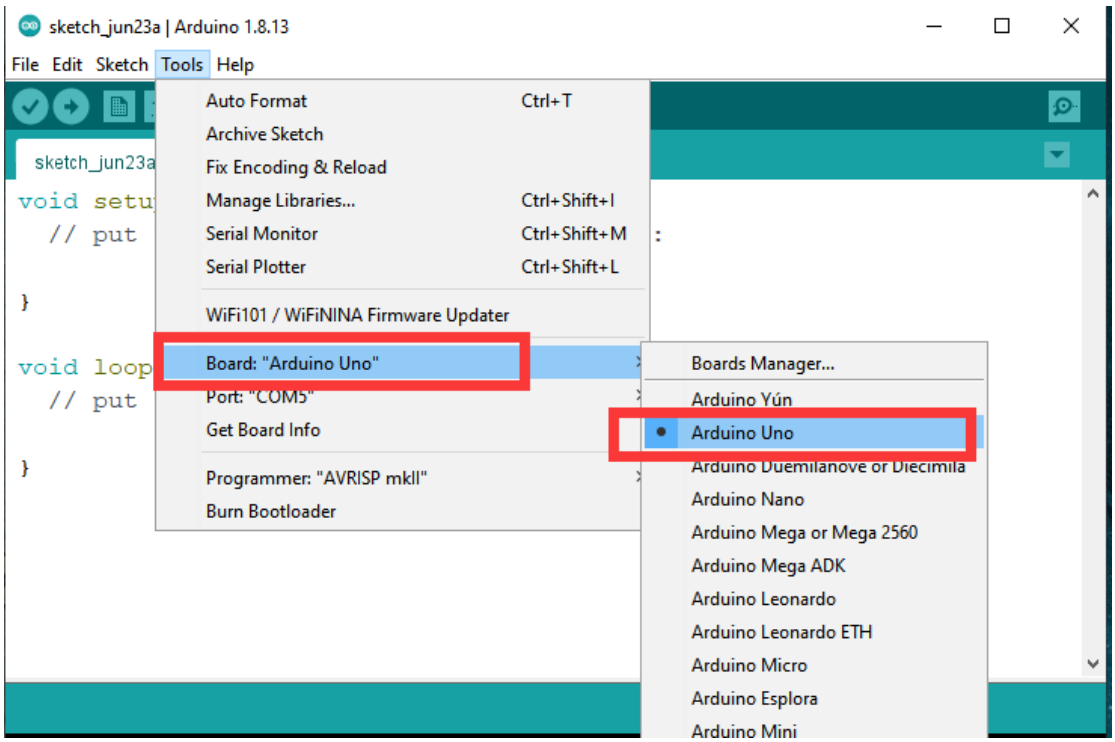
5. Connecting the Adeept Arm Drive Board and the computer

(1) Connecting the Adeept Arm Drive Board and the computer

You need to use USB Cable to connect the Adeept Arm Drive Board to the computer. As shown below:

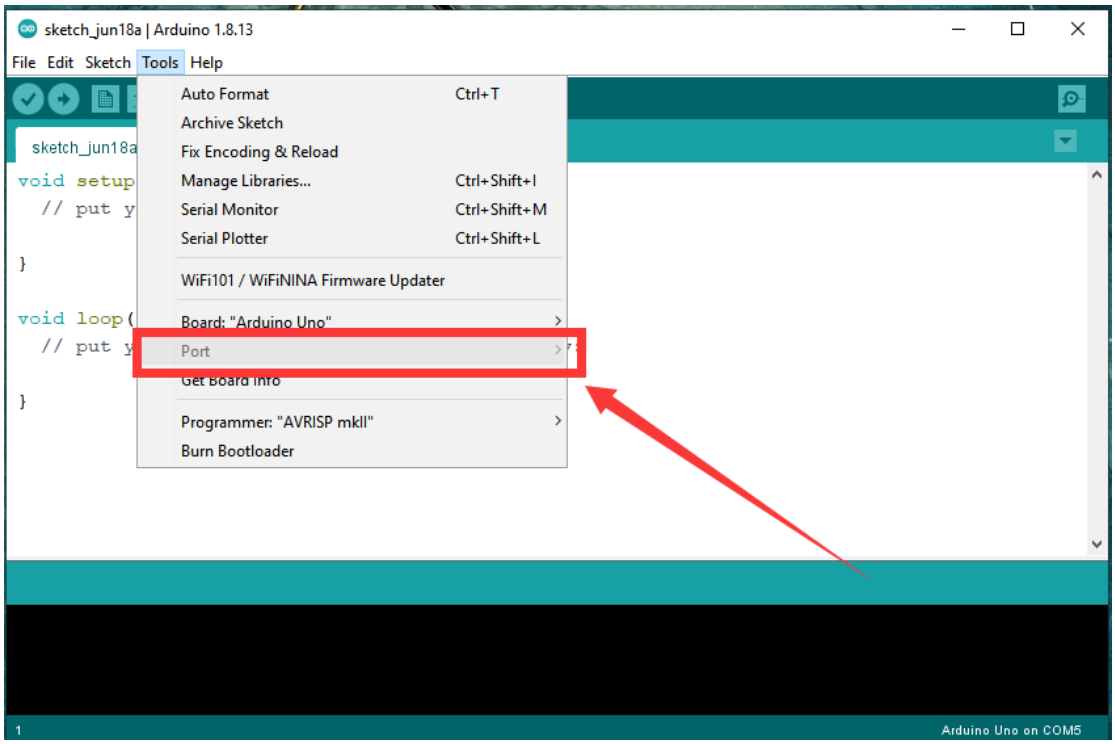
(2) Select the Arduino Uno development board in Tools

Open Arduino IDE under Tools—>Board. Select Arduino UNO in the list.



(3) Install CH341SER driver

1. Open the Arduino IDE, in the Port on the Tools toolbar, you will see that the serial port cannot be accessed, which means that you have not installed the serial port driver.

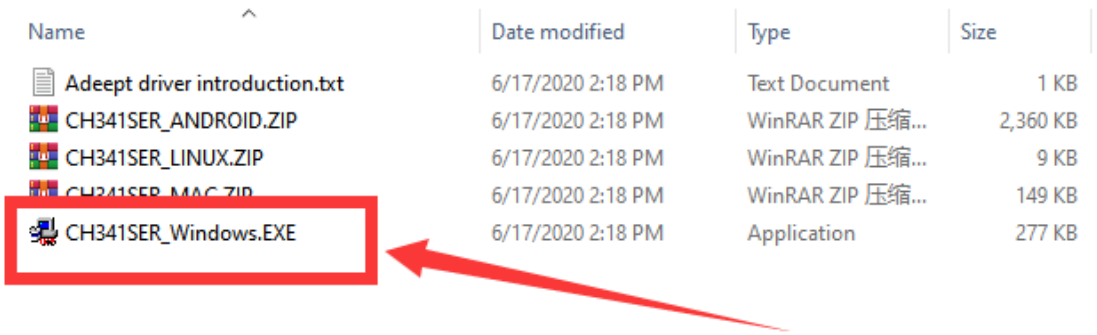


2. You need to find **the Package of Documentation** provided by Adeept.

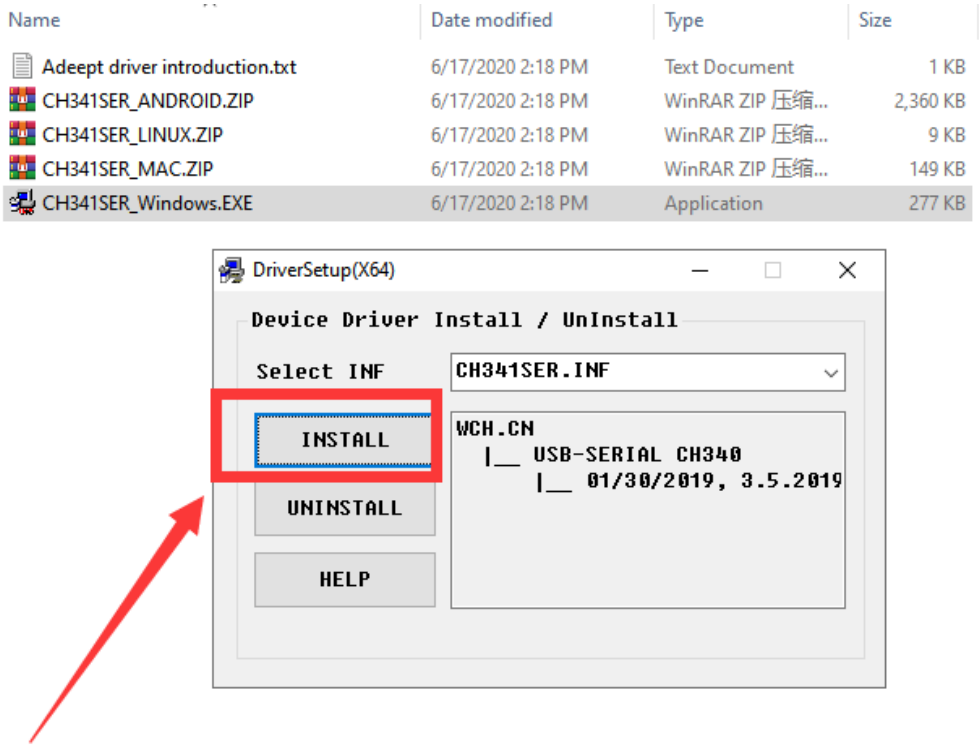
> **Get method 1:** you can open it directly in the browser "http://www.adeept.com/learn/details/id/31" Link.
>
> **Get method 2:** or open in the browser: "https://www.adeept.com/", search the model ada031 of this product in the top search bar, click the searched image of this product, and jump to the details page of this product. In the description, click the package address under "download tutorials:" to jump to the package page
>
> *Click the "code and tutorials" download link under "zip resources:" on the page. After downloading, unzip the compressed package. The unzipped user folder name is "adeeptrobotarmforarduino" plus the version number (it will be different after updating), for example: adeeptrobotarmforarduinov3_5.*

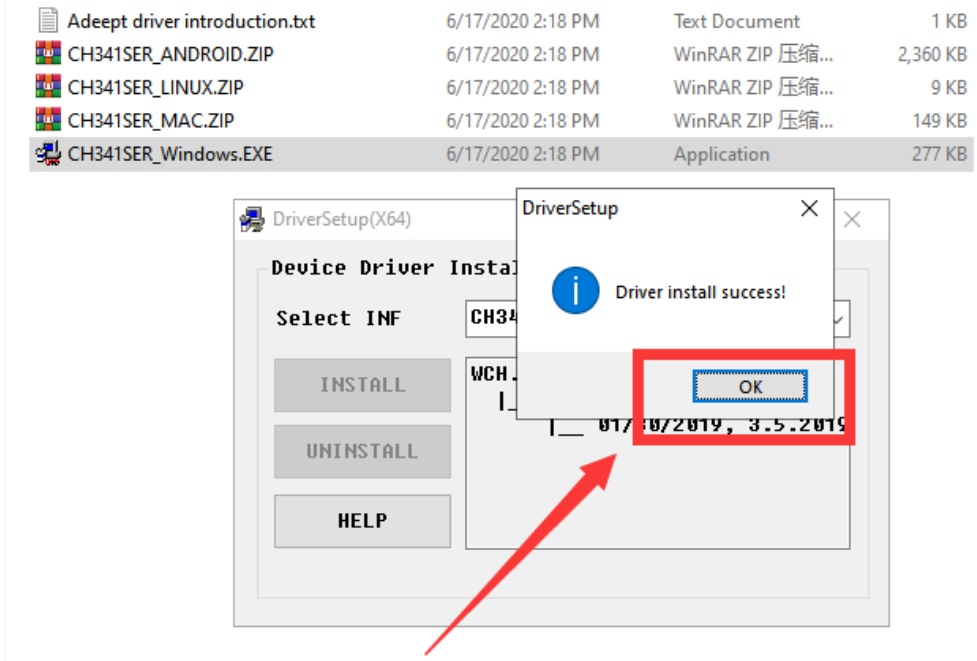
In **the Package of Documentation**, find the 01 Software Package folder, and open the Adeept driver folder. If you are using a Windows system, you can directly double-click to open CH341SER_Windows.EXE, install corresponding driver according to the computer operating system(For the installation of

non-Windows systems, please refer to the corresponding installation instructions in the package provided by us).

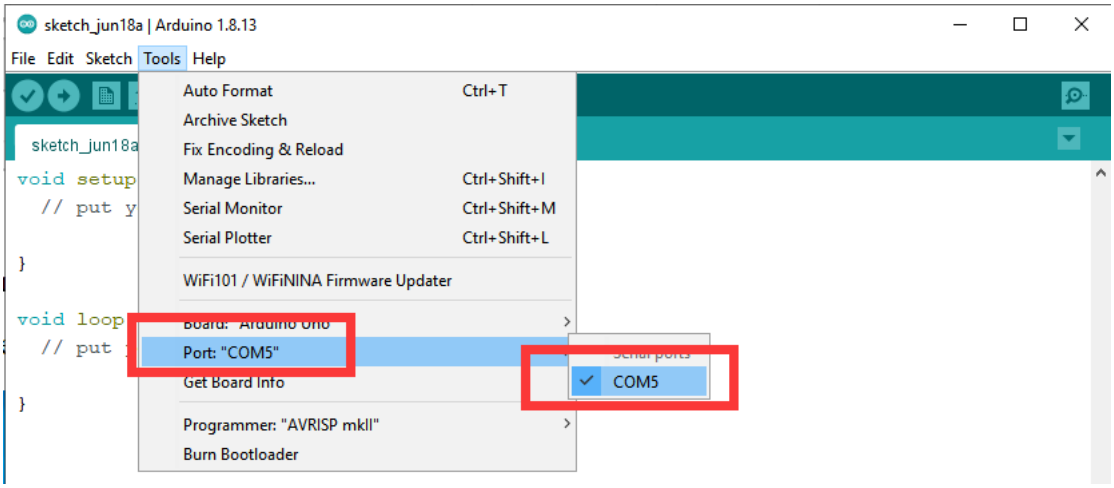


3. Click INSTALL.Wait for the installation to succeed. And click OK.





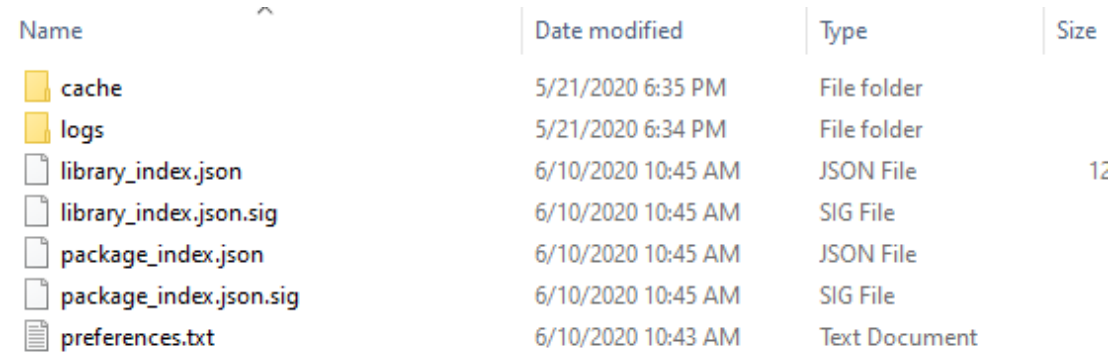
4.Now you will find the Arduino serial port is accessible (different computer configuration has different serial port). It means that the Arduino UNO development board has been successfully connected to the computer. You will need to pay attention to this connection step in the following course.



6. The solution for situation that Arduino IDE cannot be opened

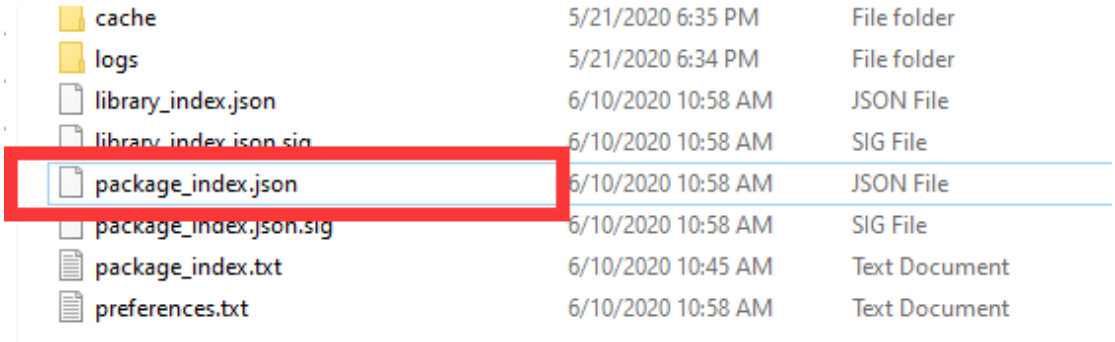
When opening the Arduino IDE, you will suddenly encounter a situation that it cannot be opened.

【Solution】
You need to find the Arduino15 folder in the "\Users\ASUS\AppData\Local\Arduino15" directory of the C drive. As shown below:



Name	Date modified	Type	Size
cache	5/21/2020 6:35 PM	File folder	
logs	5/21/2020 6:34 PM	File folder	
library_index.json	6/10/2020 10:45 AM	JSON File	12
library_index.json.sig	6/10/2020 10:45 AM	SIG File	
package_index.json	6/10/2020 10:45 AM	JSON File	
package_index.json.sig	6/10/2020 10:45 AM	SIG File	
preferences.txt	6/10/2020 10:43 AM	Text Document	

You need to delete the package_index.json file, and then reopen the Arduino IDE.



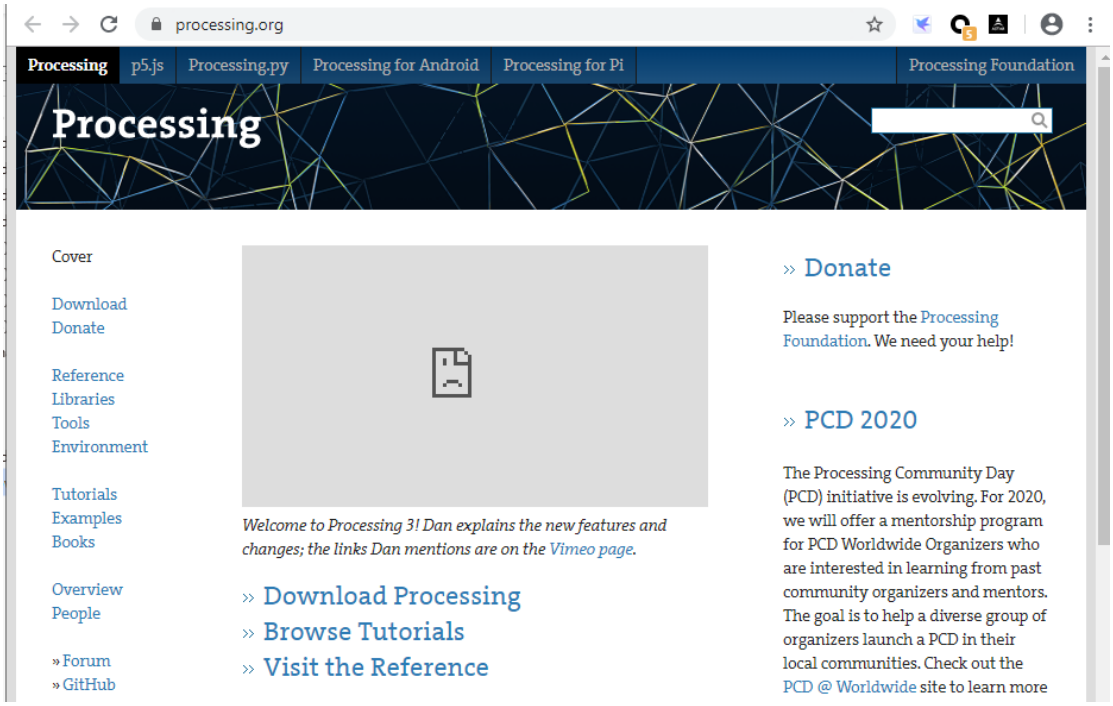
cache	5/21/2020 6:35 PM	File folder
logs	5/21/2020 6:34 PM	File folder
library_index.json	6/10/2020 10:58 AM	JSON File
library_index.json.sig	6/10/2020 10:58 AM	SIG File
package_index.json	6/10/2020 10:58 AM	JSON File
package_index.json.sig	6/10/2020 10:58 AM	SIG File
package_index.txt	6/10/2020 10:45 AM	Text Document
preferences.txt	6/10/2020 10:58 AM	Text Document

7. Download Processing

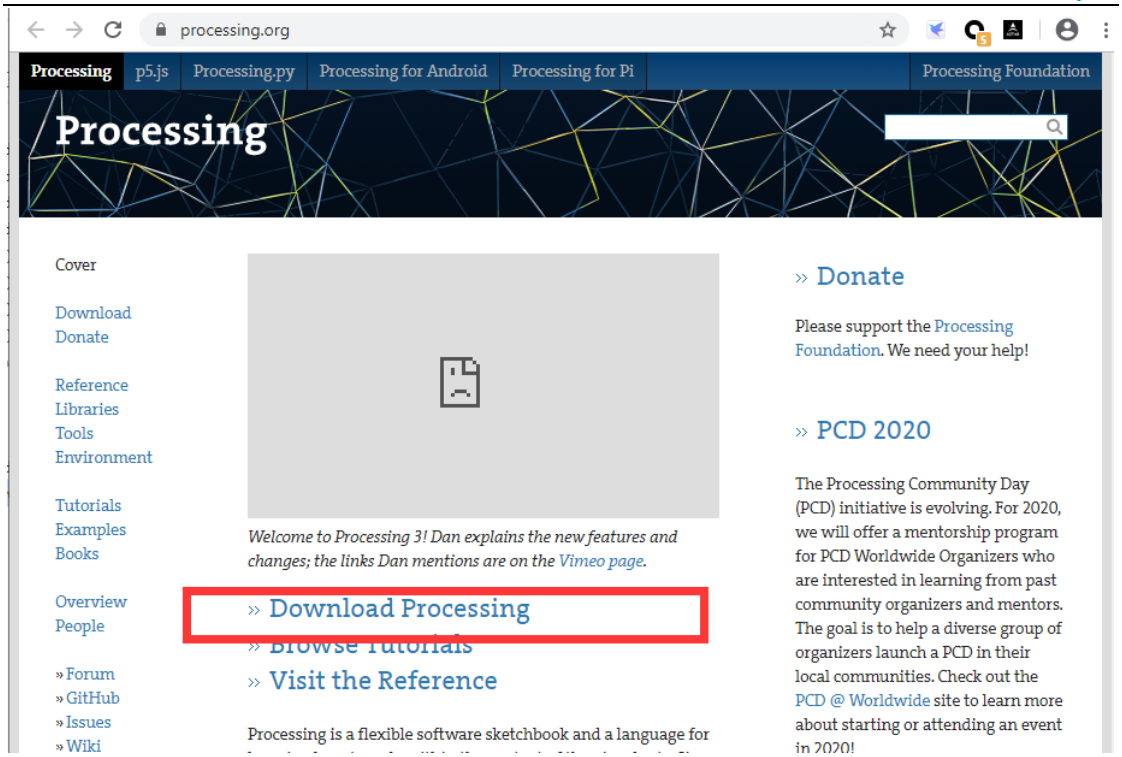
Processing is a revolutionary and forward-looking new computer language. Its concept is to introduce programming languages in the environment of electronic art and introduce the concept of electronic art to programmers. It is an extension of the Java language and supports many existing Java language architectures. It is not only much simpler in syntax, but has many intimate and user-friendly designs. Processing can be used on Windows, MAC OS X, MAC OS 9, Linux and other operating systems. The latest version is Processing 3. The work done in Processing can be used on the personal computer side or exported to the Internet in the form of Java Applets.

How to download Processing?

1. Enter this URL with Google Chrome: https://processing.org/

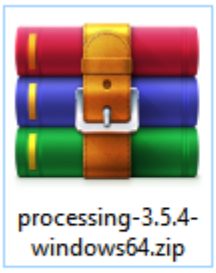


2. Click Download Processing, as shown below:

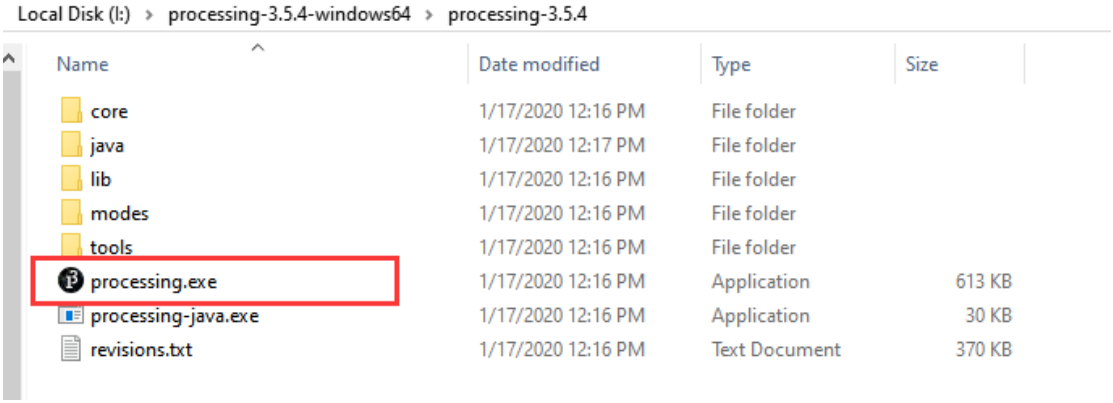


3.The operating system we choose to use here is windows 64-bit, select "Windows 64-bit".

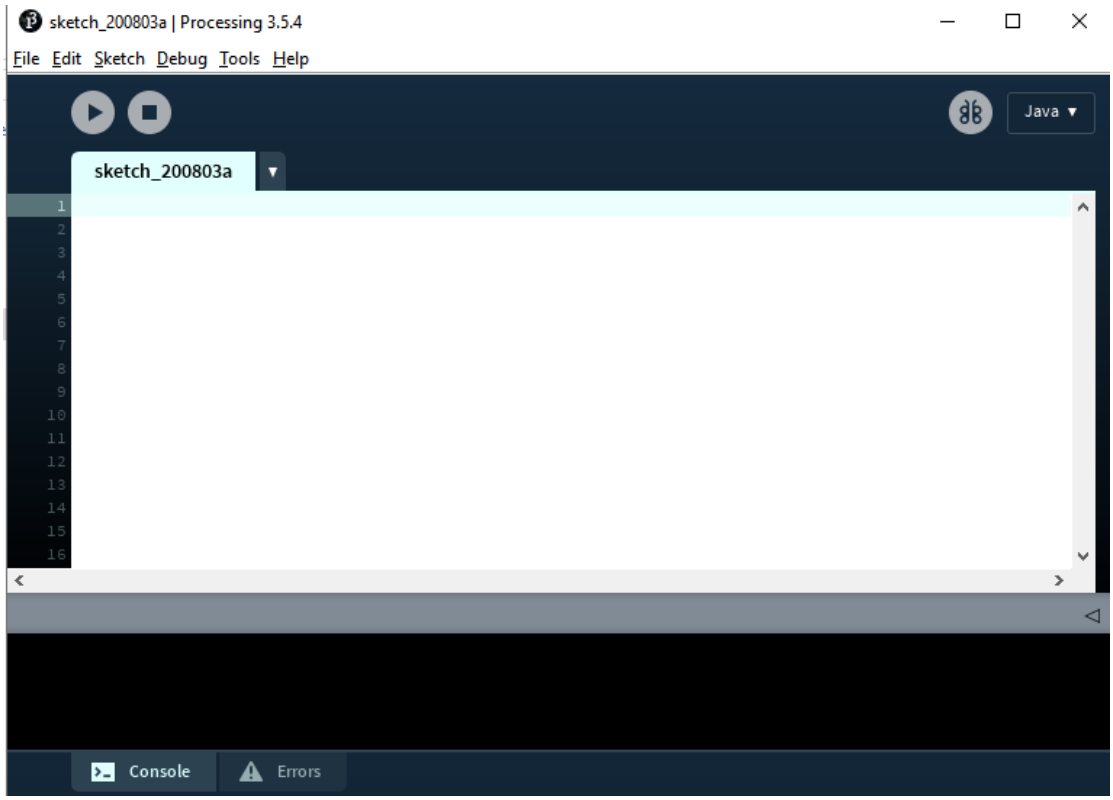
4.When finish downloading, you will get a compressed file "processing-3.5.4-windows64.zip".



5.After extracting this file, you can get the following file, just click to run processing, it can be run directly without installation.



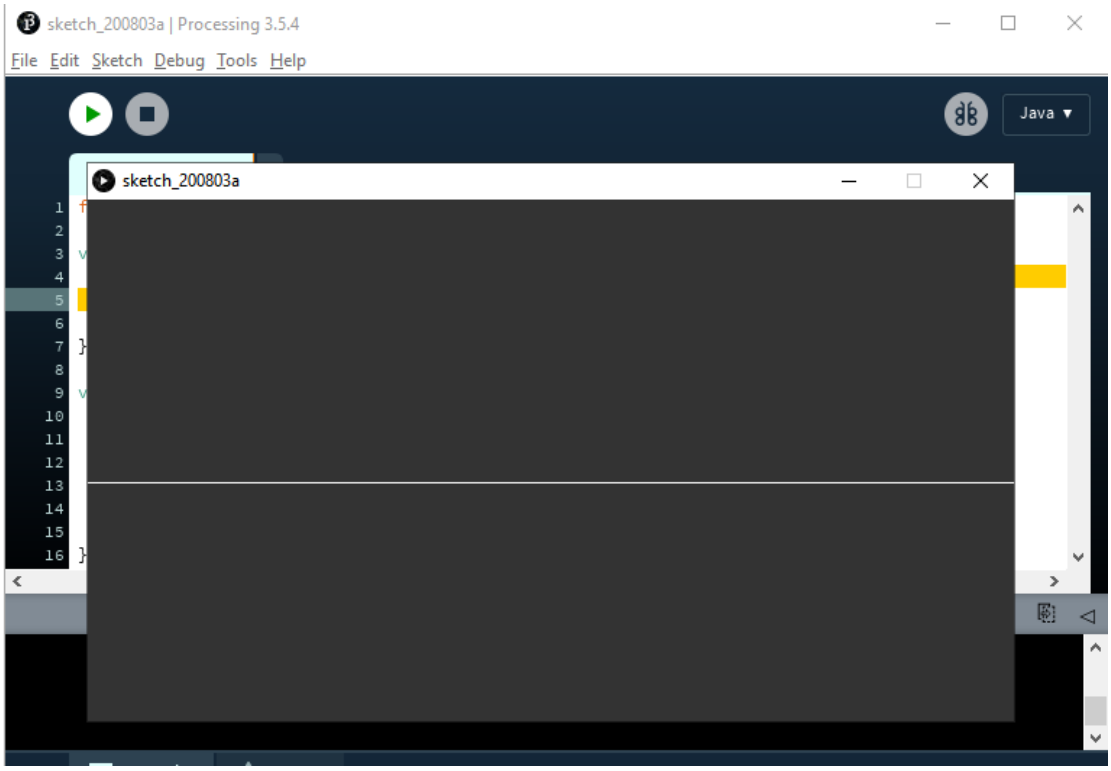
6.The interface is as follows after the Processing runs



7.Let's write a simple code that implements the following functions "Change the variable to create a moving line. When the line moves out of the window edge, the variable becomes 0 and the line goes back to the bottom of the screen

8.Click “Run”.

9.Running effect is as follow.

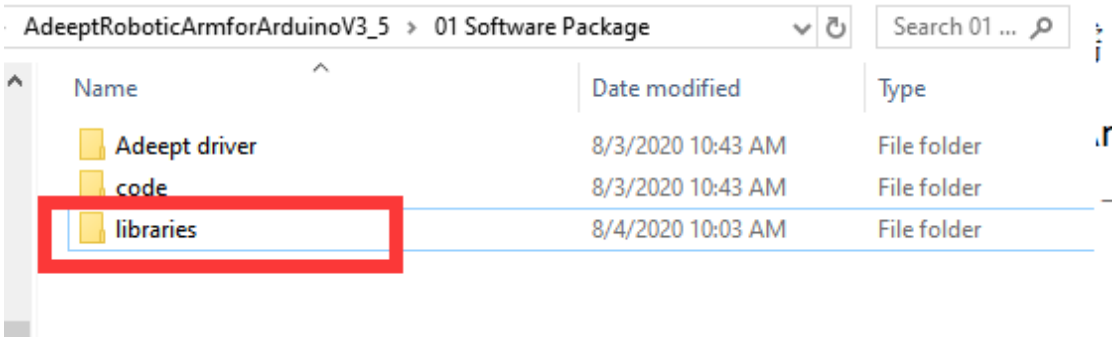


We need to upload a piece of code to the Adeept Robotic Arm Drive Board before starting to assemble the robotic arm. Find out "_6 Servo90" in the documentation we provided and upload the item code from the file to Adeept Robotic Arm Drive Board.

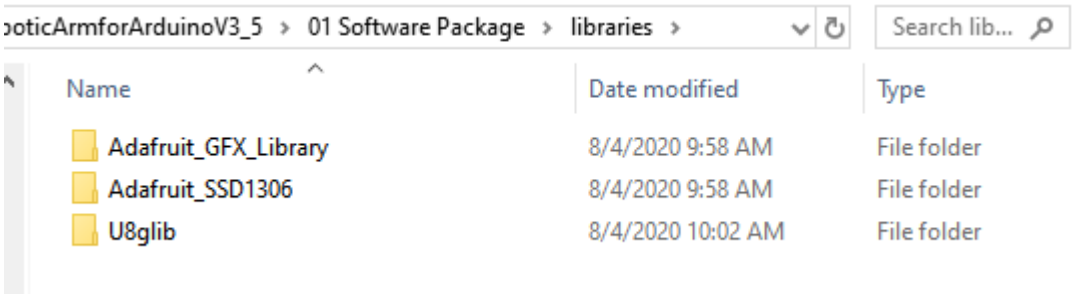
8. Configuring the "libraries" folder of the Arduino IDE

Before using Adeept Robotic Arm, you need to configure the "libraries" folder under the downloaded Arduino IDE directory.

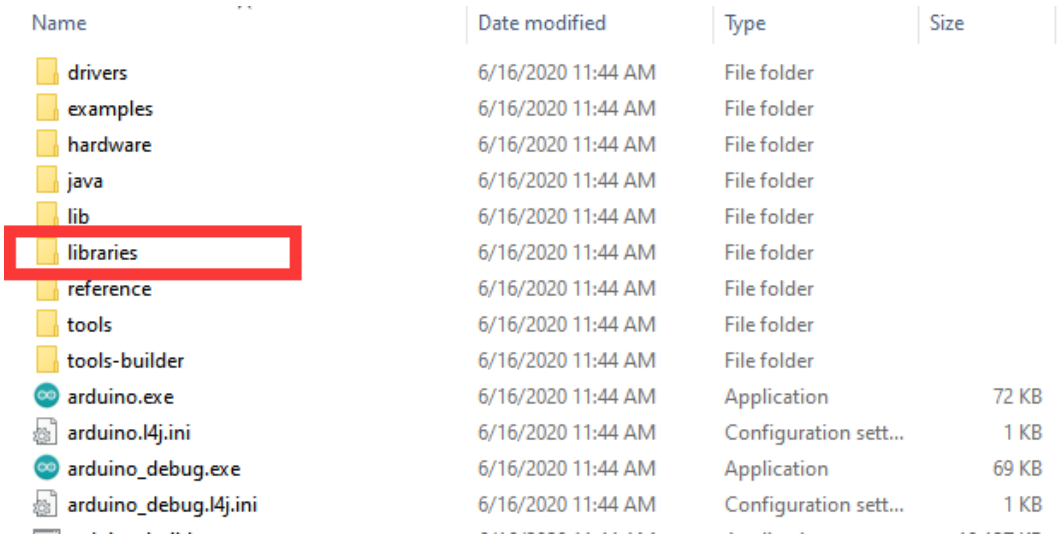
First, you need to find **the Package of Documentation** (Reference: near Page 12 of this section, subsection 5, step (4)) provided by Adeept, and find the "libraries" folder under the 01 Software Package folder, as shown below:



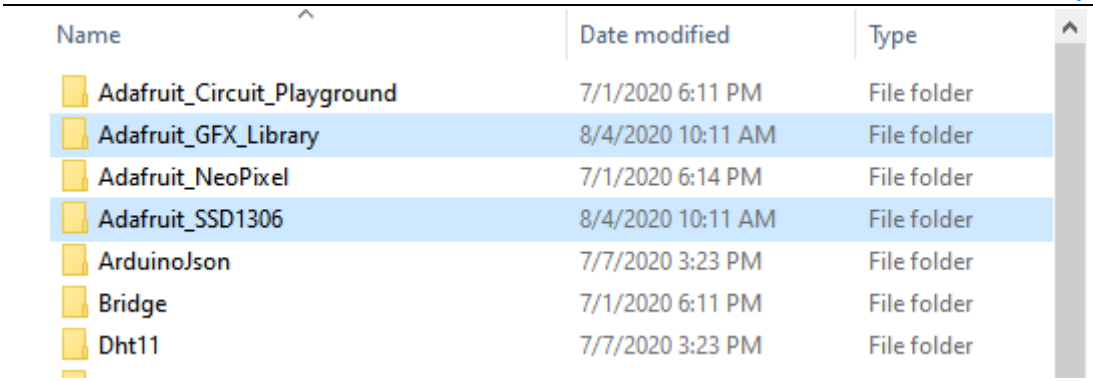
Open the "libraries" folder, as shown below:



You need to copy "Adafruit_GFX_Library", "Adafruit_SSD1306", "U8glib". Copy all three files to the "libraries" under the Arduino IDE installation directory, as shown in the figure below:



Paste the three folders in "libraries". As shown below:



Name	Date modified	Type
Adafruit_Circuit_Playground	7/1/2020 6:11 PM	File folder
Adafruit_GFX_Library	8/4/2020 10:11 AM	File folder
Adafruit_NeoPixel	7/1/2020 6:14 PM	File folder
Adafruit_SSD1306	8/4/2020 10:11 AM	File folder
ArduinoJson	7/7/2020 3:23 PM	File folder
Bridge	7/1/2020 6:11 PM	File folder
Dht11	7/7/2020 3:23 PM	File folder