

LROBRUYA

Solar Tracking Kit

LROBRUYA





Content

Preface	4
How to Install Arduino IDE	7
How to Install Arduino Driver	22
Lesson 1 Connection	38
Lesson 2 Servo Angle Installation and Calibration	39
Lesson 3 Understand Solar Tracking Code	42
Lesson 4 Track the Sun	46
Lesson 5 Store Energy	50



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 detailed user documentation.

LROBRUYA





How to Install Arduino IDE

Introduction

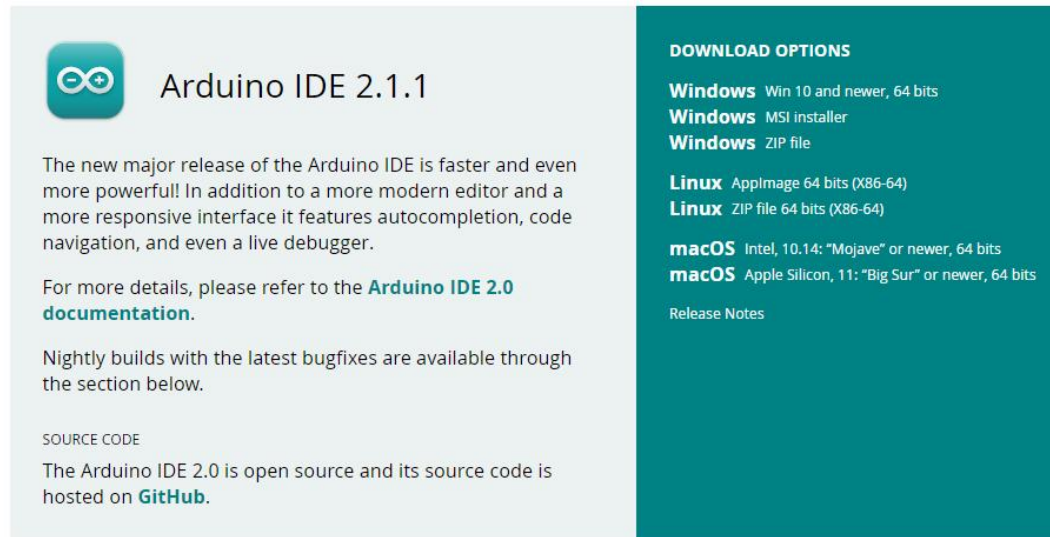
The Arduino Integrated Development Environment (IDE) is the software side of the Arduino platform.

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>.

LROBROYA



 **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.

LROB RUYA

DOWNLOAD OPTIONS

Windows Win 10 and newer, 64 bits

Windows MSI installer

Windows ZIP file

Linux Appliance 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.


LROBBUYA





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.

LROBROYA

 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.

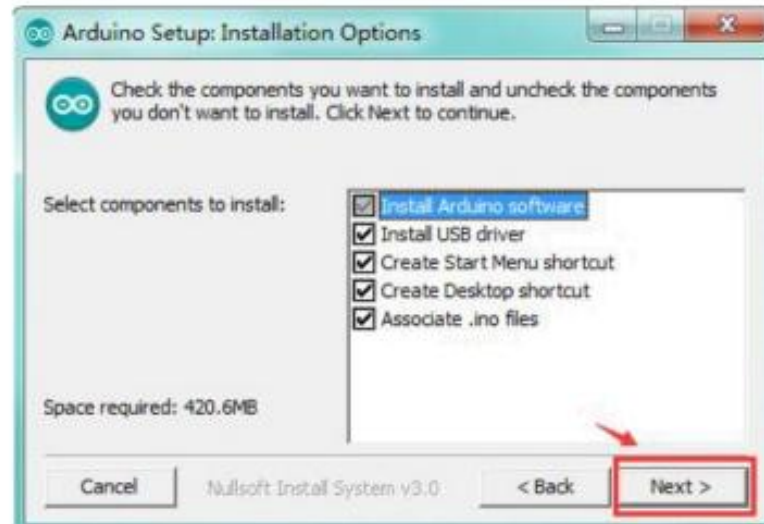
 arduino-ide_2.1.1_Windows_64bit

LROBROYA



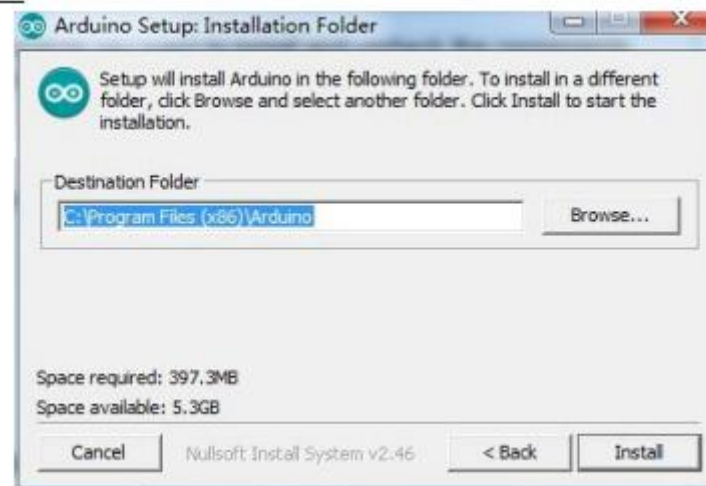
Click I Agree to see the following interface.

LROBROYA



Click Next

LROBROYA



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

LROBROYA



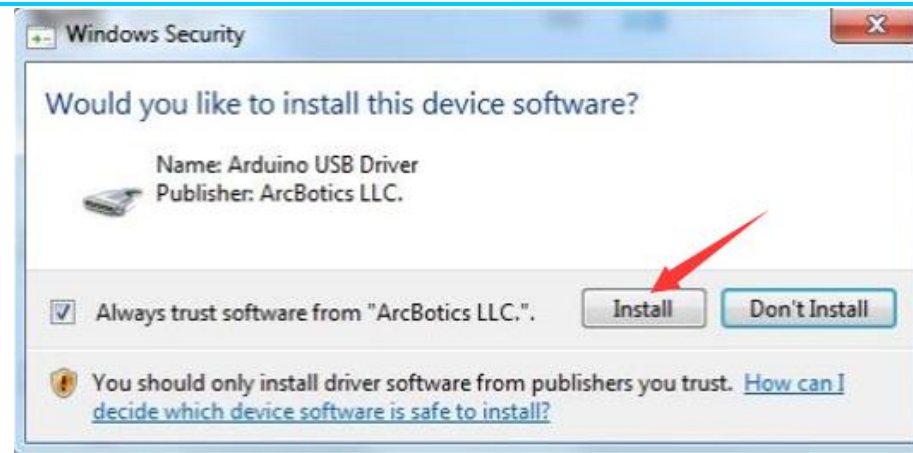
Click Install to initiate installation

LROBROYA



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

LROBROYA

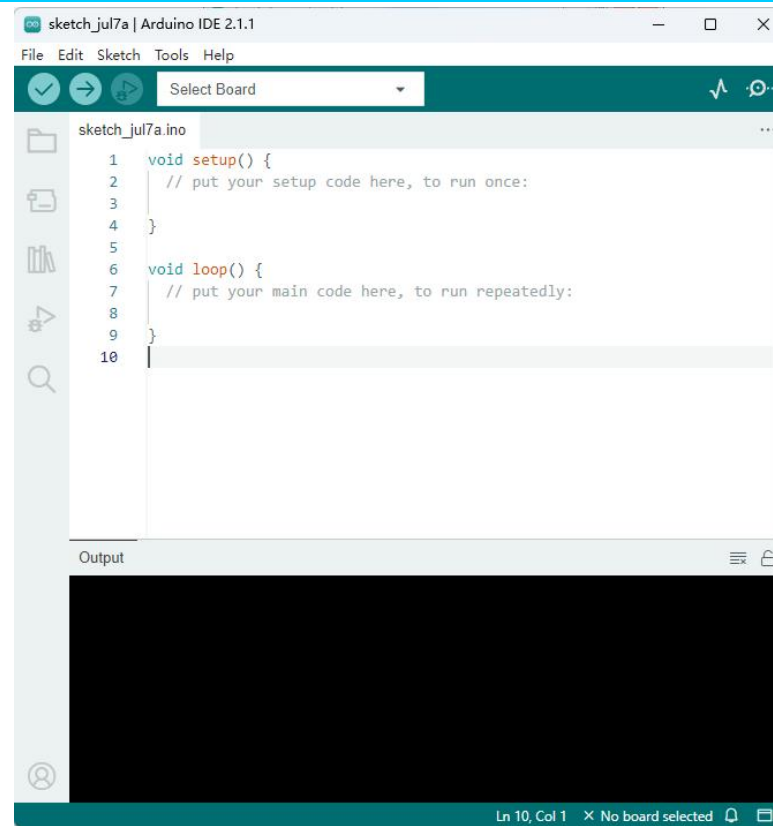


Next, the following icon appears on the desktop



Double-click to enter the desired development environment

LROBROYA



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.

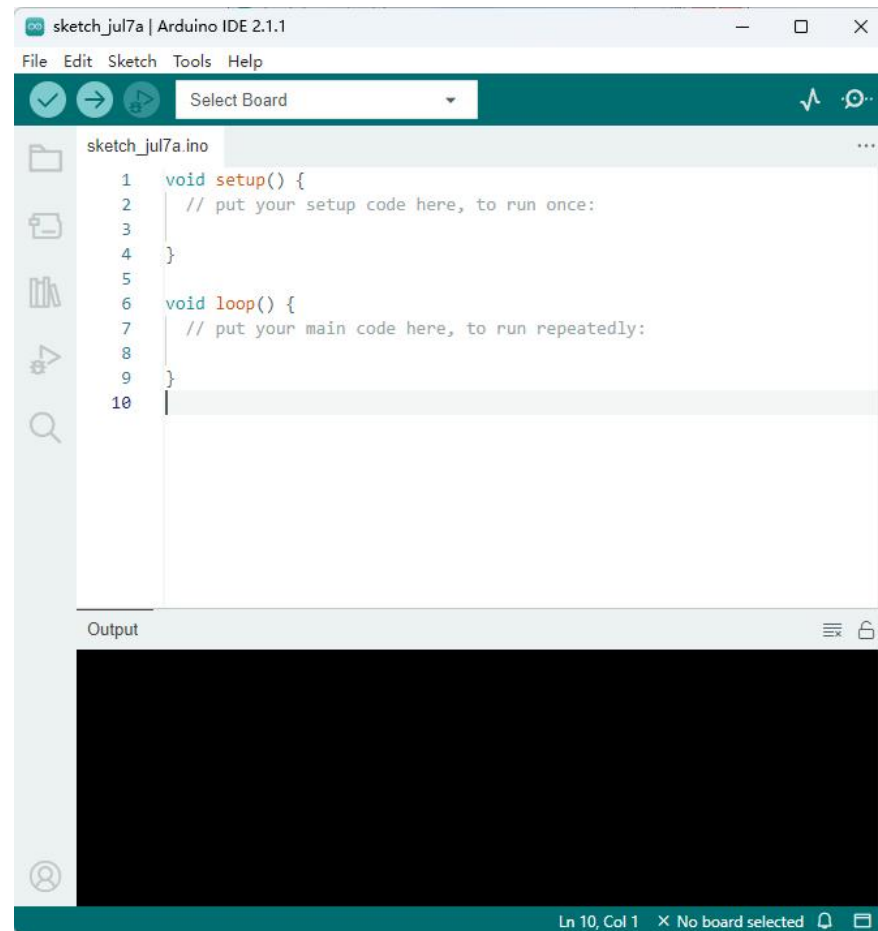
LROBROYA

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
msvcpr100.dll	2017/6/1 0:58	应用程序扩展	412 KB
msvcpr100.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

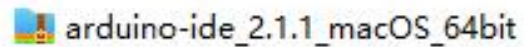
LROBROYA





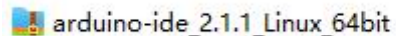
Installing Arduino (Mac OS X)

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.

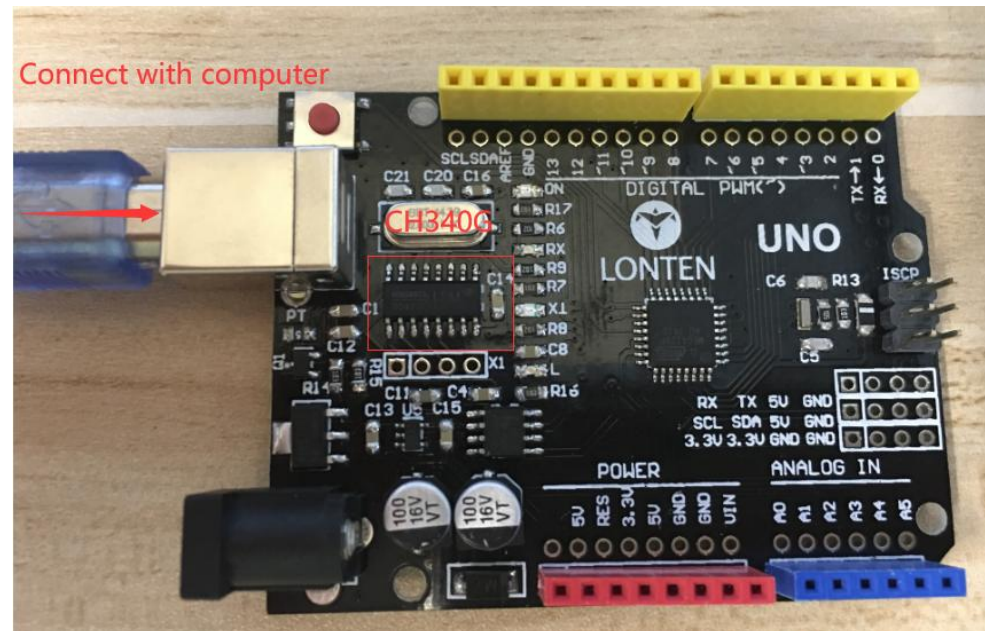


LROBBUYA

How to Install Arduino Driver

For Windows

Arduino UNO(serial conversion chip is CH340G)





The USB to serial port chip of this control board is CH340G. So you need to install the driver for the chip. You can click the driver file [here](#).

In different systems, the driver installation is similar. Here we start to install the driver on the Win10 system. You can find the “USB_Drive_CH341_3_1” folder in the information we provide, this is the driver file we want to install.

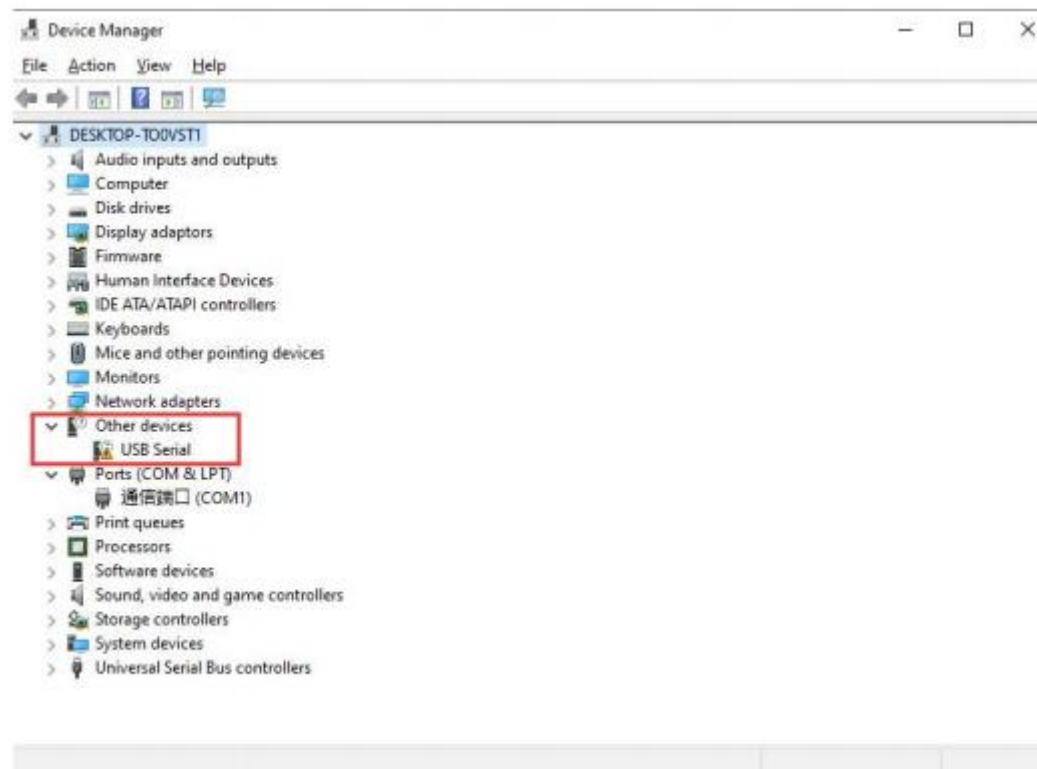


Plug one end of your USB cable into the Arduino UNO CH340 Board and the other into a USB socket on your computer.

When you connect the Arduino UNO CH340 Board to your computer at the first time, right click your “My Computer”—>for “Properties”—>click the “Device manager”, under Other devices, you should see the “USB-Serial” or “Unknown device ”.Or you can search for "devi" in your computer, or you can open the device manager of your

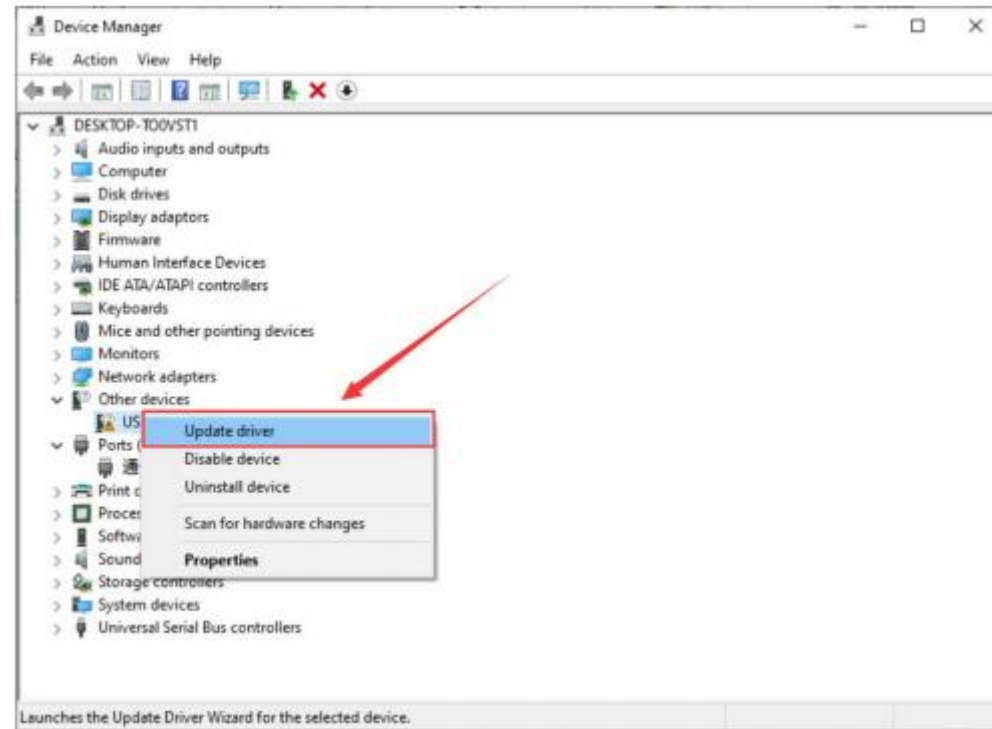
LROBBUYA

computer.



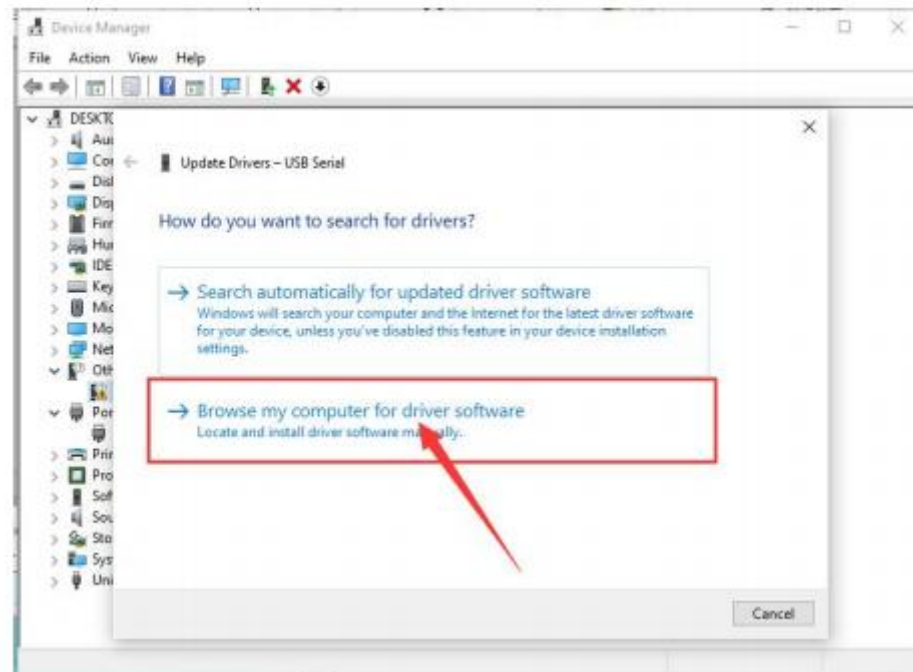
Then right-click on the device and select the top menu option (Update Driver Software...) shown as the figure below.

LROBBUYA



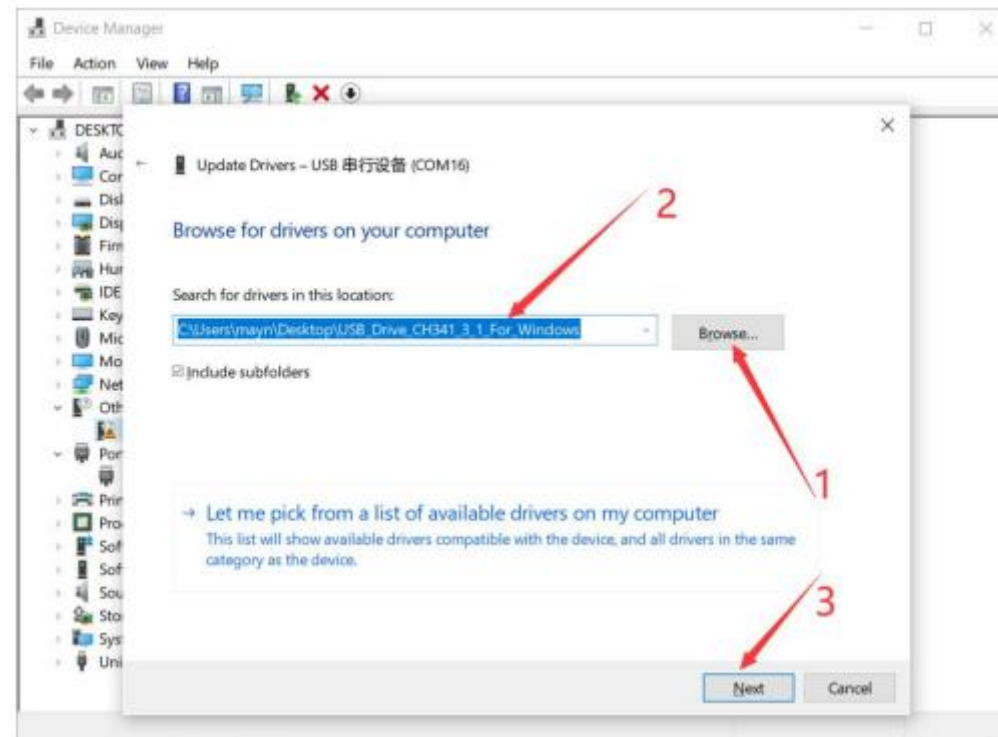
Then it will be prompted to either “Search Automatically for updated driver software” or “Browse my computer for driver software”. Shown as below. In this page, select “Browse my computer for driver software”.

LROBROYA



After that, select the browse option and navigate to the drive folder "USB_Drive_CH341_3_1", which can be found in the information we provide. (Note that the file path selects the location of the .For example, I store this driver file on the computer desktop, so the file path I choose is `C:\Users\mayn\Desktop\USB_Drive_CH341_3_1_For_Windows`)

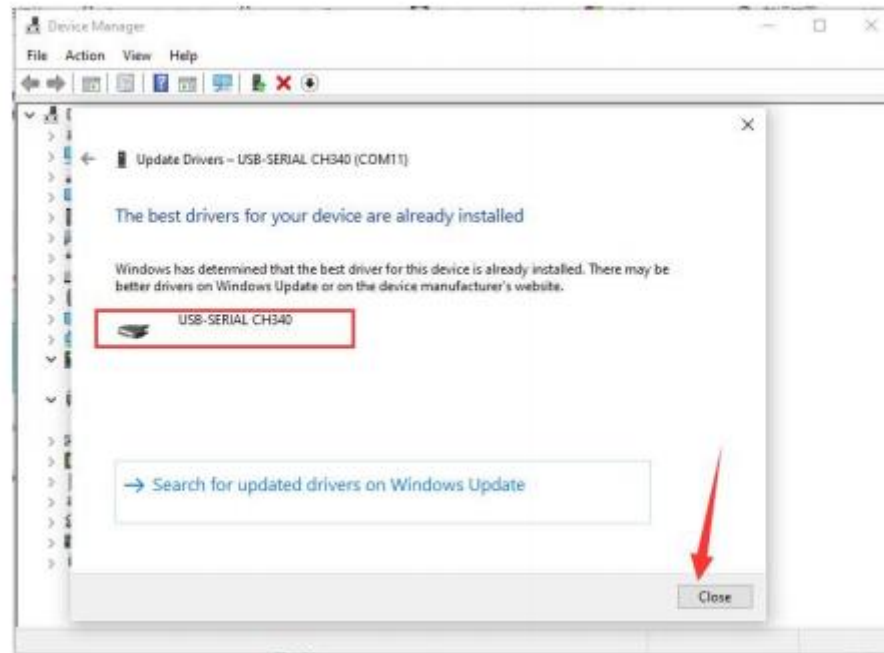
LROBRUYA



Once the software has been installed, you will get a confirmation message.

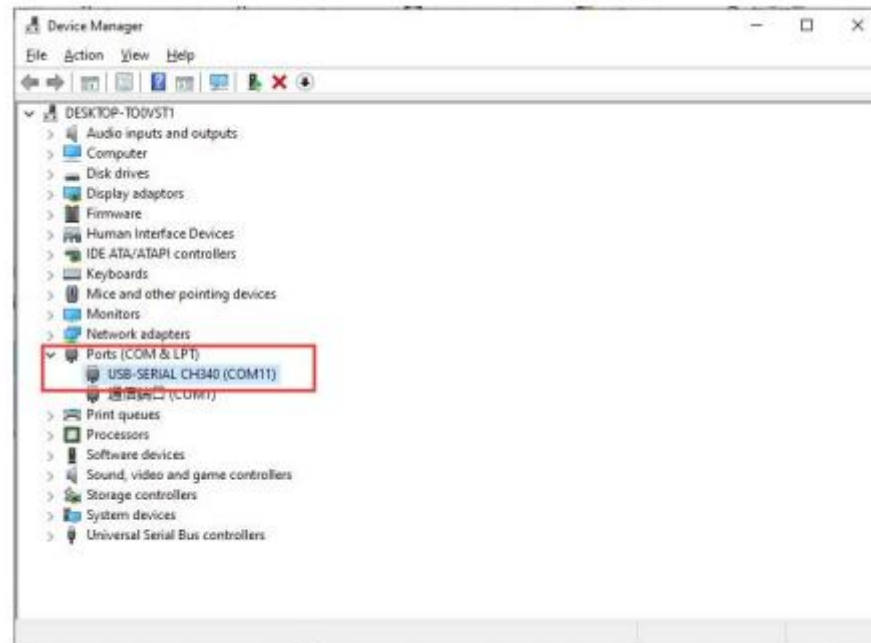
Installation completed, click “Close”.

LROBROYA



Up to now, the driver is installed well. Then you can right click “My Computer”—>for “Properties”—>click the “Device manager”, you should see the device as the figure shown below. Or you can search for "devi" in your computer, or you can open the device manager of your computer.

LROB RUYA

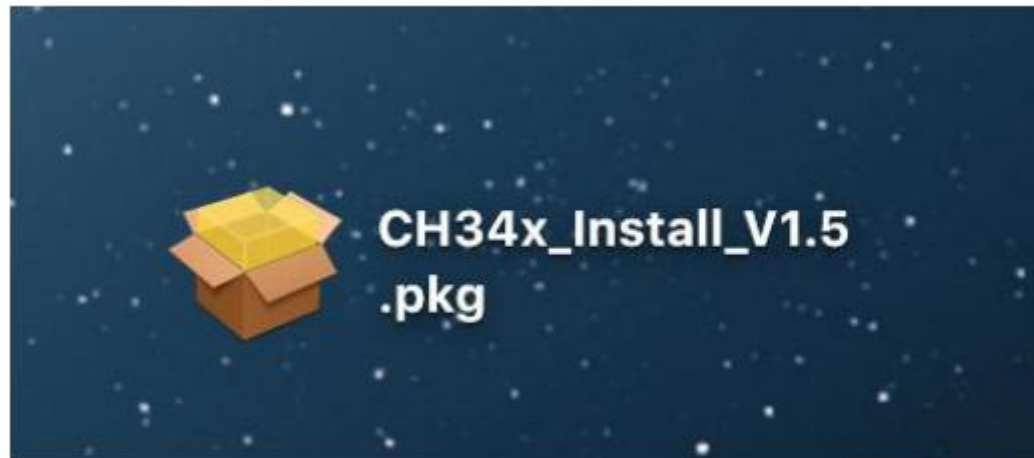


For MAC System

Arduino UNO(serial conversion chip is CH340G)

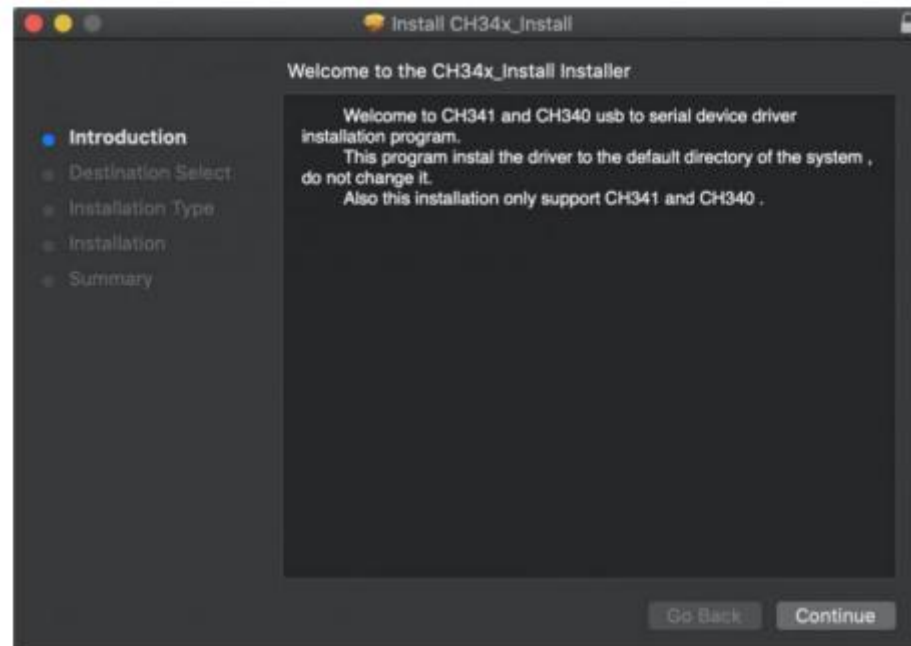
Plug one end of your USB cable into the Arduino UNO CH340 Board and the other into a USB socket on your computer.

LROB RUYA



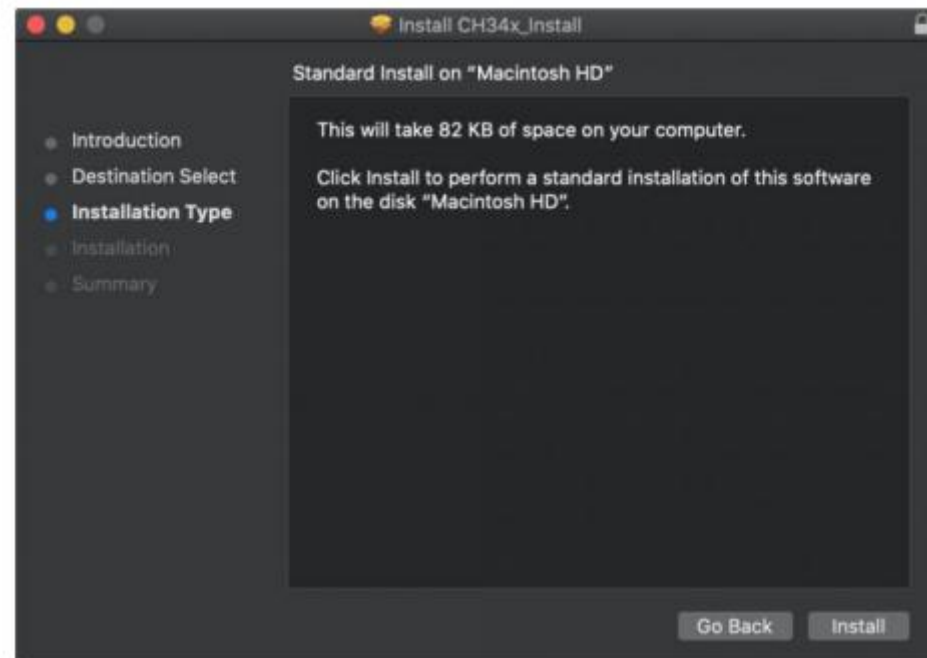
Double-click installation package and tap Continue

LROBROYA



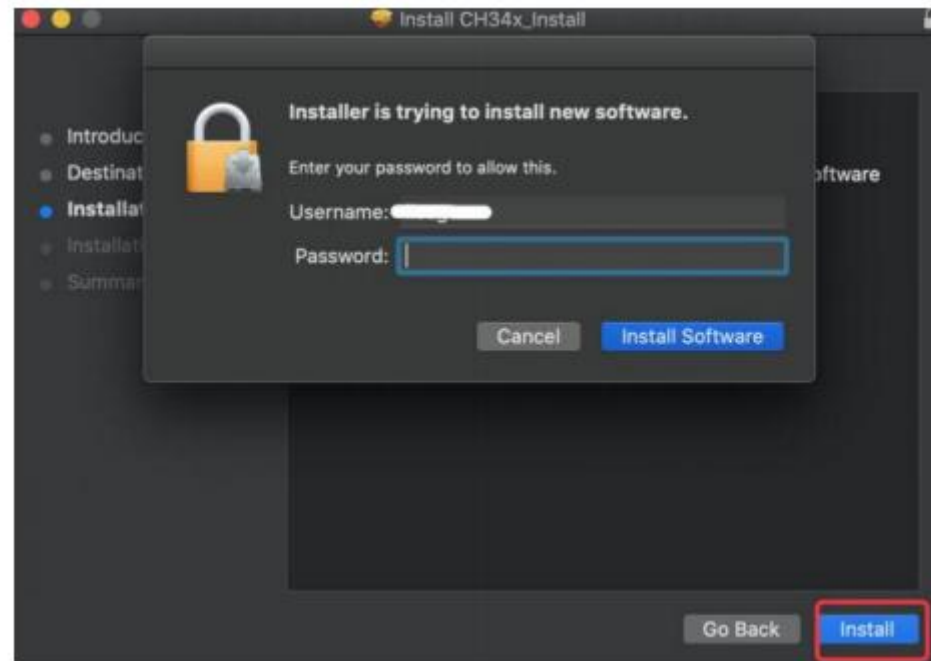
Click Install

LROBROYA



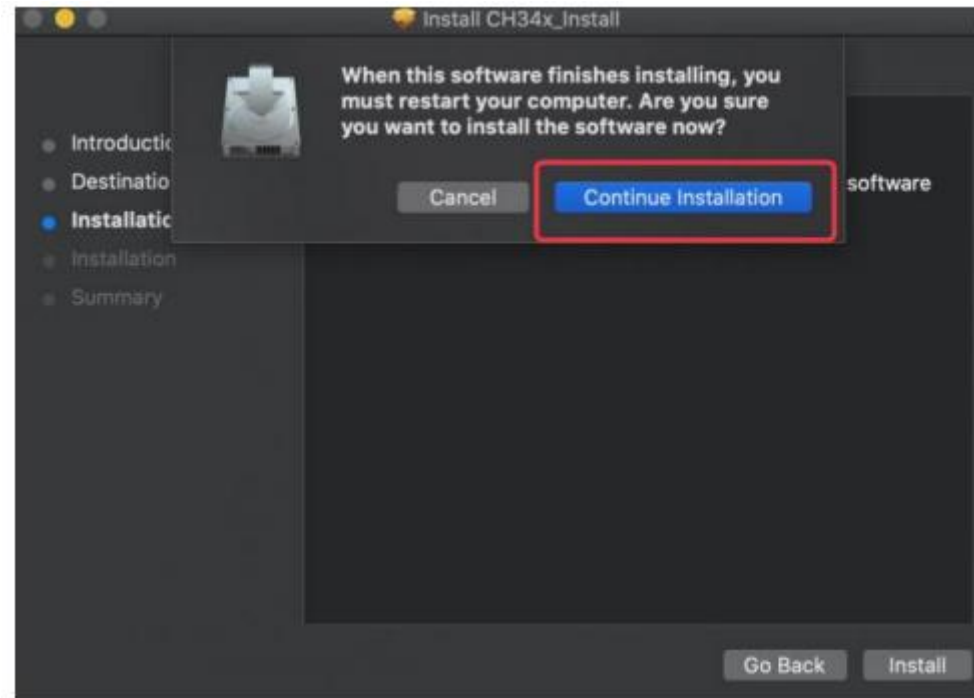
Input your user password and click Install Software

LROBROYA



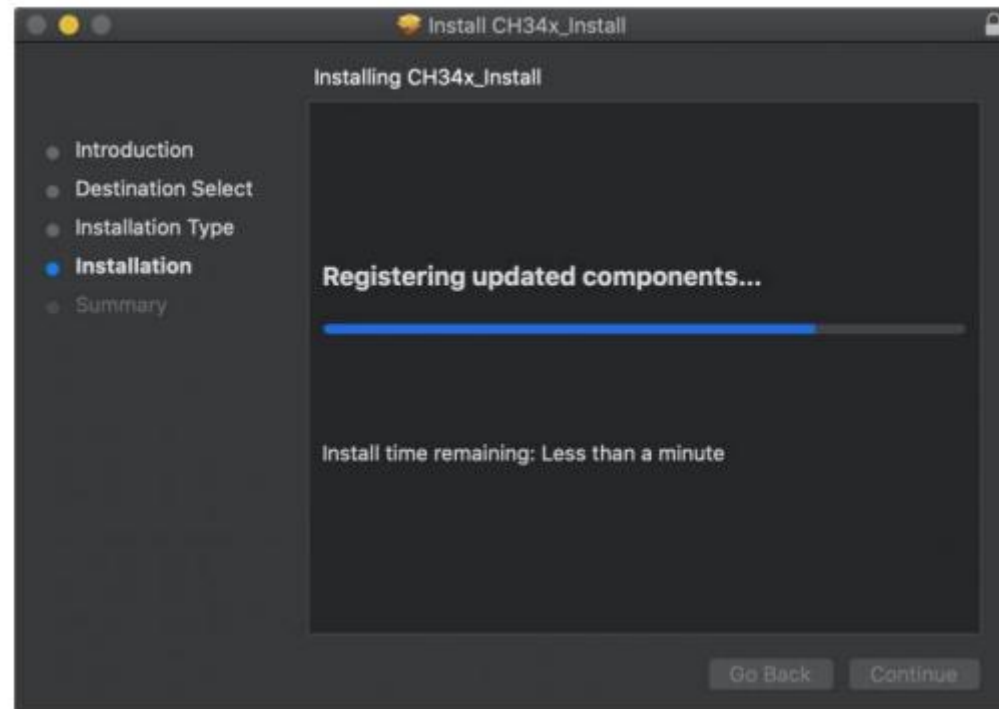
Tap Continue Installation

LROBROYA



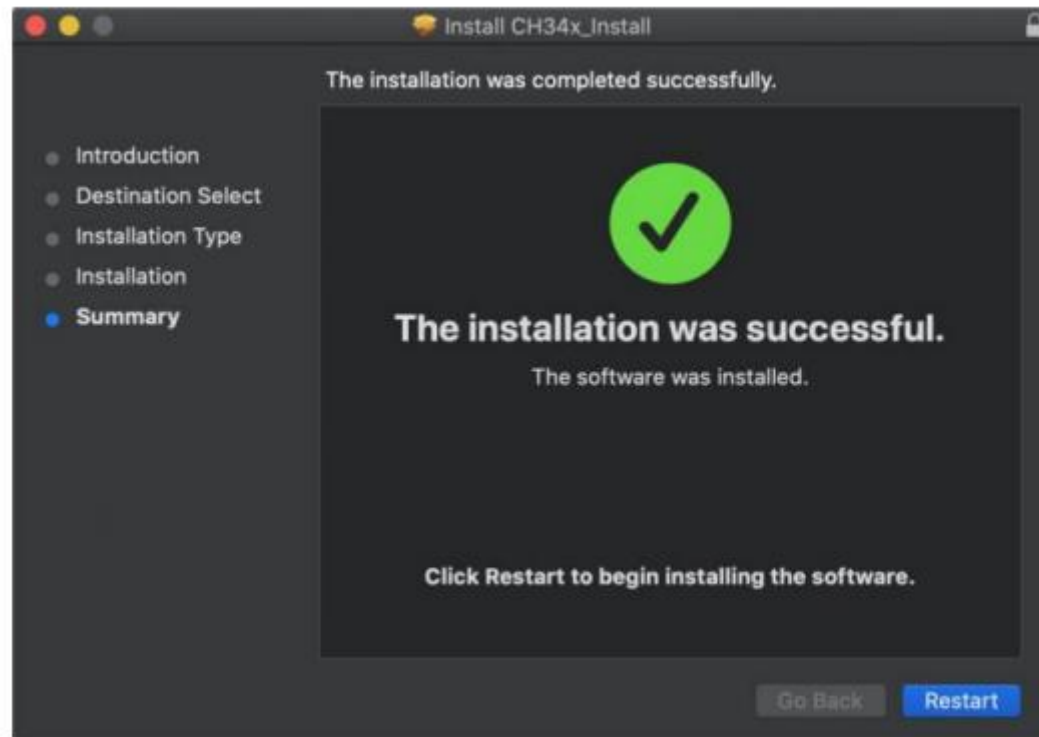
Wait to install

LROBROYA



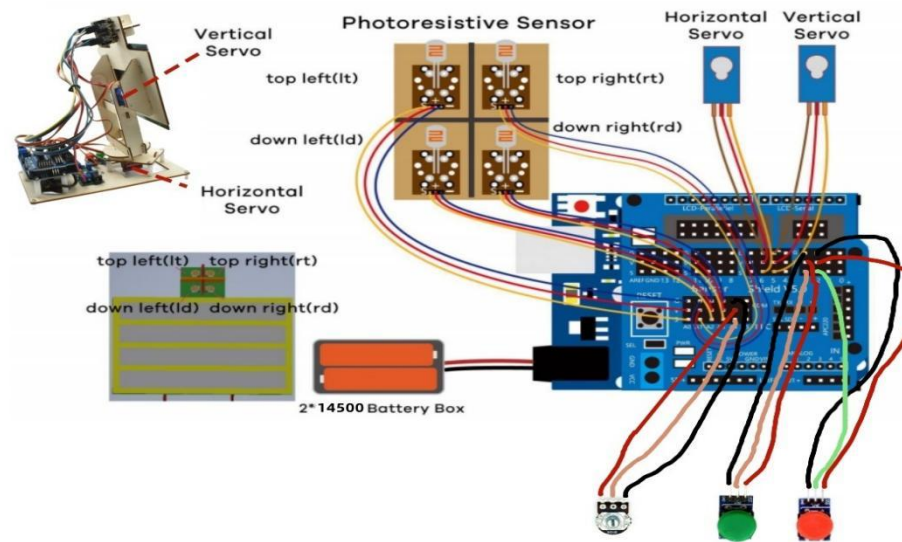
Click Restart after the installation is finished

LROBBUYA



LROBRUYA

Lesson 1 Connection





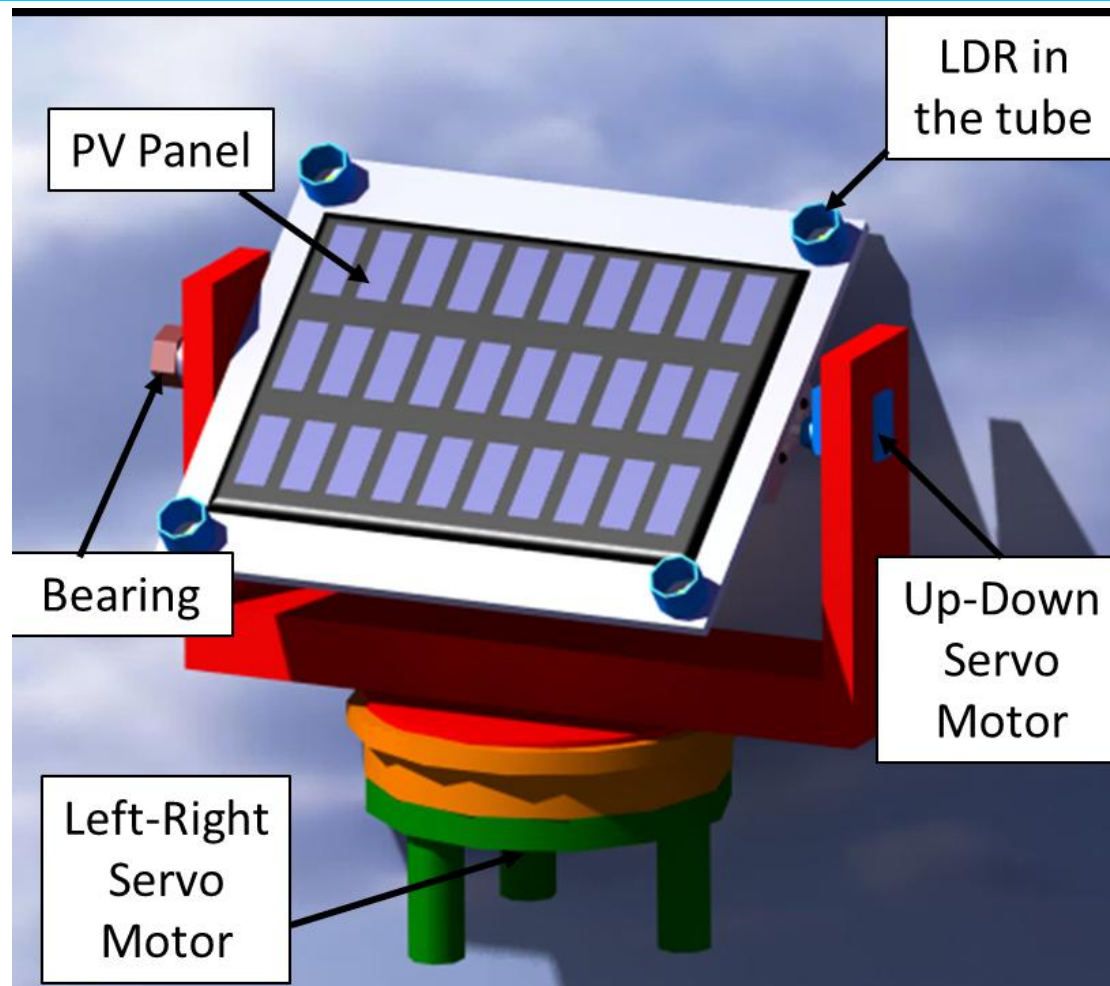
Lesson 2 Servo Angle Installation and Calibration

About this lesson:

When the system detects a change in the position of the sun, Arduino moves the solar panel by controlling the rotation direction and speed of the motor, thereby maintaining its face towards the sun. As a result, the system can always maximize the collection efficiency of solar energy and improve the electrical energy output efficiency of the solar system.

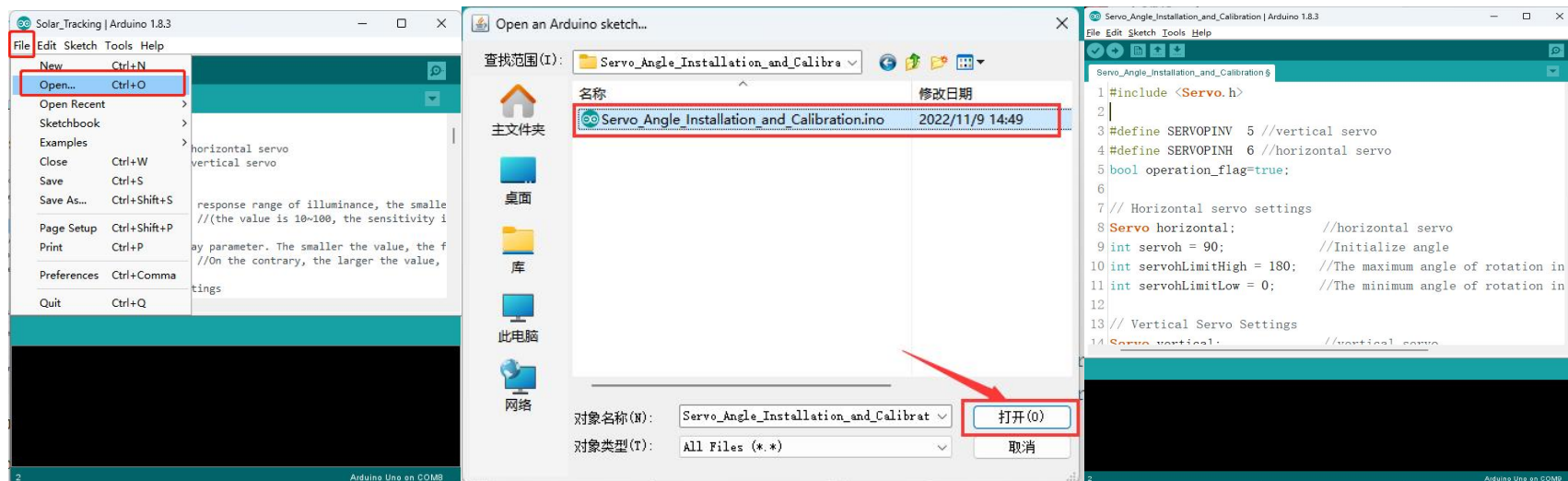
After the product is installed, it is necessary to perform horizontal calibration on the two motors to complete their angle initialization, so that in the following courses, the motors will run according to the program we have written.

LROBRUYA



LROBRUYA

Upload the code:



Result

After uploading the code successfully, you will see the servo motor initialized successfully. The horizontal servos will turn to the initial angle of 90° and vertical servos will turn to the initial angle of 120° .



Lesson 3 Understand Solar Tracking Code

About this lesson:

In this lesson, you will learn how to write code to control solar panels to follow the sunlight.

Arduino Mathematical Operations map() :

Map() is a mathematical operation function in Arduino that maps a numerical value from one numerical range to another. It accepts five parameters: the value to be mapped, the lower limit of the original range, the upper limit of the original range, the lower limit of the target range, and the upper limit of the target range, and returns the mapped value.

Its scope of application:

- 1) Map the range of analog input (0-1023) to the range of analog output (0-255) to achieve PWM signal control.
- 2) Map the sensor readings to actual physical quantities such as temperature, distance, angle, etc.
- 3) Map numerical values to different colors or tones for visualization or sound effects.



Application scenario:

- 1) Sensor data conversion: The `map()` function is commonly used to map sensor readings from the original range to a more meaningful numerical range. For example, mapping the reading of a photosensitive resistor from a range of 0 to 1023 to a brightness value range of 0 to 100 can provide a more intuitive representation of light intensity.
- 2) Output signal mapping: In a control system, the range of the output signal may not be consistent with the range of the input signal. The `map()` function can be used to map the input signal to the desired output signal range to meet specific control requirements.
- 3) Data adjustment and normalization: In data processing and analysis, it may be necessary to adjust or normalize the data for comparison, statistics, or other operations. The `map()` function can map data to the required range to meet the requirements of analysis or processing.

When using the `map()` function, the following precautions should be taken:



-
- 1) The `map()` function can accept integers or floating-point numbers as parameters, but the returned result type is the same as the parameter type. If you want to assign the results to variables of different types, you need to perform type conversion.
 - 2) The `map()` function can only accept five parameters, namely the mapped value, the lower and upper limits of the original interval, and the lower and upper limits of the target interval. If you want to map multiple values, you need to call the `map()` function separately.
 - 3) The `map()` function uses integer operations, so it may lose decimal parts or result in rounding errors. If you need more precise mapping, you can use floating-point operations or custom formulas.

Mode switching:

This device has two modes: manual and automatic. The button is connected to pin 2 and can be switched between two modes.



If the manual mode is active, the potentiometer is connected to pin A4 and can control the servo motors from east to west for the left and right motors, and from south to north for the upper and lower motors. A button connected to pin 3 is used to switch the potentiometer between two motors, which can control the left and right servo motors or the up and down servo motors.


If automatic mode is active, the algorithm will be executed.



Lesson 4 Track the Sun

About this lesson:

When you have successfully uploaded the code, turn on the power switch. The solar panels will point in the direction of the brightest light in the environment.

Click the icon  in the upper right corner of the Arduino IDE and set the baud rate to 9600. You can open the serial monitor to view the real-time value(0~1024) of each photosensitive sensor. "0" represents the maximum brightness, and "1024" represents the darkest brightness.

Can't track the sun?

- Maybe you forget to calibrate the initial angle of the servo arm.
- Maybe the wiring of the light sensor is not correct.

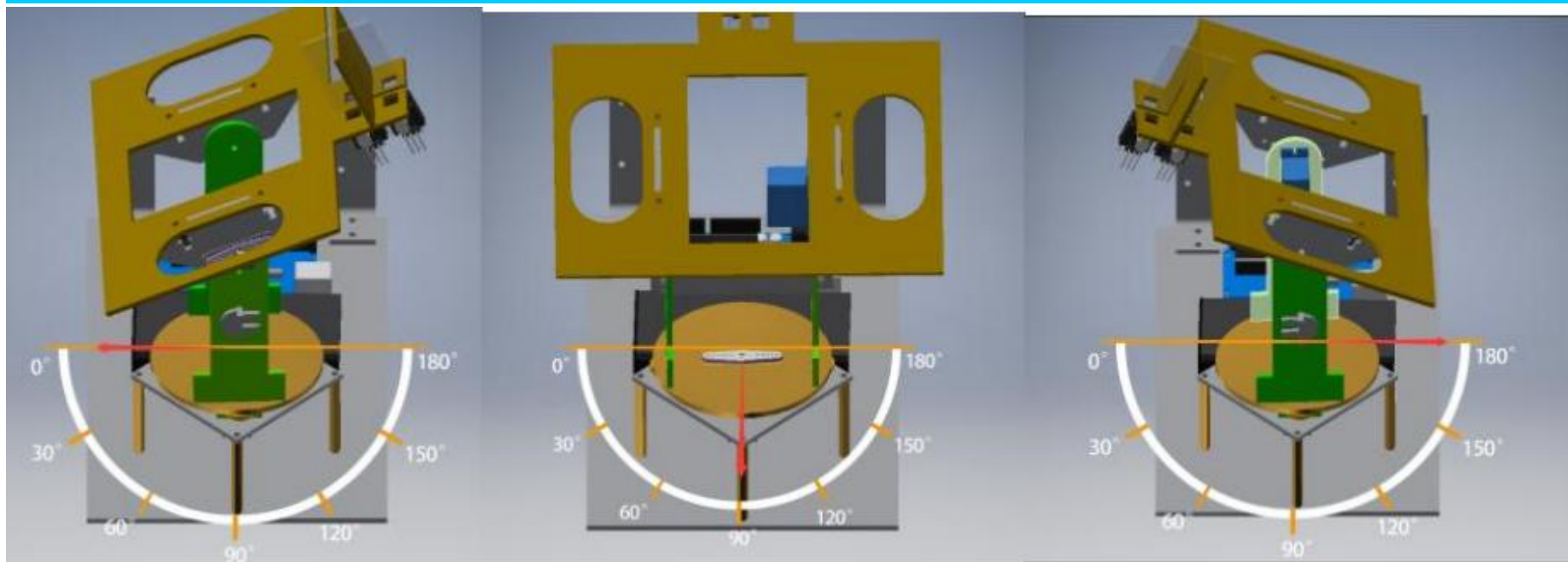


Explanation of core variables:

Important Parameters	Function
tol	The response range of illuminance, the smaller the value, the more sensitive the response, otherwise it is slow (the value is 10~100, the sensitivity is different depending on the ambient light intensity, the indoor light source changes greatly, you should set the “tol” number higher; the change is smaller under the sun. You should set the “tol” value a little smaller.)
dtime	delay parameter. The smaller the value, the faster the response speed. On the contrary, the larger the value, the slower the response speed. Unit: milliseconds General value (10~100) .

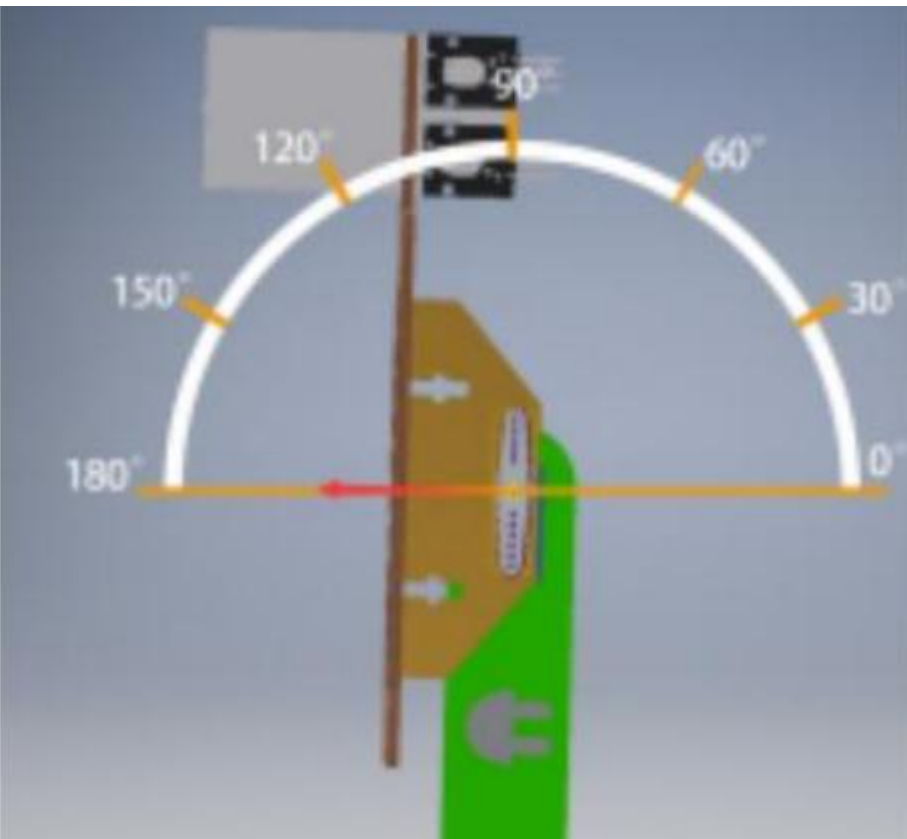
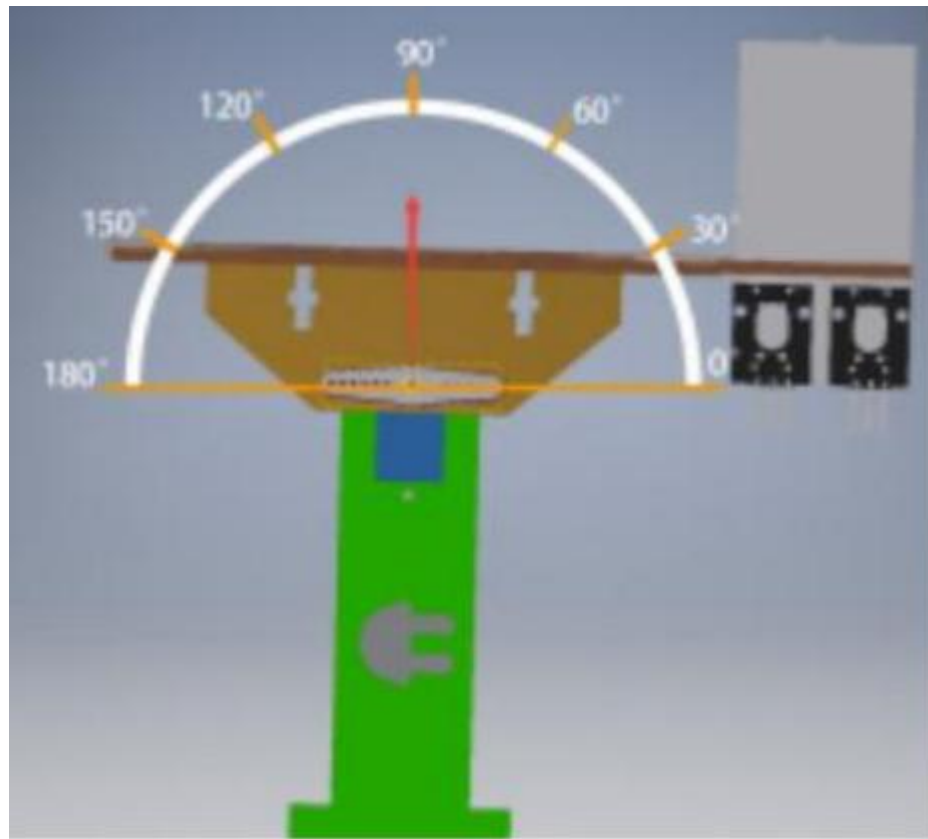
The angle the servo can turn in the horizontal direction. Min=0° Max=180°

LROBRUYA



The angle the servo can turn in the vertical direction. Min=90° Max=180°

LROB RUYA

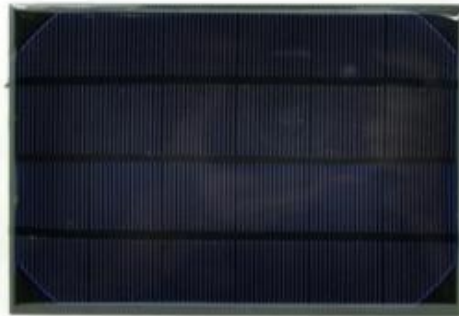




Lesson 5 Store Energy

Solar Panel:

Solar panels use the photoelectric effect to directly convert solar radiation into electrical energy. The photoelectric conversion efficiency of monocrystalline silicon solar panels is only about 15%, and the highest is 24%, which is the highest photoelectric conversion efficiency among all types of solar panels.



LROBRUYA

【Model】 : 6V 3W monocrystalline solar panel

【Maximum open circuit voltage】 : 7V

【Current】 : 0~400MA

【Size】 : 110*162*2mm

Note: Solar panels have high requirements on light intensity. The nominal power is the peak value under direct sunlight at noon. The sunlight in the morning and evening and the sunlight that is not strong cannot reach the nominal value. So if you want to store electricity faster, you should take advantage of the highest intensity sunlight at noon. The charging efficiency in the morning and afternoon will be very low.

14500 Mobile Power Shield

