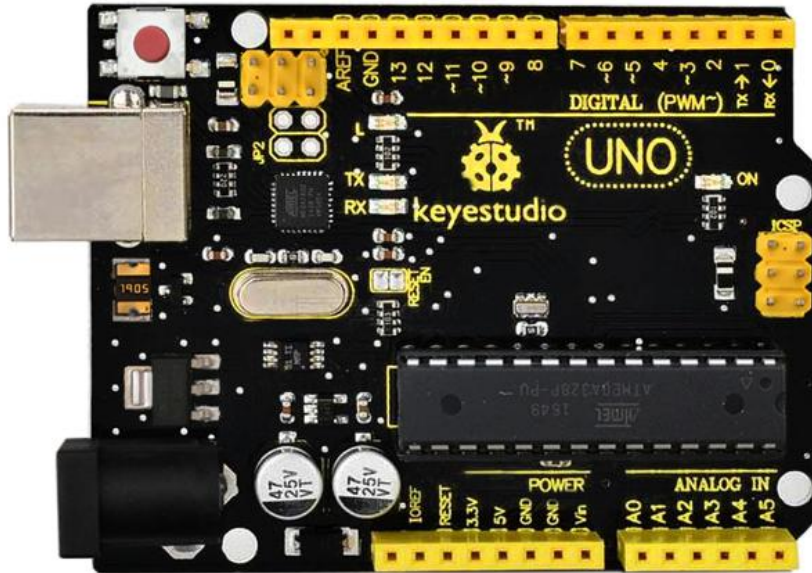# keyestudio

Keyestudio UNO R3 BOARD

Introduction:

Keyestudio UNO R3 development board is a microcontroller board based on the ATmega328P (datasheet), fully compatible with ARDUINO UNO REV3. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, 2 ICSP headers and a reset button.

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Note that the two ICSP headers separately used to program the firmware to ATMEGA16U2-MU and ATMEGA328P-PU, but we have programmed the two chips, so generally no need to use them.

The Uno R3 differs from all preceding boards in that it does not use the FTDI

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USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter.

The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with.

TECH SPECS:

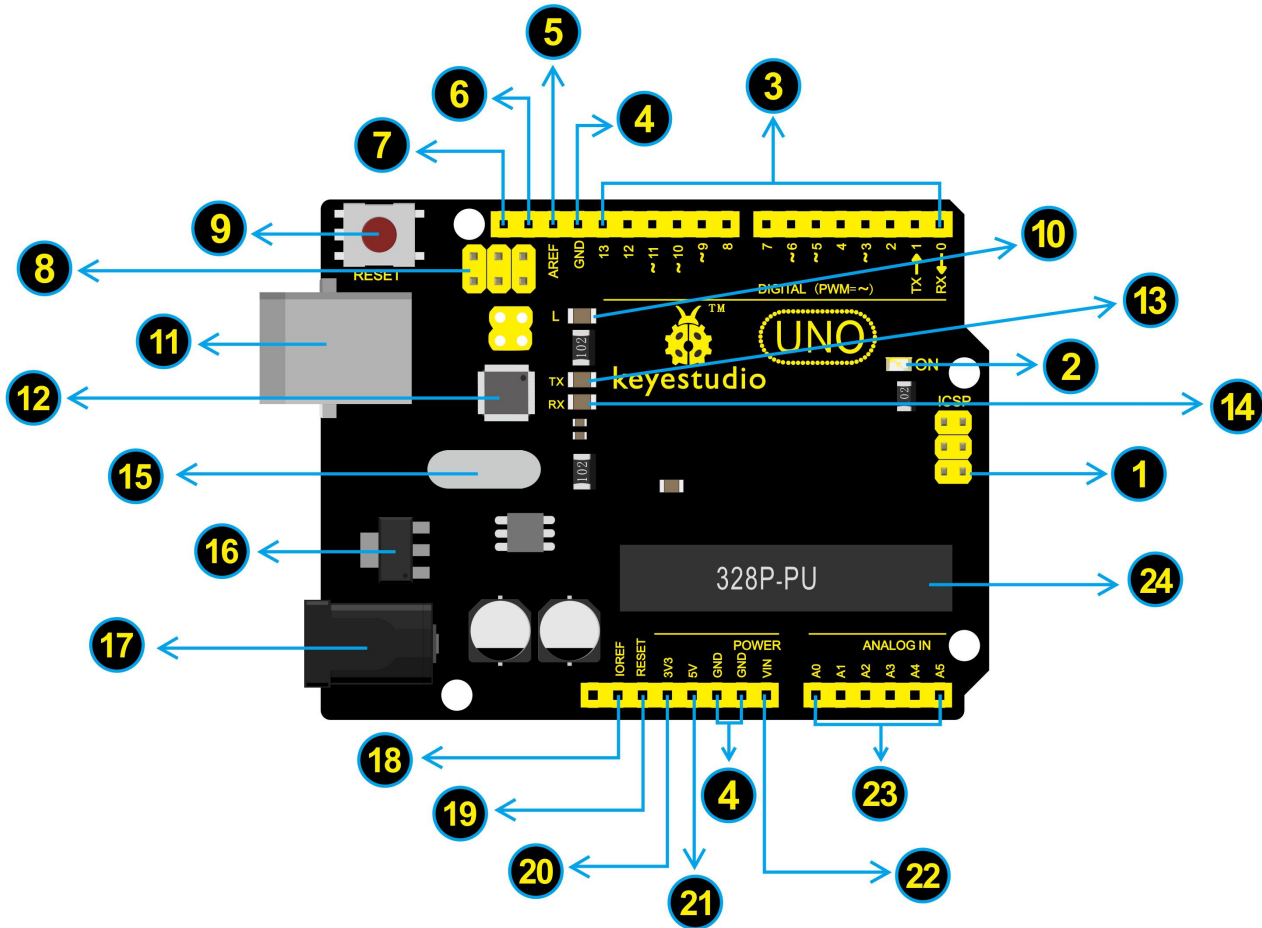|	
Microcontroller	ATmega328P-PU
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6 (D3, D5, D6, D9, D10, D11)
Analog Input Pins	6 (A0-A5)
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P-PU) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P-PU)
EEPROM	1 KB (ATmega328P-PU)
Clock Speed	16 MHz
LED_BUILTIN	D13

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Dimensions:
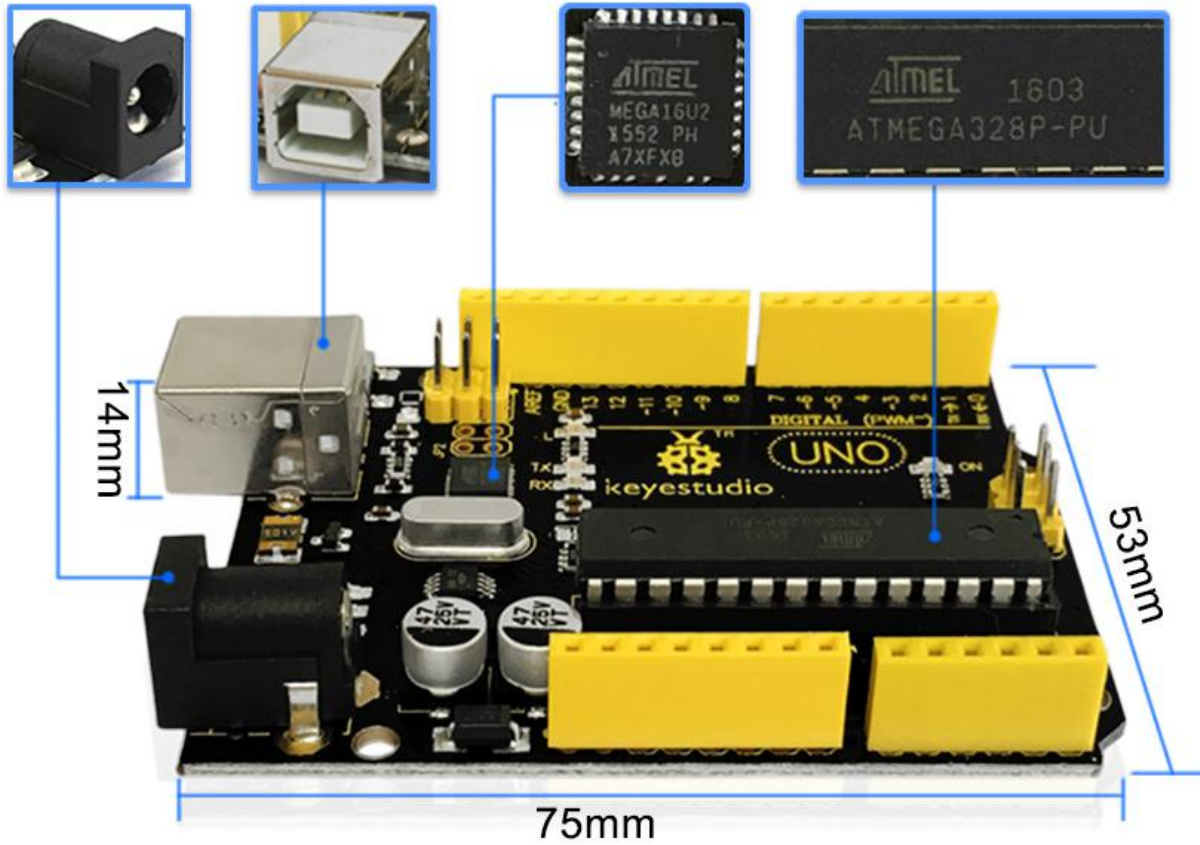
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Element and Interfaces:

Here is an explanation of what every element and interface of the board does:

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1	**ICSP (In-Circuit Serial Programming) Header** In most case, ICSP is the AVR，an Arduino micro-program header consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often called the SPI (serial peripheral interface) and can be considered an "extension" of the output. In fact, slave the output devices under the SPI bus host. When connecting to PC, program the firmware to ATMEGA328P-PU.
2	**Power LED Indicator** Powering the Arduino, LED on means that your circuit board is correctly powered on. If LED is off, connection is wrong.
3	**Digital I/O** Arduino UNO has 14 digital input/output pins (of which 6 can be used as PWM outputs). These pins can be configured as digital input pin to read the logic value (0 or 1). Or used as digital output pin to drive different modules like LED, relay, etc. The pin labeled "∼" can be used to generate PWM.
4	**GND (Ground pin headers)** Used for circuit ground
5	**AREF** Reference voltage (0-5V) for analog inputs. Used with analogReference().
6	**SDA** IIC communication pin
7	**SCL** IIC communication pin

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(8)	**ICSP (In-Circuit Serial Programming) Header** In most case, ICSP is the AVR, an Arduino micro-program header consisting of MOSI, MISO, SCK, RESET, VCC, and GND. Connected to ATMEGA 16U2-MU. When connecting to PC, program the firmware to ATMEGA 16U2-MU.
(9)	**RESET Button** You can reset your Arduino board, for example, start the program from the initial status. You can use the RESET button.
(10)	**D13 LED** There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
(11)	**USB Connection** Arduino board can be powered via USB connector. All you needed to do is connecting the USB port to PC using a USB cable.
(12)	**ATMEGA 16U2-MU** USB to serial chip, can convert the USB signal into serial port signal.
(13)	**TX LED** Onboard you can find the label: TX (transmit) When Arduino board communicates via serial port, send the message, TX led flashes.
(14)	**RX LED** Onboard you can find the label: RX(receive) When Arduino board communicates via serial port, receive the message, RX led flashes.

15	**Crystal Oscillator** Helping Arduino deal with time problems. How does Arduino calculate time? by using a crystal oscillator. The number printed on the top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16MHz.
16	**Voltage Regulator** To control the voltage provided to the Arduino board, as well as to stabilize the DC voltage used by the processor and other components. Convert an external input DC7-12V voltage into DC 5V, then switch DC 5V to the processor and other components.
17	**DC Power Jack** Arduino board can be supplied with an external power DC7-12V from the DC power jack.
18	**IOREF** Used to configure the operating voltage of microcontrollers. Use it less.
19	**RESET Header** Connect an external button to reset the board. The function is the same as reset button (labeled 9)
20	**Power Pin 3V3** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
21	**Power Pin 5V** Provides 5V output voltage

22	**Vin** You can supply an external power input DC7-12V through this pin to Arduino board.
23	**Analog Pins** Arduino UNO board has 6 analog inputs, labeled A0 through A5. These pins can read the signal from analog sensors (such as humidity sensor or temperature sensor), and convert it into the digital value that can read by microcontrollers) Can also used as digital pins, A0=D14, A1=D15, A2=D16, A3=D17, A4=D18, A5=D19.
24	**Microcontroller** Each Arduino board has its own microcontroller. You can regard it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from the panel pair. Microcontrollers are usually from ATMEL. Before you load a new program on the Arduino IDE, you must know what IC is on your board. This information can be checked at the top of IC.

Specialized Functions of Some Pins:

- **Serial communication:** Digital pins 0 (RX) and 1 (TX).
- **PWM Interfaces (Pulse-Width Modulation):** D3, D5, D6, D9, D10, D11
- **External Interrupts:** D2 (interrupt 0) and D3 (interrupt 1). These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **SPI communication:** D10 (SS), D11 (MOSI), D12 (MISO), D13 (SCK). These pins support SPI communication using the SPI library.
- **IIC communication:** A4 (SDA); A5(SCL)

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Warnings:

- The Arduino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

- Automatic (Software) Reset:
  Rather than requiring a physical press of the reset button before an upload, the Arduino Uno board is designed in a way that allows it to be reset by software running on a connected computer.

- The Uno board contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

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Detailed Use with ARDUINO Software as follows:

Step1 | Download the Arduino environment (IDE)

When you get the UNO development board, first you should install the Arduino software and driver.

We usually use the Windows software Arduino 1.5.6 version. You can download it from the link below:

https://www.arduino.cc/en/Main/OldSoftwareReleases#1.5.x

Or you can browse the ARDUINO website to download the latest version from this link, https://www.arduino.cc, pop up the following interface.
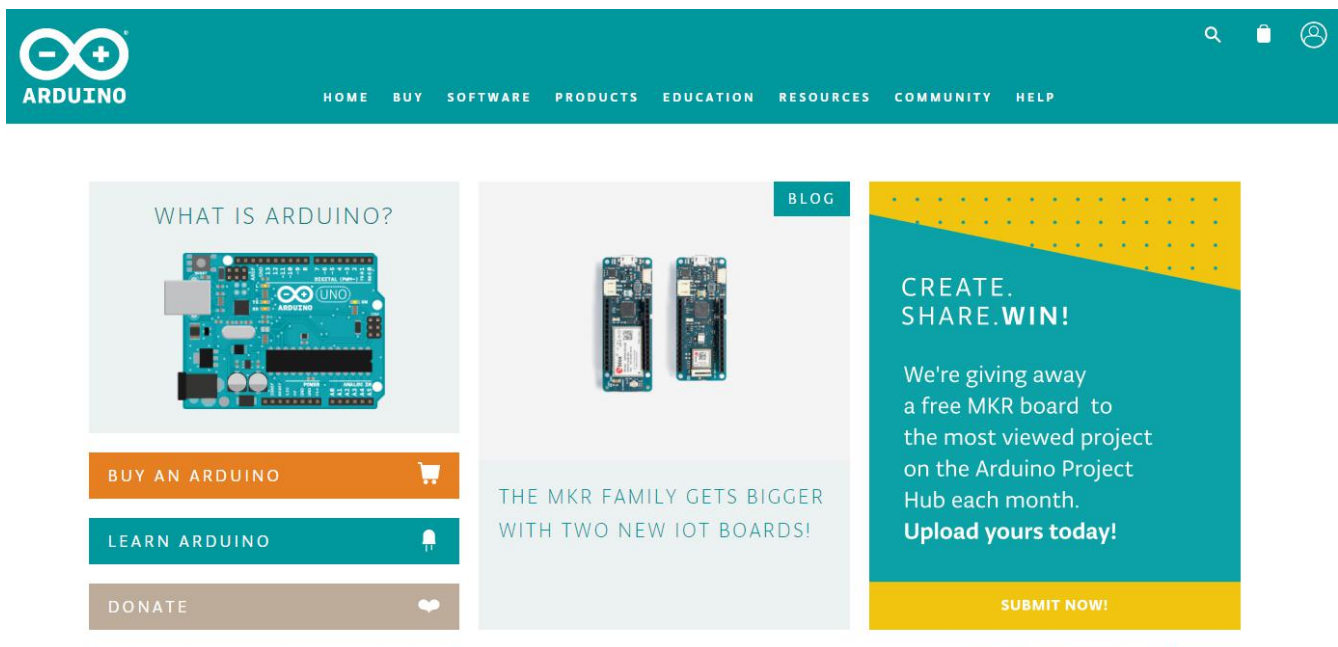
Then click the **SOFTWARE** on the browse bar, you will have two options ONLINE TOOLS and DOWNLOADS.

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Click **DOWNLOADS**, it will appear the latest software version of ARDUINO 1.8.5 shown as below.

In this software page, on the right side you can see the version of development software for different operating systems. ARDUINO has a powerful compatibility. You should download the software that is compatible with the operating system of your computer.

We will take **WINDOWS system** as an example here. There are also two options

under Windows system, one is installed version, the other is non-installed version. For simple installed version, first click **Windows Installer**, you will get the following page.

Contribute to the Arduino Software

Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). Learn more on how your contribution will be used.

SINCE MARCH 2015, THE ARDUINO IDE HAS BEEN DOWNLOADED 24,353,248 TIMES. (IMPRESSIVE!) NO LONGER JUST FOR ARDUINO AND GENUINO BOARDS, HUNDREDS OF COMPANIES AROUND THE WORLD ARE USING THE IDE TO PROGRAM THEIR DEVICES, INCLUDING COMPATIBLES, CLONES, AND EVEN COUNTERFEITS. HELP ACCELERATE ITS DEVELOPMENT WITH A SMALL CONTRIBUTION! REMEMBER: OPEN SOURCE IS LOVE!

$3 $5 $10 $25 $50   OTHER

JUST DOWNLOAD   **CONTRIBUTE & DOWNLOAD**

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This way you just need to click JUST DOWNLOAD, then click the downloaded file to install it.

For non-installed version, first click Windows ZIP file, you will also get the pop-up interface as the above figure.

Click JUST DOWNLOAD, and when the ZIP file is downloaded well to your computer, you can directly unzip the file and click the icon of ARDUINO software to start it.

Installing Arduino (Windows):

Install Arduino with the exe. Installation package downloaded well.

Click "*I Agree*" to see the following interface.

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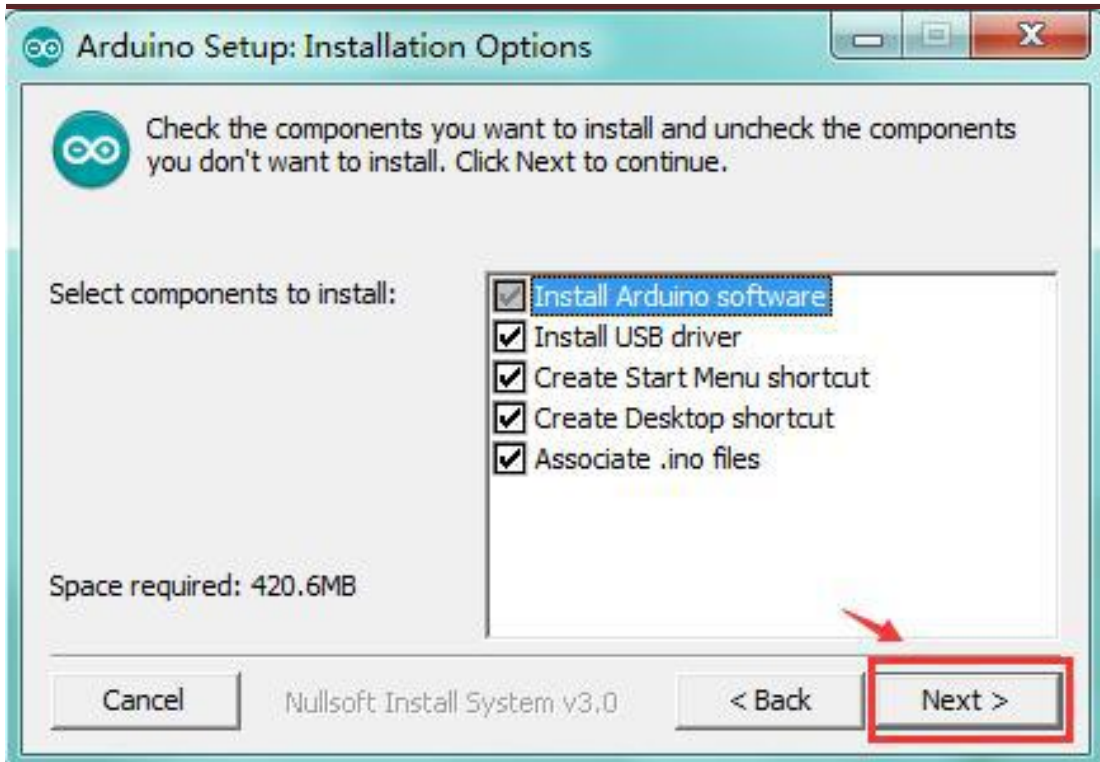
Click "*Next*". Pop up the interface below.
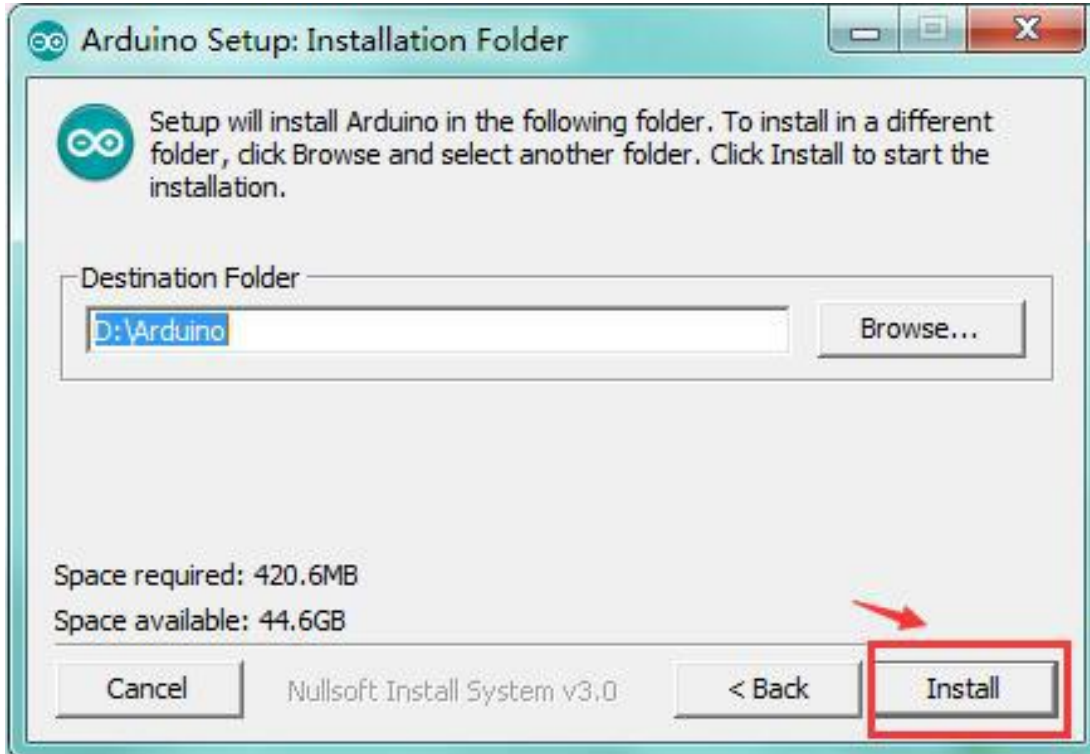
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You can press Browse… to choose an installation path or directly type in the directory you want. Then click "Install" to initiate installation.
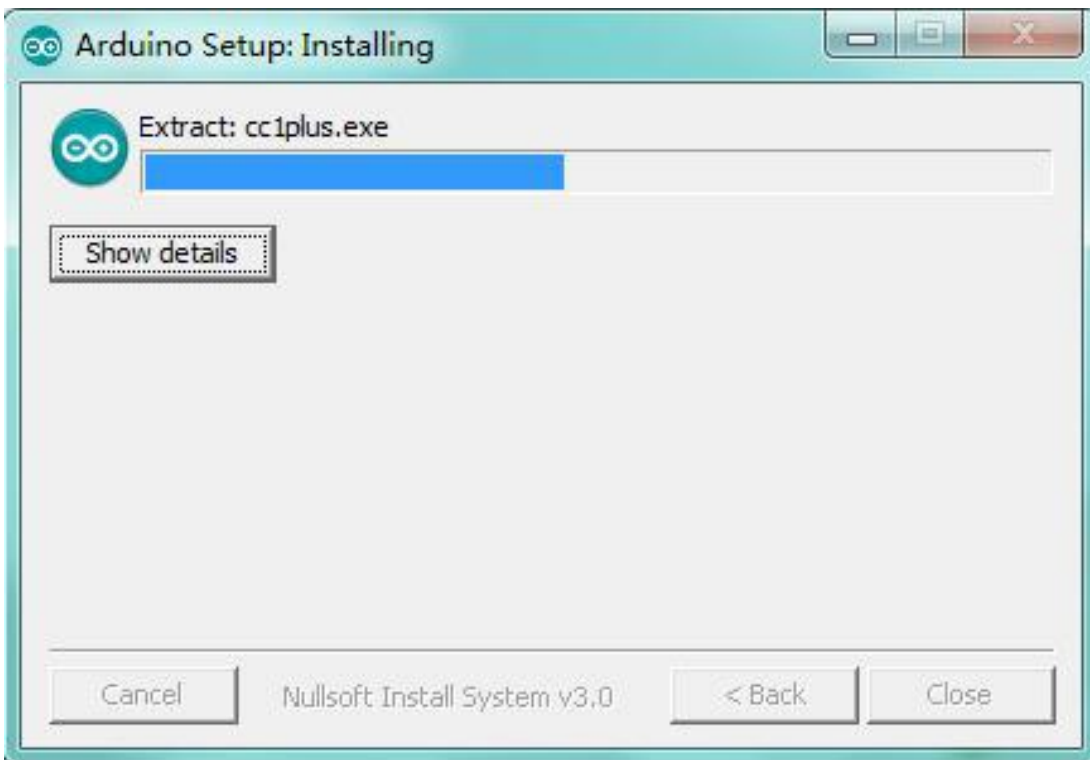
Wait for the installing process, if appear the interface of Window Security, just continue to click Install to finish the installation.
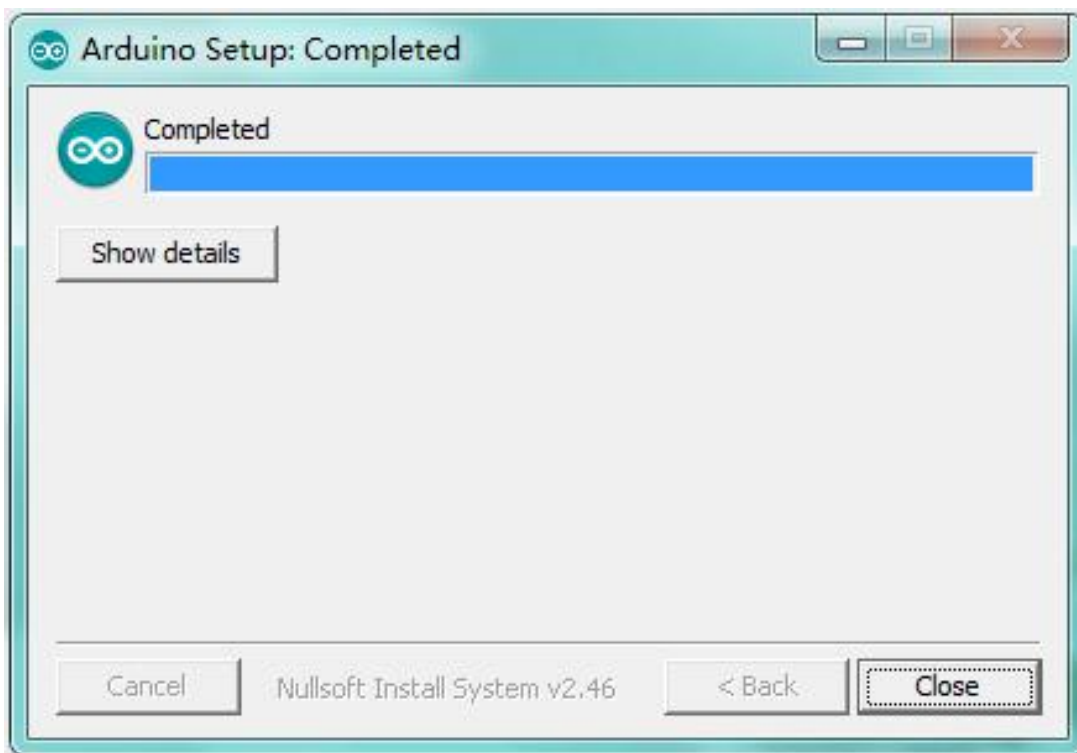
Installing Driver:

Next, we will introduce the driver installation of UNO R3 development board. The driver installation may have slight differences in different computer systems. So in the following let's move on to the driver installation in the WIN 7 system.

The Arduino folder contains both the Arduino program itself and the drivers that allow the Arduino to be connected to your computer by a USB cable. Before we launch the Arduino software, you are going to install the USB drivers.
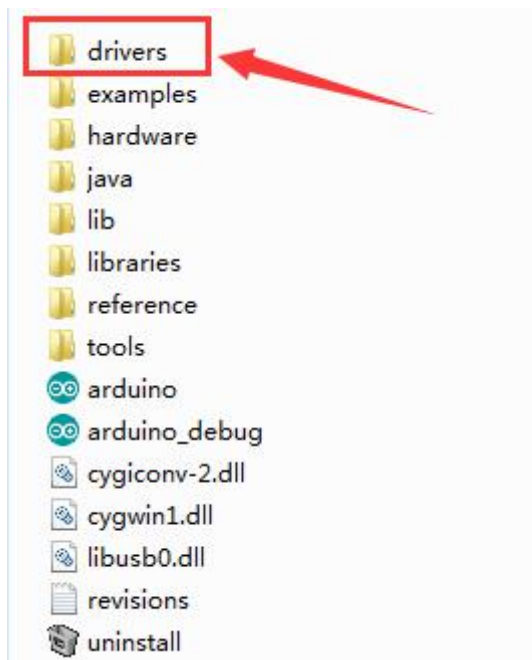
Plug one end of your USB cable into the Arduino and the other into a USB socket on your computer.

When you connect UNO board to your computer at the first time, right click the icon of your *"Computer" —>for "Properties"—> click the "Device manager"*, under "Other Devices", you should see an icon for "Unknown device" with a little yellow warning triangle next to it. This is your Arduino.

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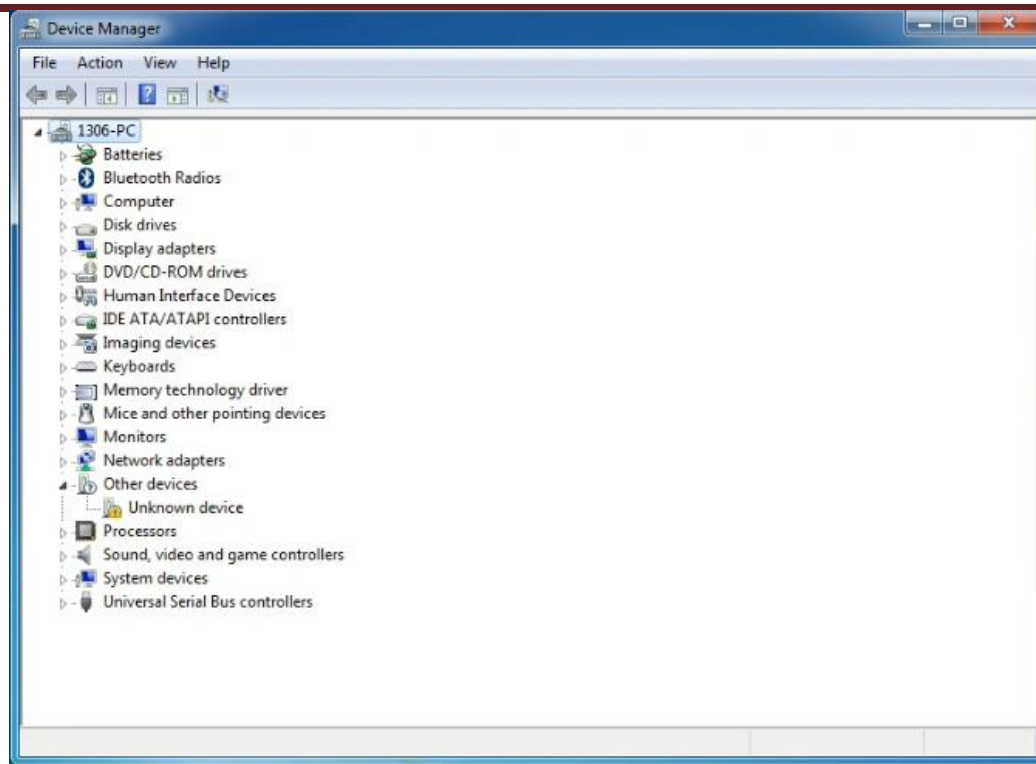
Then right-click on the device and select the top menu option (Update Driver Software...) shown as the figure below.
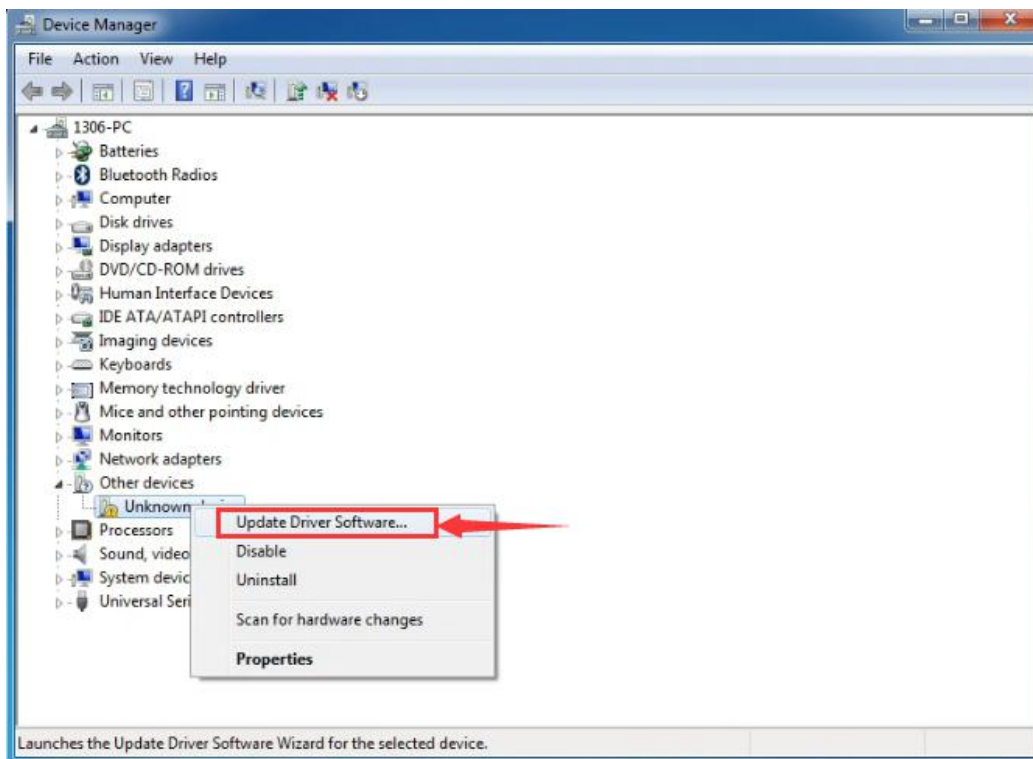
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It will then be prompted to either "Search Automatically for updated driver software" or "Browse my computer for driver software". Shown as below. In this page, select "Browse my computer for driver software".
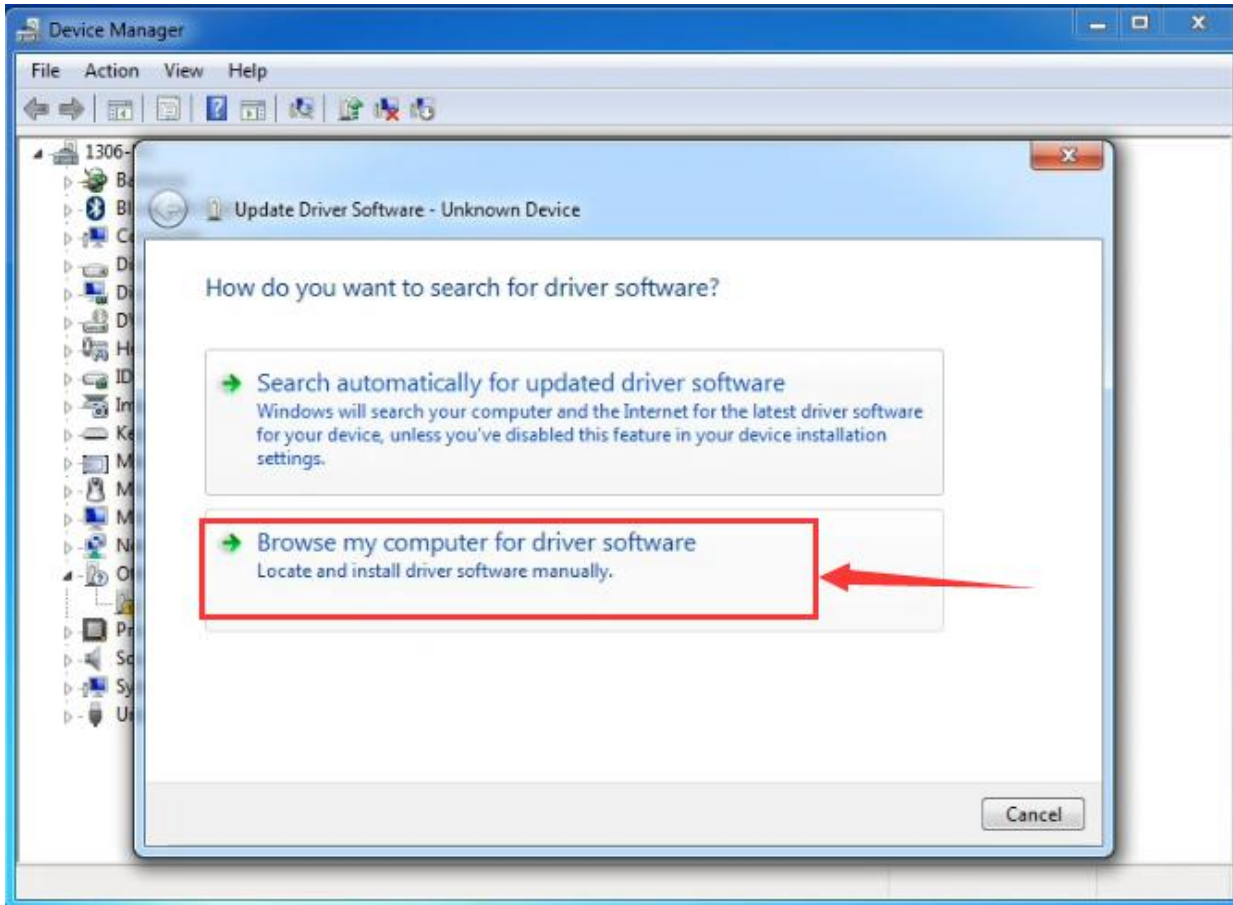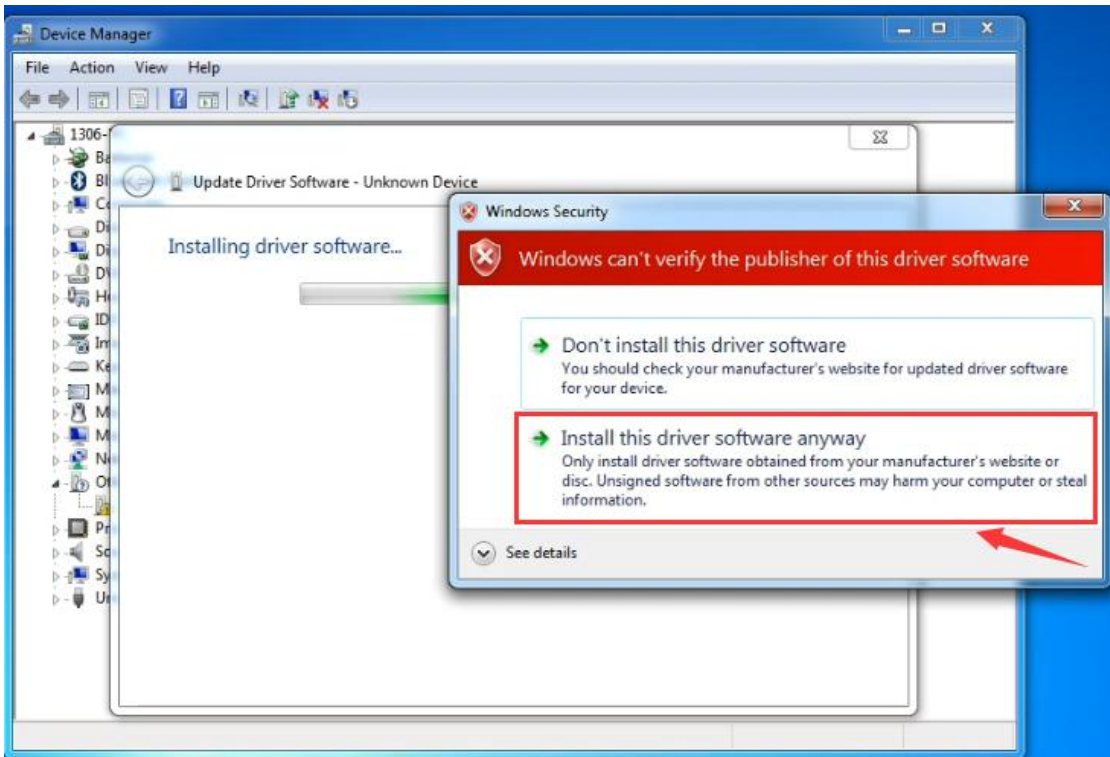

After that, select the option to browse and navigate to the "drivers" folder of Arduino installation.
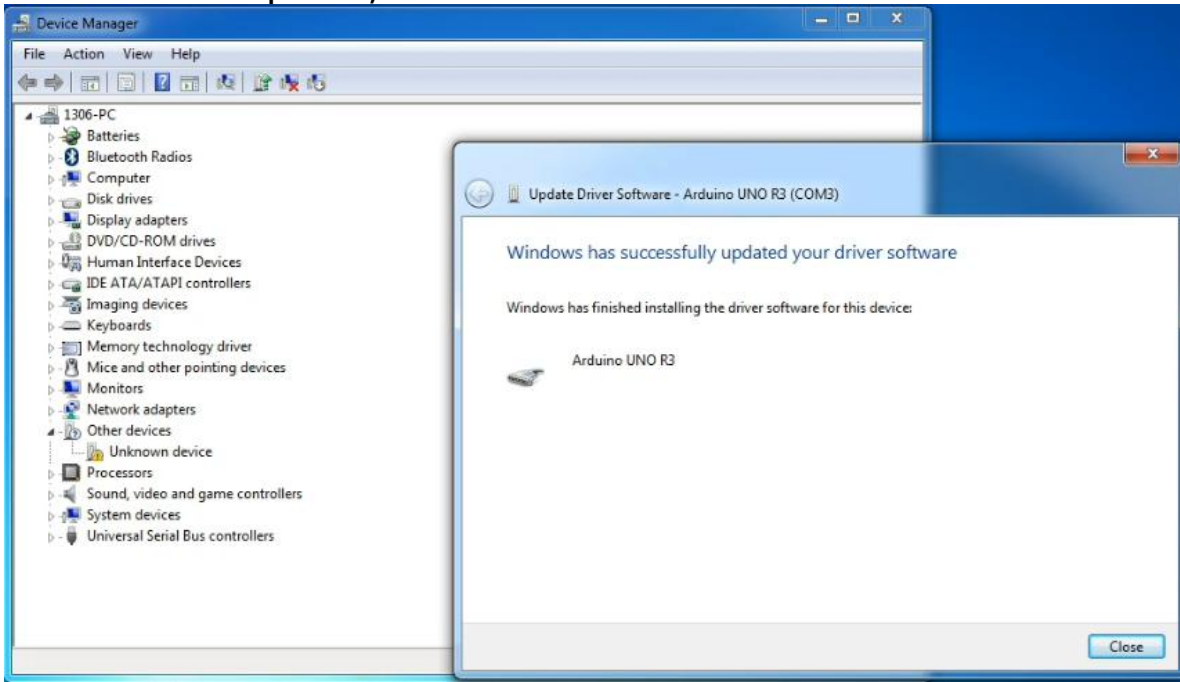
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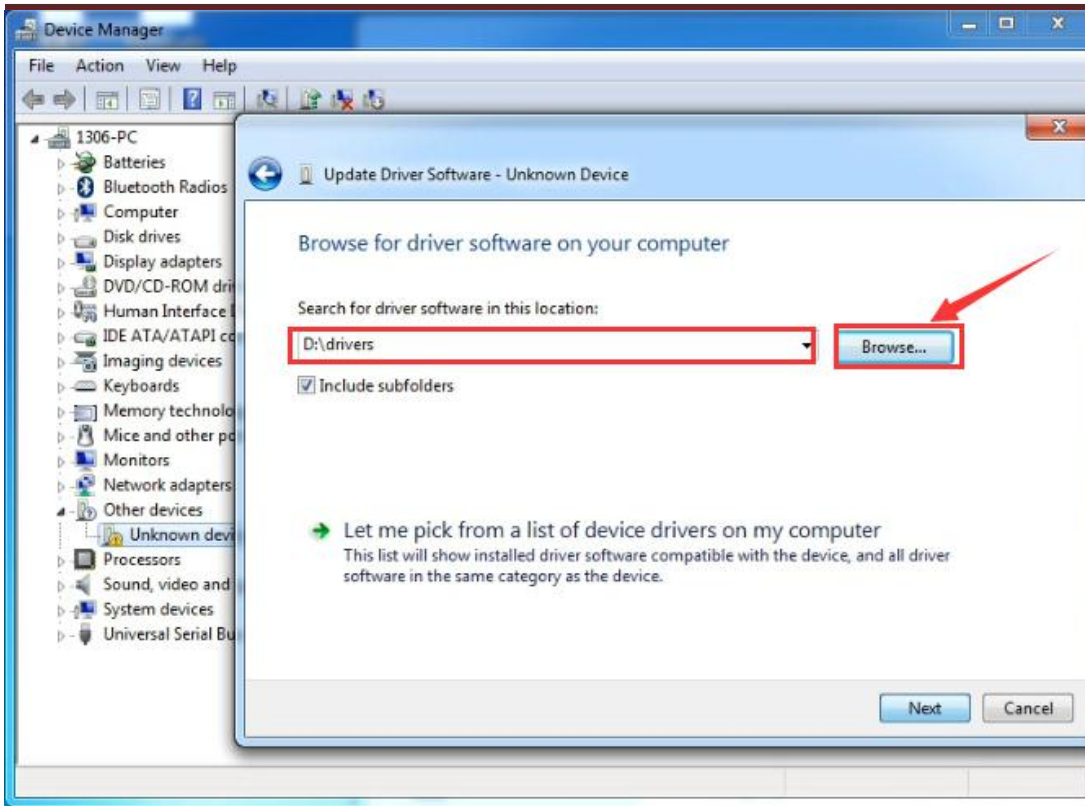
Click "Next" and you may get a security warning, if so, allow the software to be installed. Shown as below.

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Installation completed, click "Close".

Up to now, the driver is installed well. Then you can right click *"Computer"* —>*"Properties"*—>*"Device manager"*, you should see the device shown below.
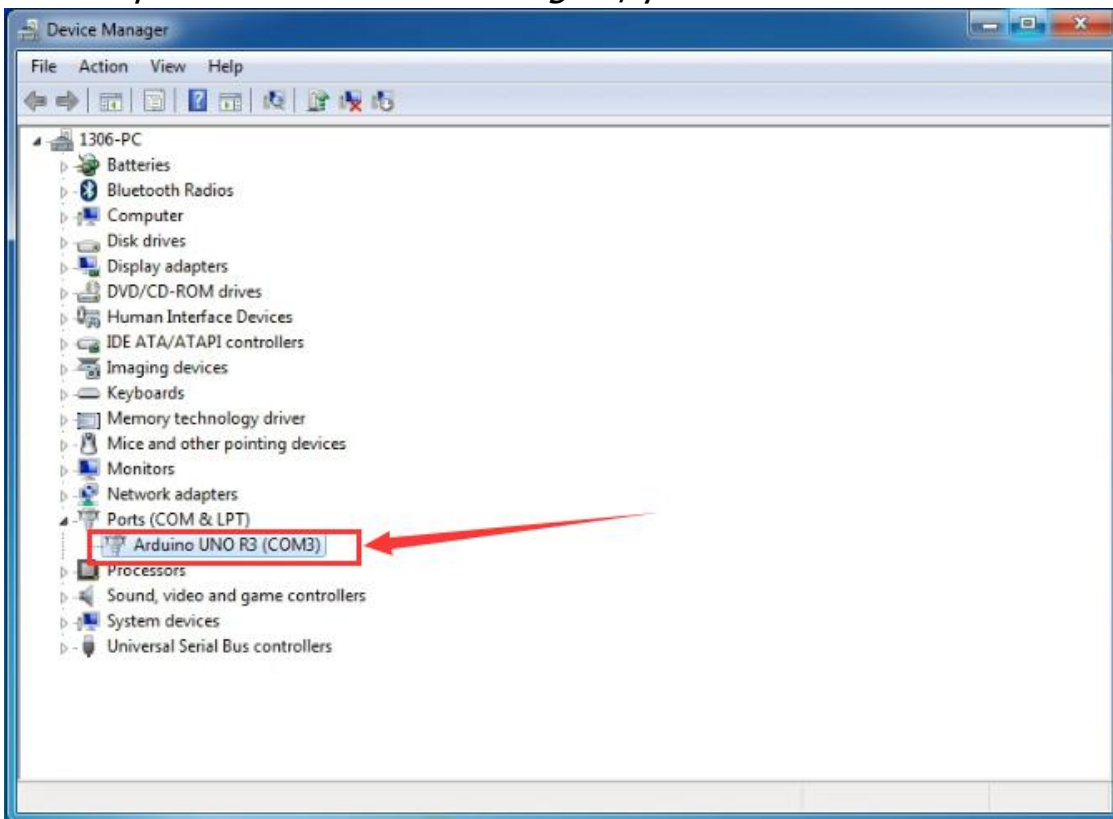
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Introduction for Arduino IDE Toolbar:

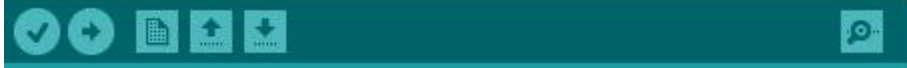Double-click the icon of Arduino software downloaded well, you will get the interface shown below.

(Note: if the Arduino software loads in the wrong language, you can change it in the preferences dialog. See the environment page for details.)
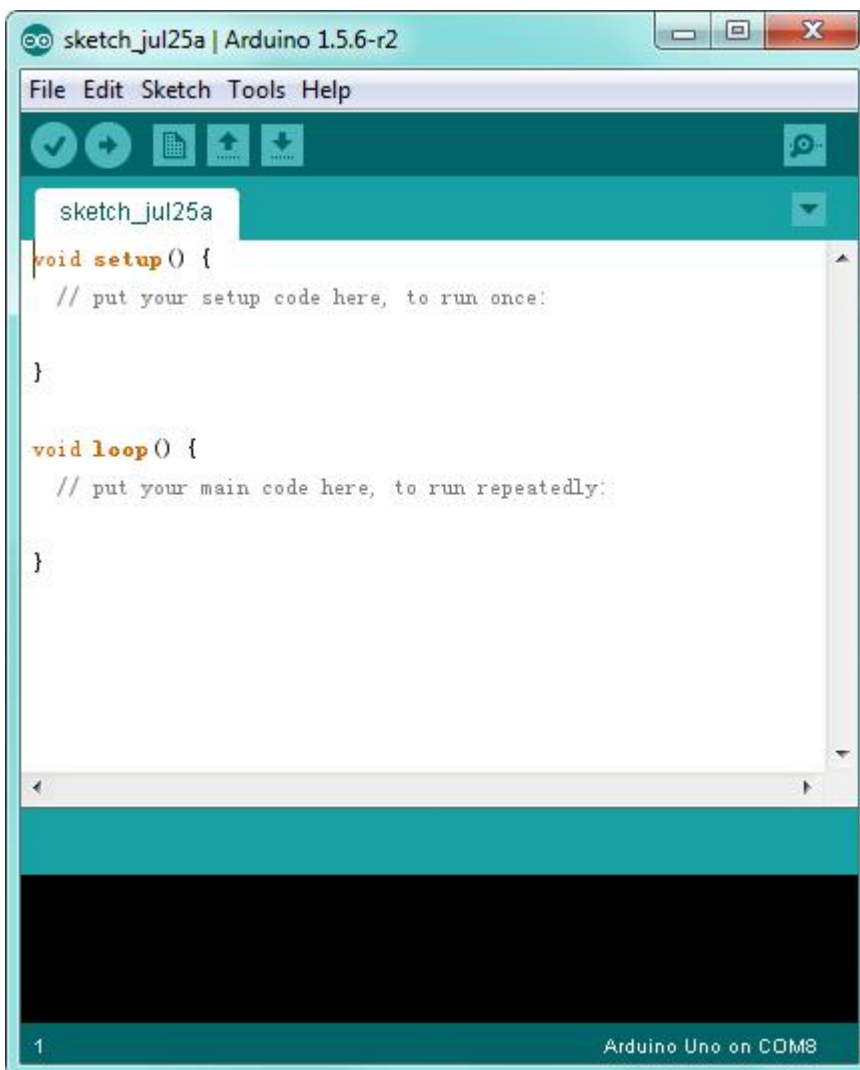
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The functions of each button on the Toolbar are listed below:

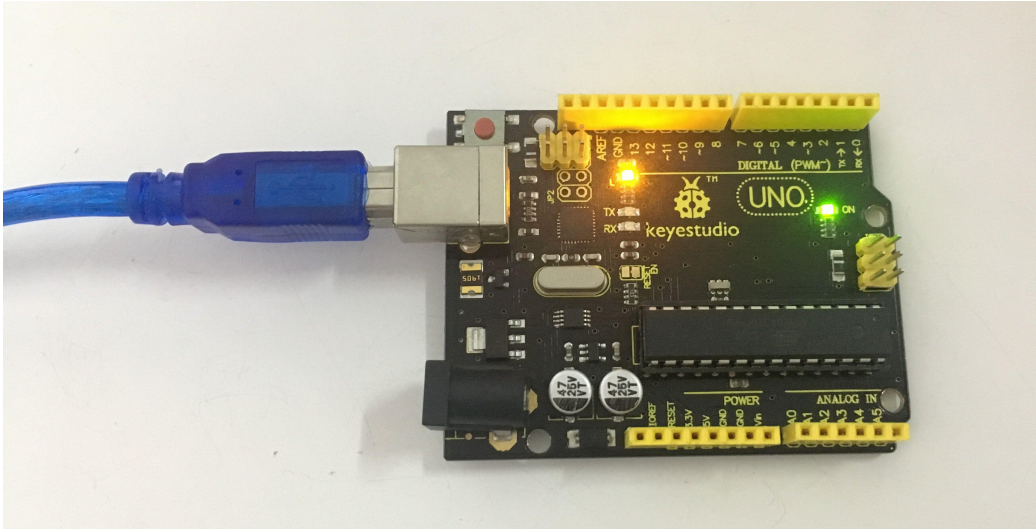|	
Verify/Compile	Check the code for errors
Upload	Upload the current Sketch to the Arduino
New	Create a new blank Sketch
Open	Show a list of Sketches
Save	Save the current Sketch
Serial Monitor	Display the serial data being sent from the Arduino

Step2| Connect the board

Connect the UNO board to your computer using the USB cable. The green power LED should go on.

Step3| Select the Arduino Board

Open the Arduino IDE, you'll need to click the "Tools", then select the Board that corresponds to your Arduino.
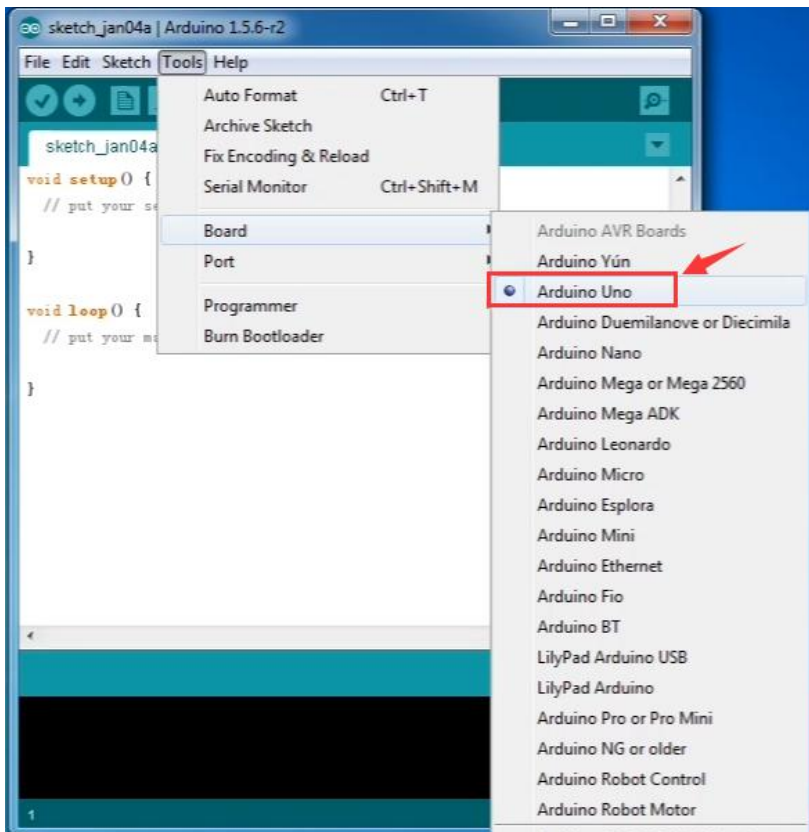
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Step4| Select your serial port

Select the serial device of the Arduino board from the **Tools | Serial Port menu**. This is likely to be COM3 or higher (COM1and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu; the entry that disappears should be the Arduino board. Reconnect the board and select that serial port.
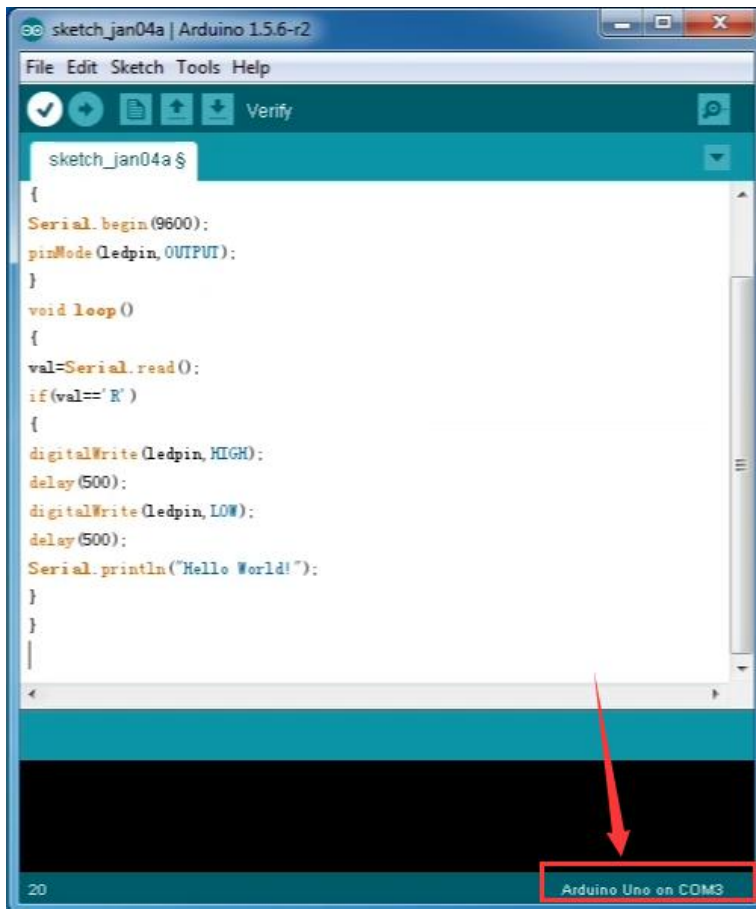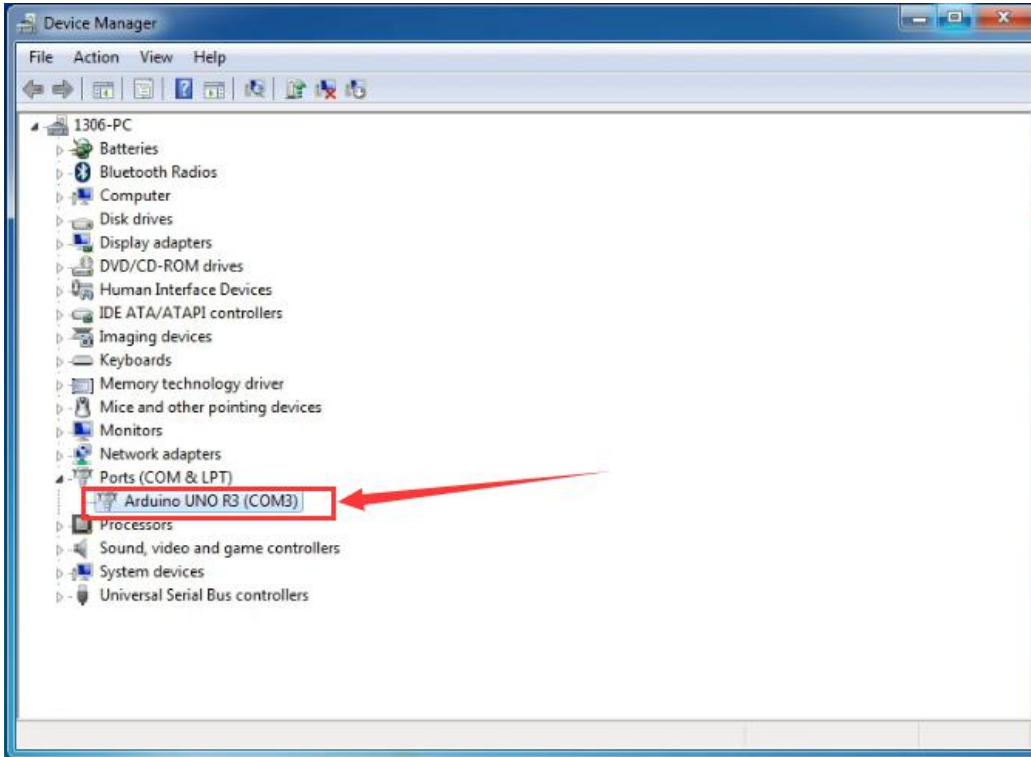
Here you should select COM 3 as below.
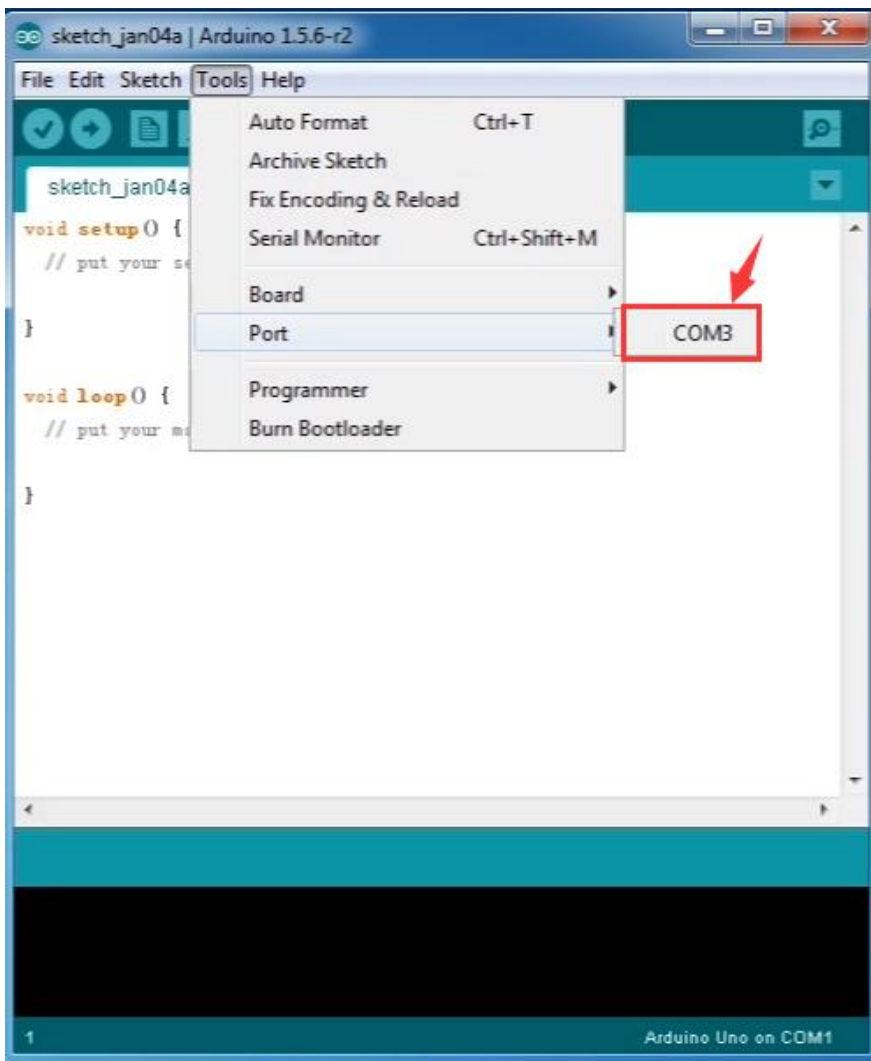
Note: to avoid errors, the COM Port should keep the same as the Ports shown on Device Manager.

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Step5|Upload the Program

Below is an example program for displaying the Hello World!
Copy and paste the code to the Arduino environment IDE.

```
/////////////////////////////////////////////////////////////////////////////////////
int val;
int ledpin=13;
void setup()
{
Serial.begin(9600);
pinMode(ledpin,OUTPUT);
}
void loop()
{
val=Serial.read();
if(val=='R')
{
digitalWrite(ledpin,HIGH);
delay(500);
digitalWrite(ledpin,LOW);
delay(500);
Serial.println("Hello World!");
}
}
/////////////////////////////////////////////////////////////////////////////////////
```

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Then click verify button to check the errors. If compiling successfully, the message "Done compiling." will appear in the status bar.
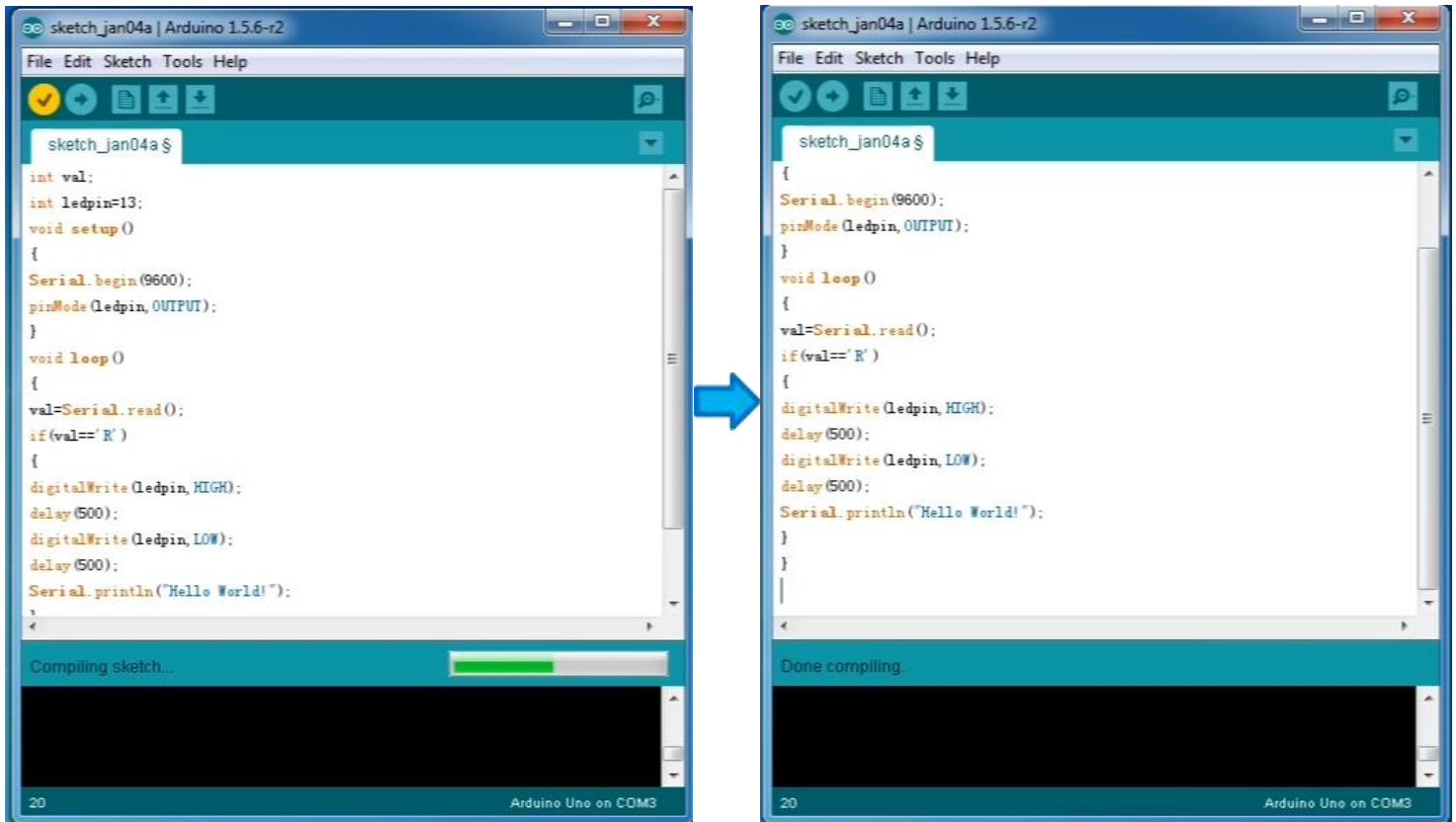
After that, click the "Upload" button to upload the code. Wait a few seconds - you should see the RX and TX leds on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar. (Note: If you have an Arduino Mini, NG, or other board, you'll need to physically present the reset button on the board immediately before pressing the upload button.)
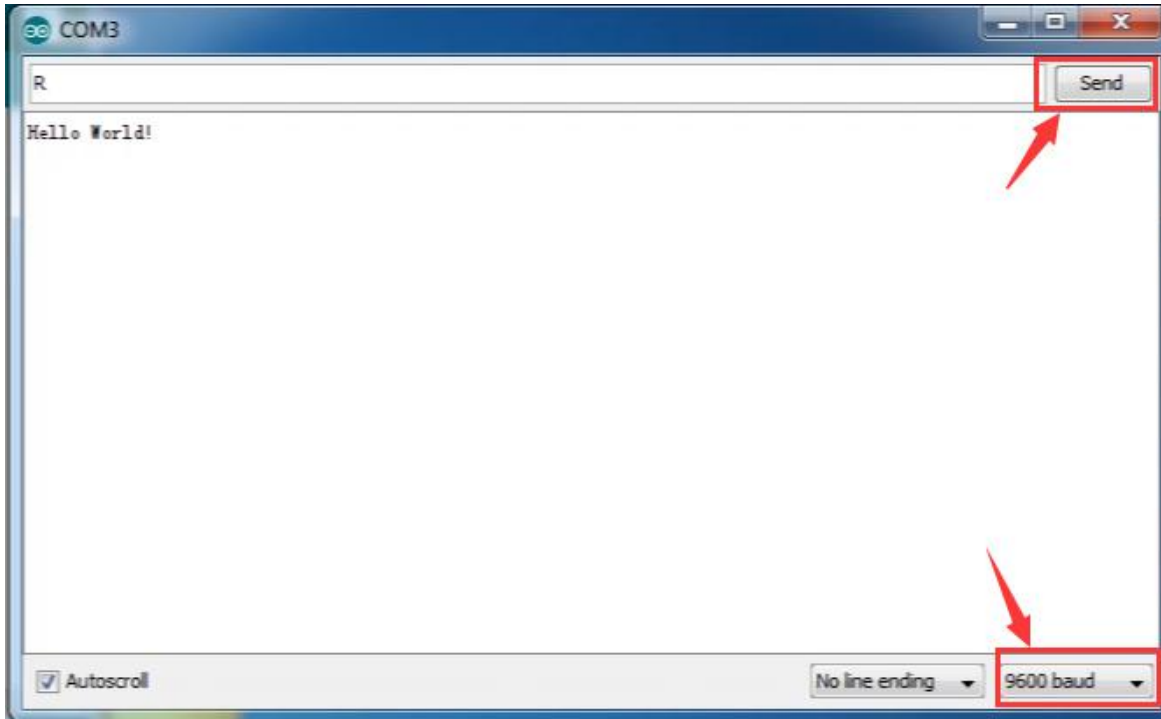
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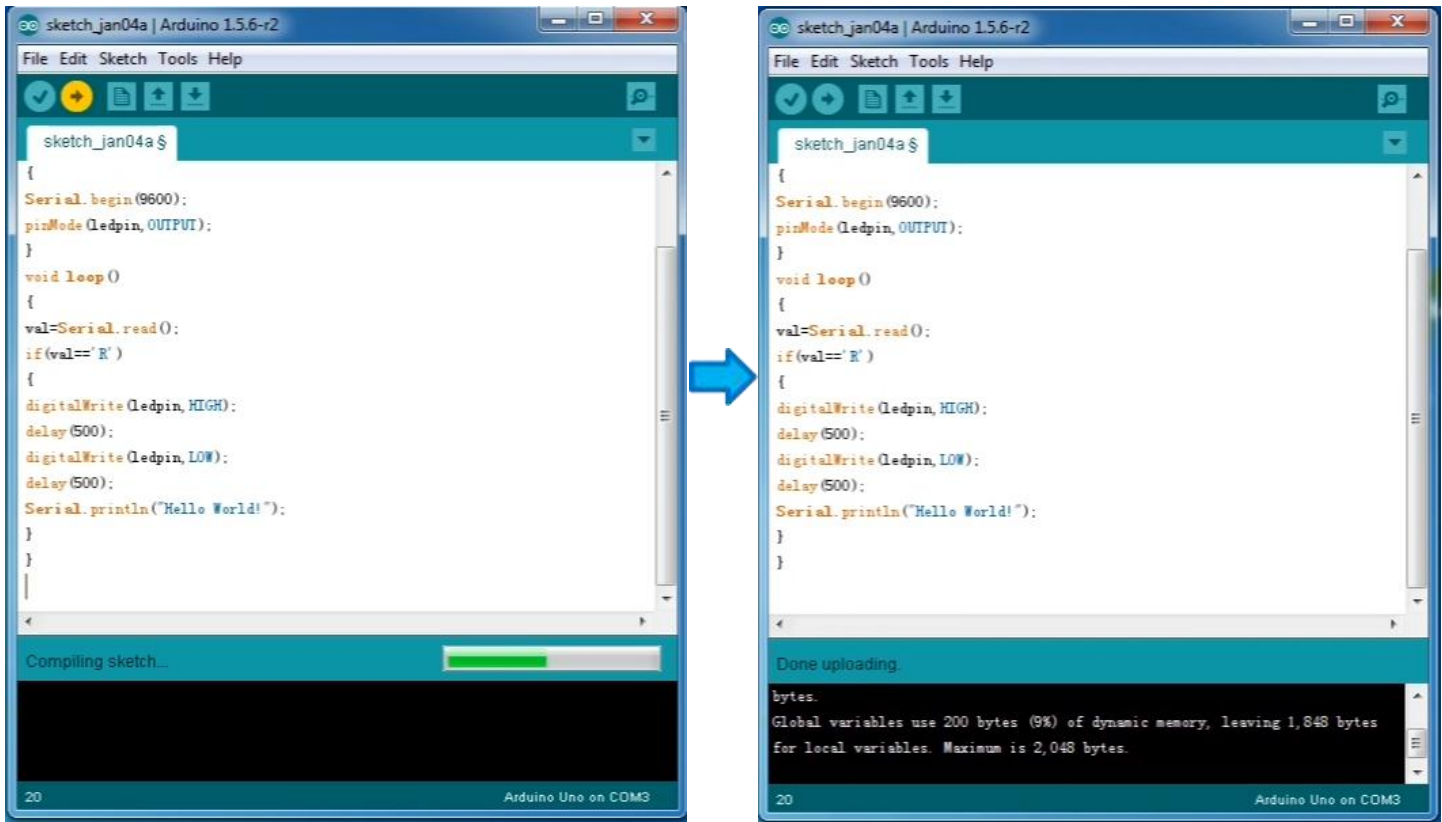
Step6|Open the Serial Monitor

After that, click the serial monitor button to open the serial monitor.

Then set the baud rate as 9600, enter an "R" and click Send, you should see the RX led on the board blink once, and then D13 led blink once, finally "Hello World!" is showed on the monitor, the TX led blink once.

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Other Links:

You might also want to look at:

the examples for using various sensors and actuators;

the reference for the Arduino language;

The text of the Arduino getting started guide is licensed under a Creative Commons Attribution-ShareAlike 3.0 License. Code samples in the guide are released into the public domain.

You can download the datasheet from the link:

https://drive.google.com/open?id=1PQnMRVBaPwLdfzw_7T3OlLhOyEP0rY_S

Software Download:

https://drive.google.com/open?id=12D-JkXdNm03Qt4dlPQr3RP6OmgXqpvHc

Troubleshooting:

If you have problems, please see the troubleshooting suggestions.