

## Uno IO expansion board ---- Ultrasonic module

### 1. About Hardware

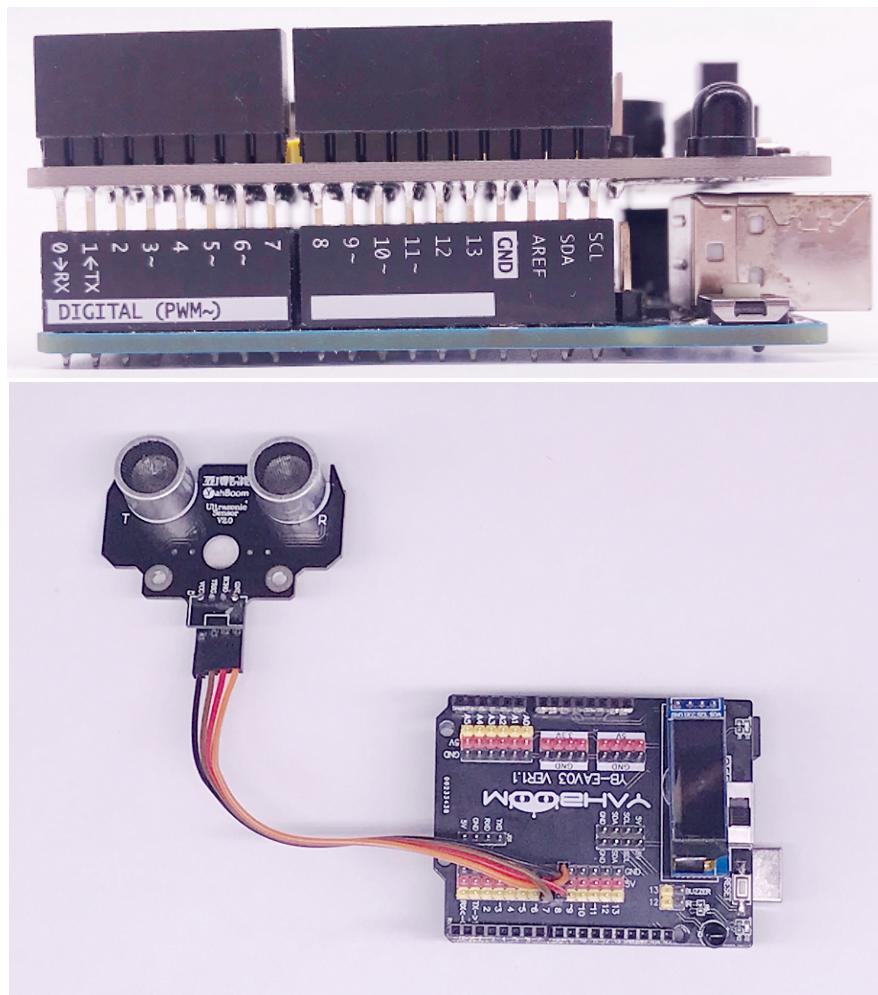
In this experiment, we will learn how to use ultrasonic module. First, we need to plug the UNO IO expansion board into the UNO board. Then, plug the OLED into the dedicated interface of the expansion board.

**VCC pin is connected to 5V.**

**Echo pin is connected to pin 8.**

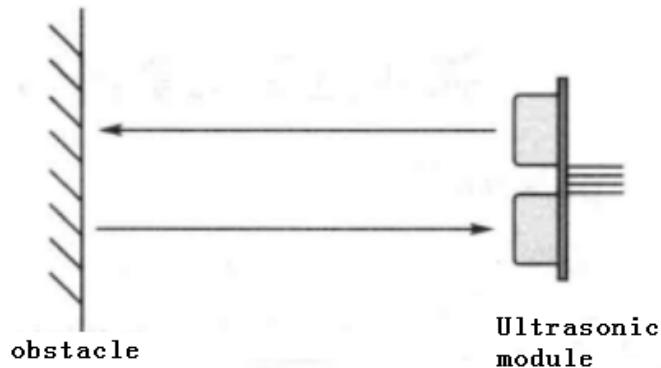
**Trig pin is connected to pin 7.**

**GND pin is connected to GND.**

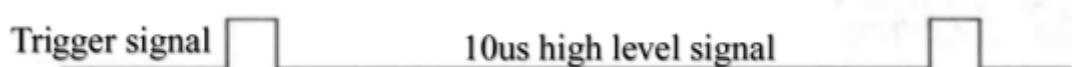


### 2. Principle of ultrasonic module

The ultrasonic module is a sensor that uses ultrasonic characteristics to detect the distance. It has two ultrasonic probes for transmitting and receiving ultrasonic waves. The range of measurement is 3-450 cm.



- (1) You need to input a high level signal of at least 10us to the Trig pin to trigger the ranging function of the ultrasonic module.



- (2) After the ranging function is triggered, the module will automatically send out 8 ultrasonic pulses with 40 kHz and automatically detect whether there is a signal return. This step is done internally by the module.



- (3) When the module detects an echo signal, the ECHO pin will output a high level. The high level duration is the time from when the ultrasonic wave is sent to when it returns. You can calculate the distance by using the time function to calculate the high level duration.

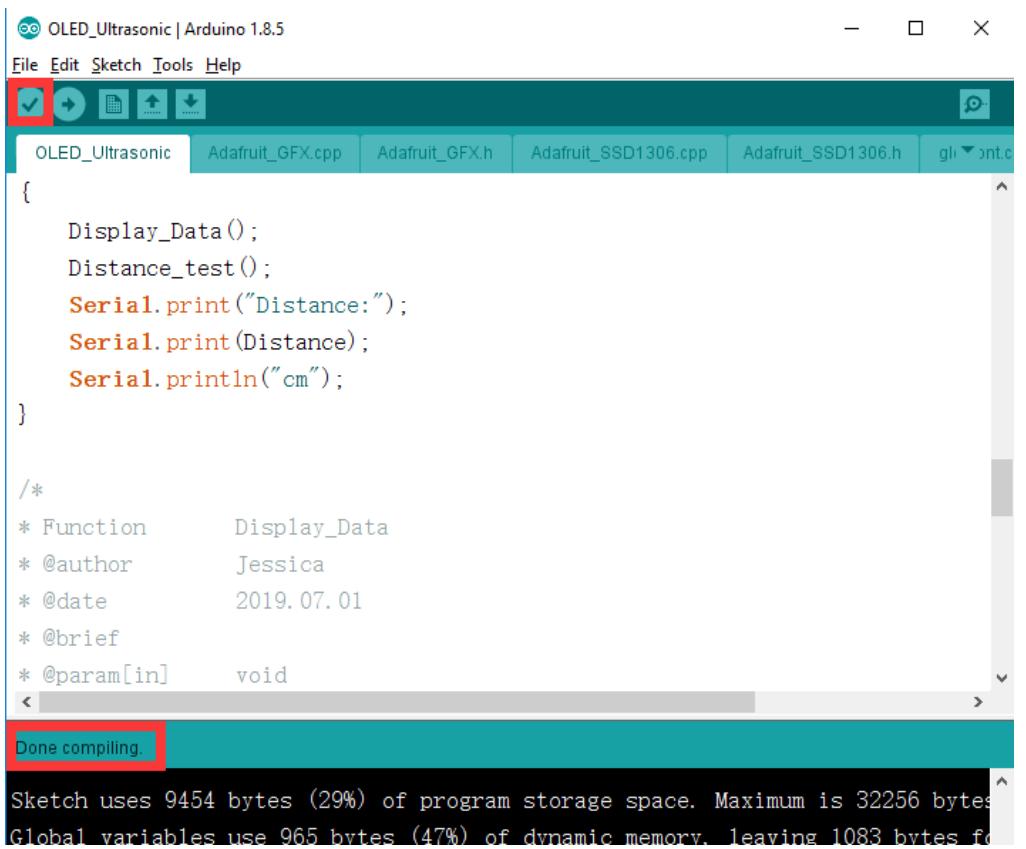
**Formula: Distance = High level duration \* Speed of sound(340M/S)/2.**

### 3. About code

For the code of this course, please refer to OLED\_Ultrasonic folder.

### 4. Compiling and downloading code

4.1 We need to open the **OLED\_Ultrasonic.ino** file by Arduino IDE software. Then click “√” under the menu bar to compile the code, and wait for the word “Done compiling ” in the lower right corner, as shown below.



```

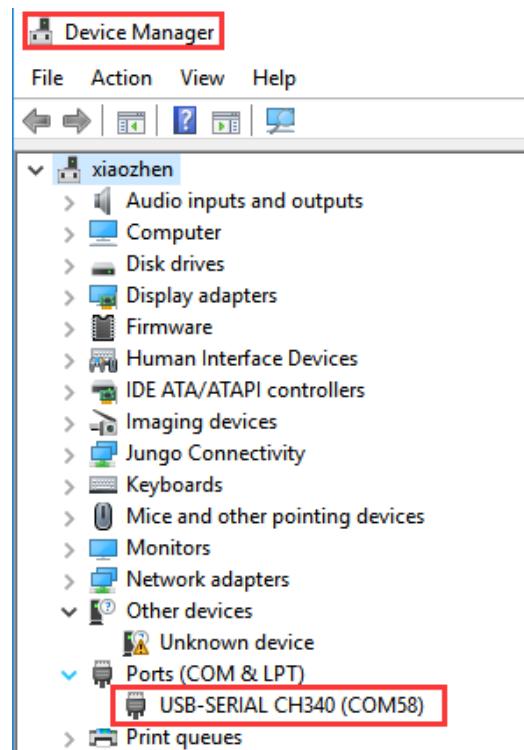
OLED_Ultrasonic | Arduino 1.8.5
File Edit Sketch Tools Help
OLED_Ultrasonic Adafruit_GFX.cpp Adafruit_GFX.h Adafruit_SSD1306.cpp Adafruit_SSD1306.h glint.c
{
    Display_Data();
    Distance_test();
    Serial.print("Distance:");
    Serial.print(Distance);
    Serial.println("cm");
}

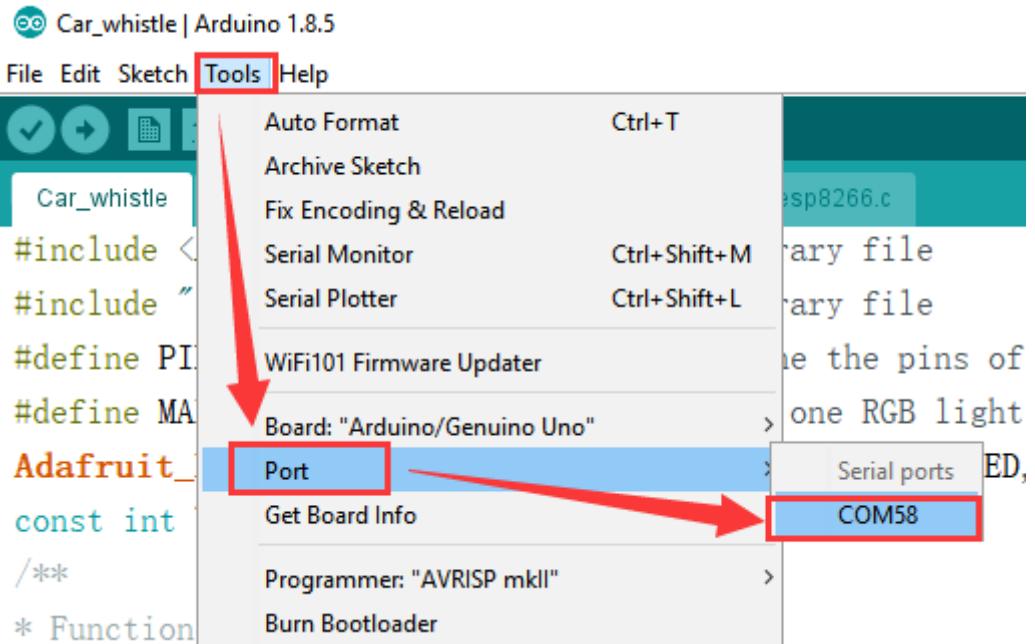
/*
 * Function      Display_Data
 * @author       Jessica
 * @date         2019. 07. 01
 * @brief
 * @param[in]     void
 */
Done compiling.

Sketch uses 9454 bytes (29%) of program storage space. Maximum is 32256 bytes
Global variables use 965 bytes (47%) of dynamic memory, leaving 1083 bytes for

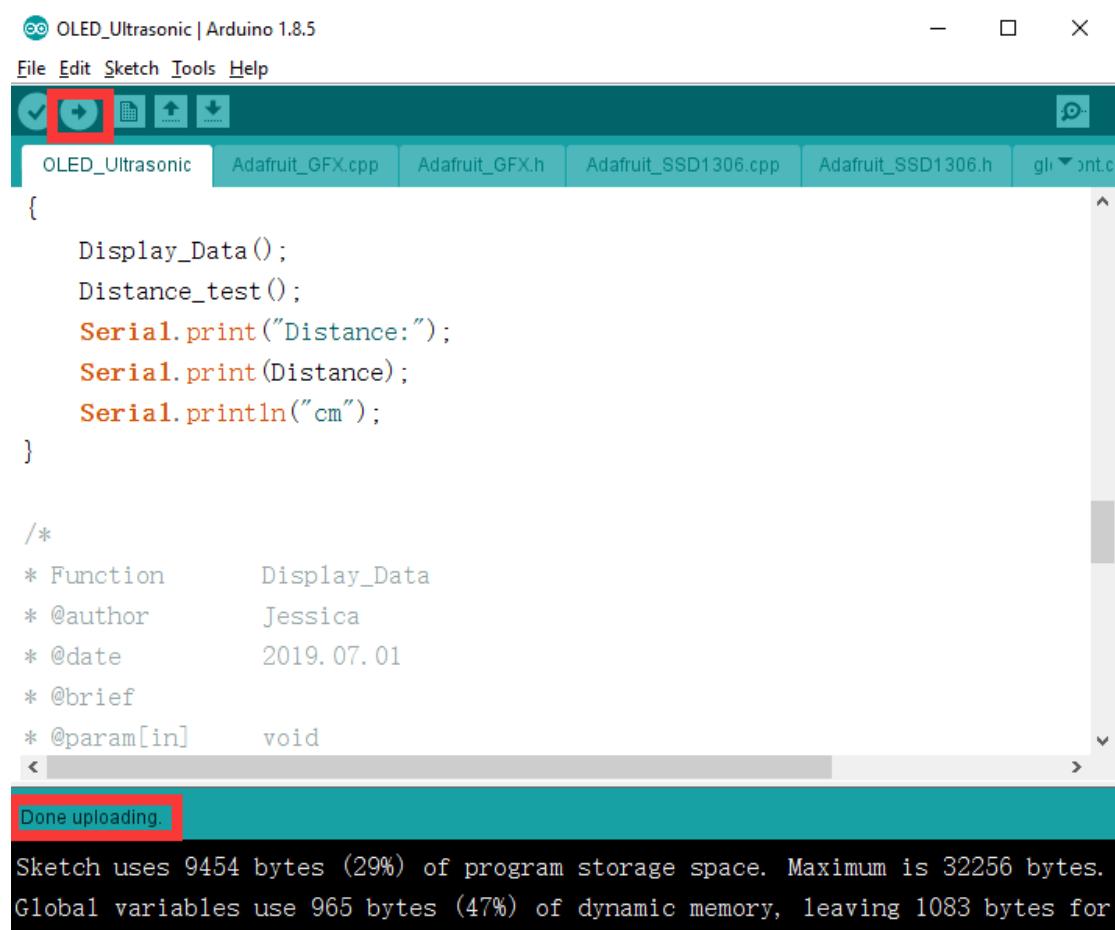
```

4.2 In the menu bar of Arduino IDE, we need to select 【Tools】---【Port】--- selecting the port that the serial number displayed by the device manager just now, as shown below.



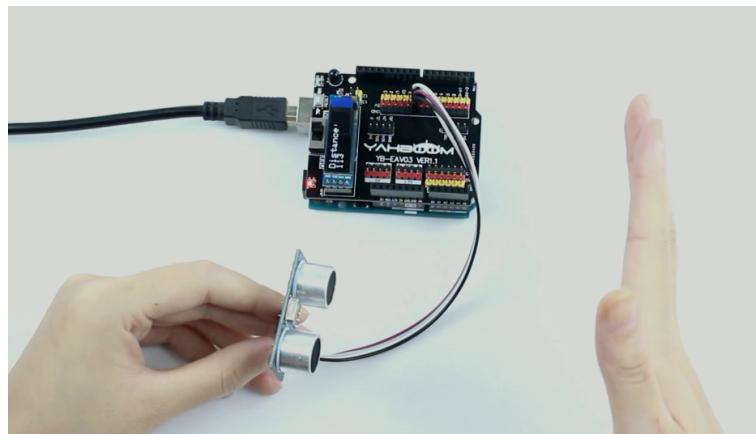


4.3 After the selection is completed, you need to click "→" under the menu bar to upload the code to the UNO board. When the word "**Done uploading**" appears in the lower left corner, the code has been successfully uploaded to the UNO board, as shown below.



## 5.Experimental phenomena

After the program is downloaded, we will see that the data measured by the ultrasonic module will be displayed on the OLED. As shown below.



**!!!Note: If it is not displayed, you can press the reset button on the expansion board.**