

9 ultrasonic distance measurement

The purpose of the experiment:

After uploading the program ultrasonic.ino of this lesson, open the power switch of the car, the ultrasonic sensor will measure the distance in front and display it on the LCD screen.

Precautions:

If the LCD is not displayed, use a screwdriver to adjust the adjustable resistor.

List of components required for the experiment:

Arduino Smart Car* 1

USB data cable* 1

DuPont line * n

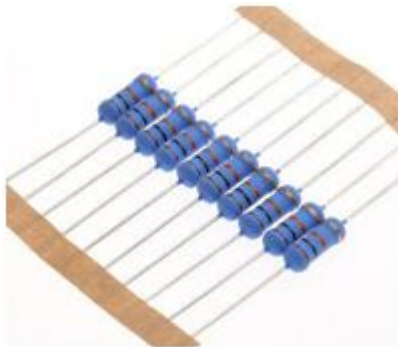
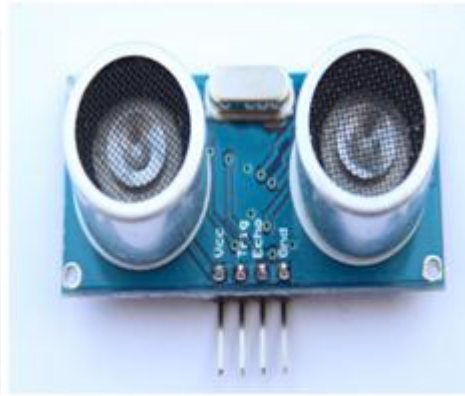
Breadboard* 1

1602 LCD screen* 1

Adjustable resistance* 1

Ultrasonic sensor*1





Experimental code analysis:

```
//=====yahboom=====
====
```

```
// Intelligent car ultrasonic distance measurement
```

```
//=====
=====
```

```
#include <LiquidCrystal.h> //Declare the function library of 1602 liquid crystals
```

```
//Declare the Arduino digital port connected by the pin of the 1602 LCD,
```

```
//8 or 4 line data modes, choose one of them.
```

```
//LiquidCrystal lcd(12,11,10,9,8,7,6,5,4,3,2); //8 data port mode connection statement
```

```
LiquidCrystal lcd(3,4,7,8,11,12,13); //4 data port mode connection statement
```

```
int Echo = A5; // Echo(P2.0)
```

```
int Trig =A4; // Trig(P2.1)
```

```
int Distance = 0;
```

```
void setup()
```

```
{
```

```
    Serial.begin(9600); //Initialize the serial port
```

```
    //Initialize the motor drive IO for output
```

```
    //Initialization of ultrasonic pins
```

```

pinMode(Echo, INPUT); // Define of ultrasonic input foot
pinMode(Trig, OUTPUT); // Define of ultrasonic output foot
lcd.begin(16,2); //Initialization of 1602 liquid crystal working mode
//Define the 1602 LCD display range of 2 lines and 16 columns
}

void Distance_test() // Measuring the distance ahead
{
    digitalWrite(Trig, LOW); // Give the trigger pin low level 2us
    delayMicroseconds(2);

    digitalWrite(Trig, HIGH); // Give the trigger pin high level 10us, at least
    10μs
    delayMicroseconds(10);
    digitalWrite(Trig, LOW); //Give the trigger pin low level Continuously

    float Fdistance = pulseIn(Echo, HIGH); //Reading high level time(unit: us)

    Fdistance= Fdistance/58; // Y meter = (X second *344) /2

    // X second= ( 2*Y meter ) /344 ==> Xsecond =0.0058*Y meter ==> cm = us
    /58

    Serial.print("Distance:"); //Output distance (unit: cm)

    Serial.println(Fdistance); //display distance
    Distance = Fdistance;
}

void loop()
{
    Distance_test();
    if((2<Distance)&(Distance<400))//Range of ultrasonic distance ranging from
    2cm to 400cm
    {
        lcd.home(); //Move the cursor back to the upper left corner,
        //which is the beginning of the output
        lcd.print(" Distance: "); //display
        lcd.setCursor(6,2); //Position the cursor in second lines, sixth columns
        lcd.print(Distance); //display distance
    }
}

```

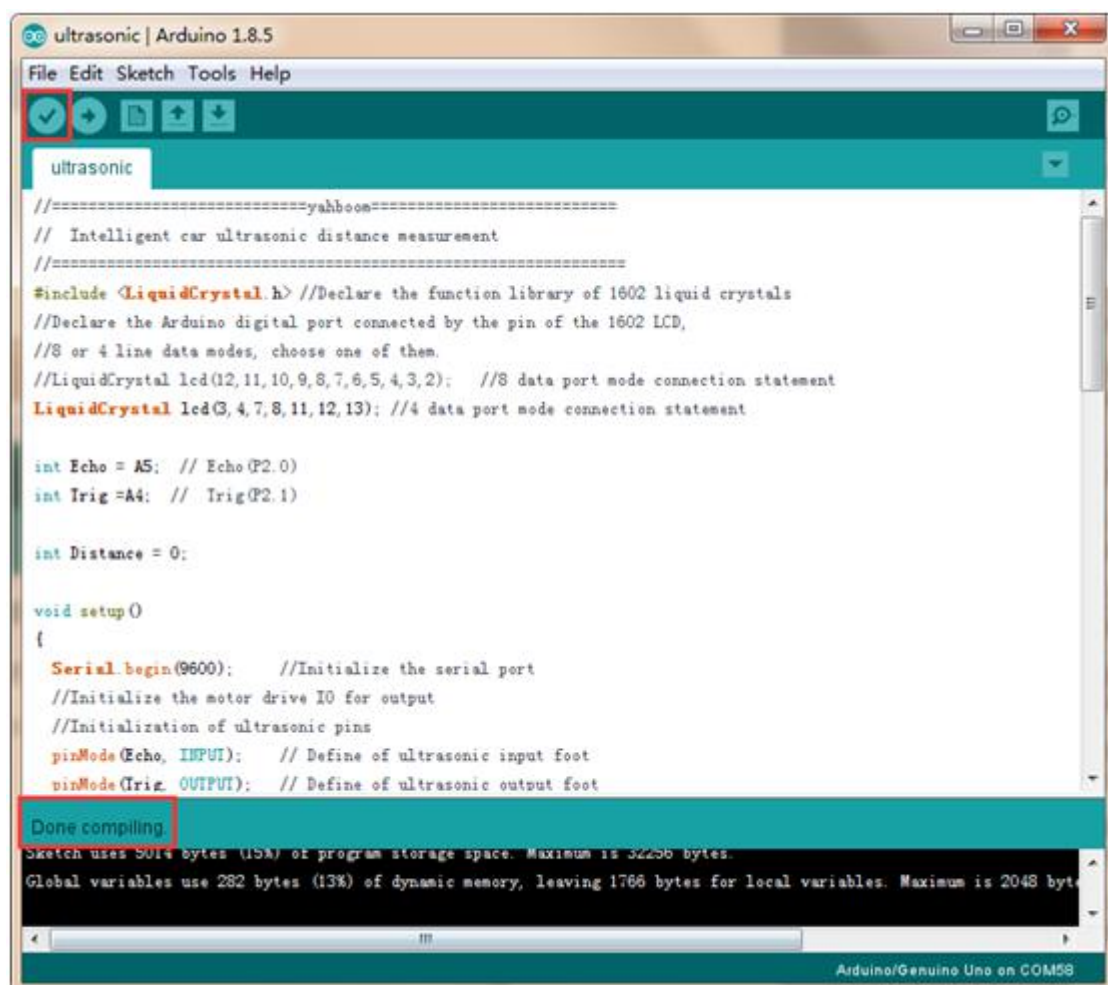
```

    lcd.print("cm");          //display
}
else
{
    lcd.home();              //Move the cursor back to the upper left corner,
                             //which is the beginning of the output
    lcd.print("!!! Out of range");    //Display beyond distance
}
delay(250);
lcd.clear();
}

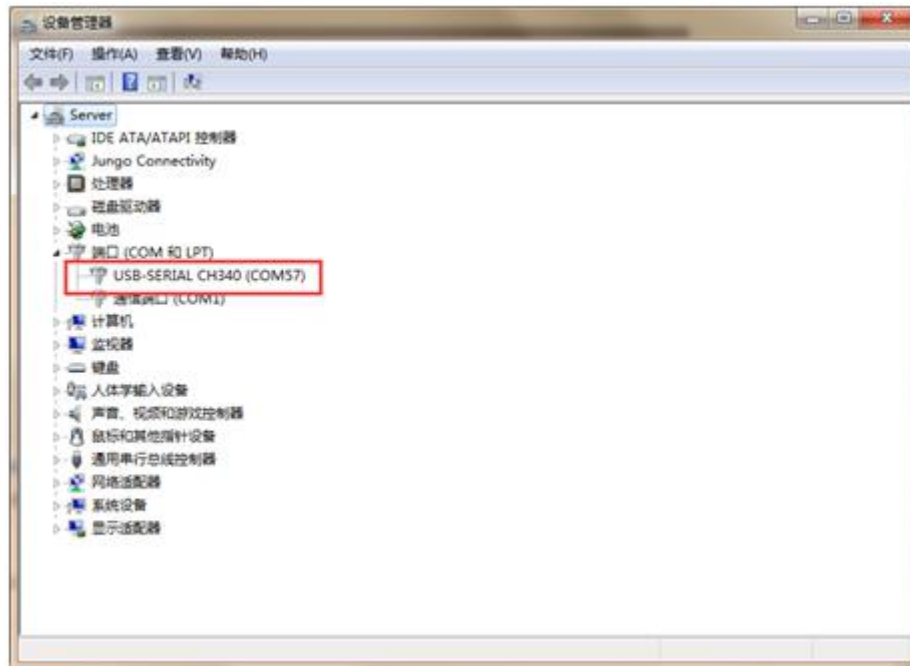
```

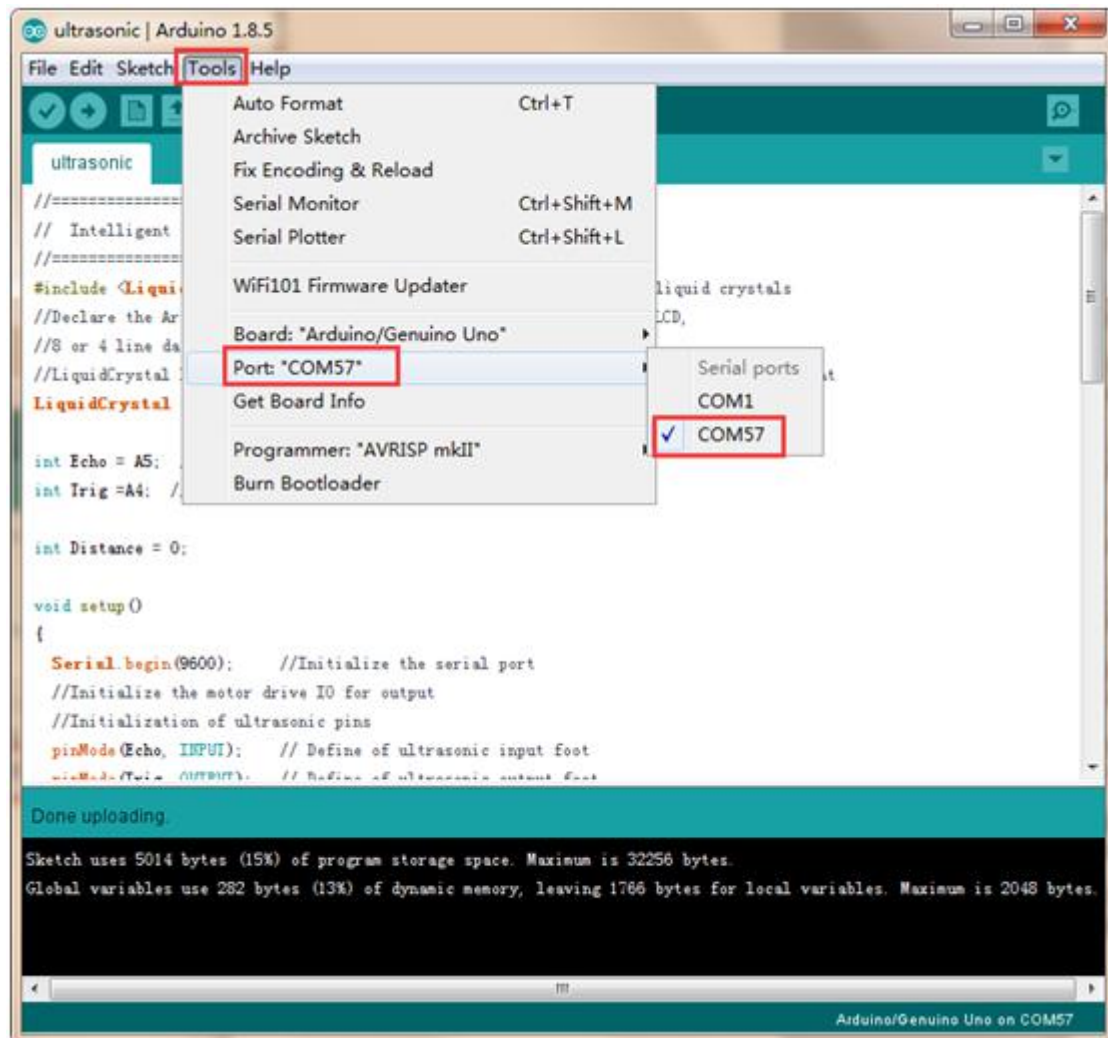
Experimental steps:

1. We need to open the code of this experiment: **ultrasonic.ino**, click “ ✓ ” under the menu bar to compile the code, and wait for the word "**Done compiling**" in the lower right corner, as shown in the figure below.

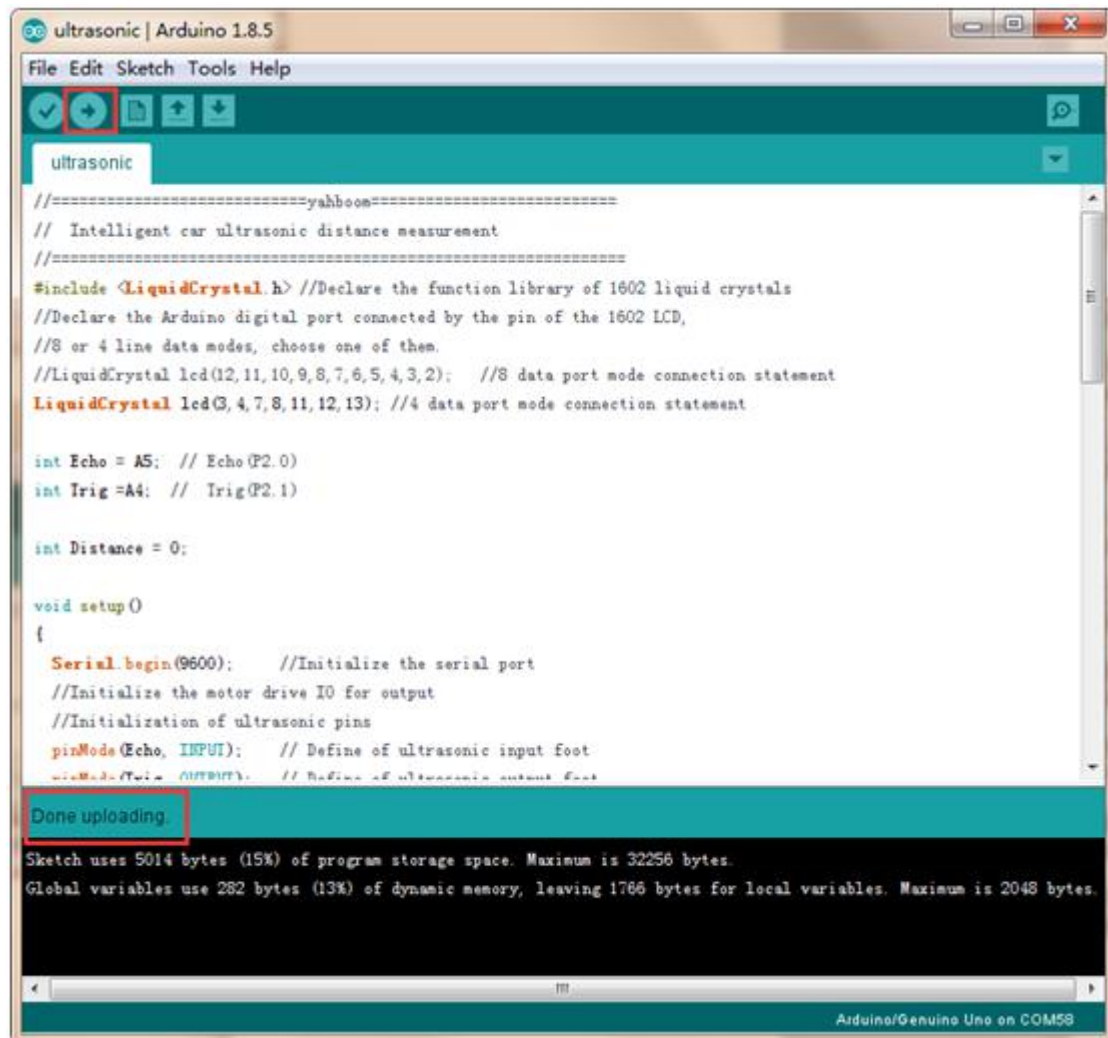


2. In the menu bar of Arduino IDE, we need to select **【Tools】** --- **【Port】** --- selecting the port that the serial number displayed by the device manager just now, as shown in the figure below.



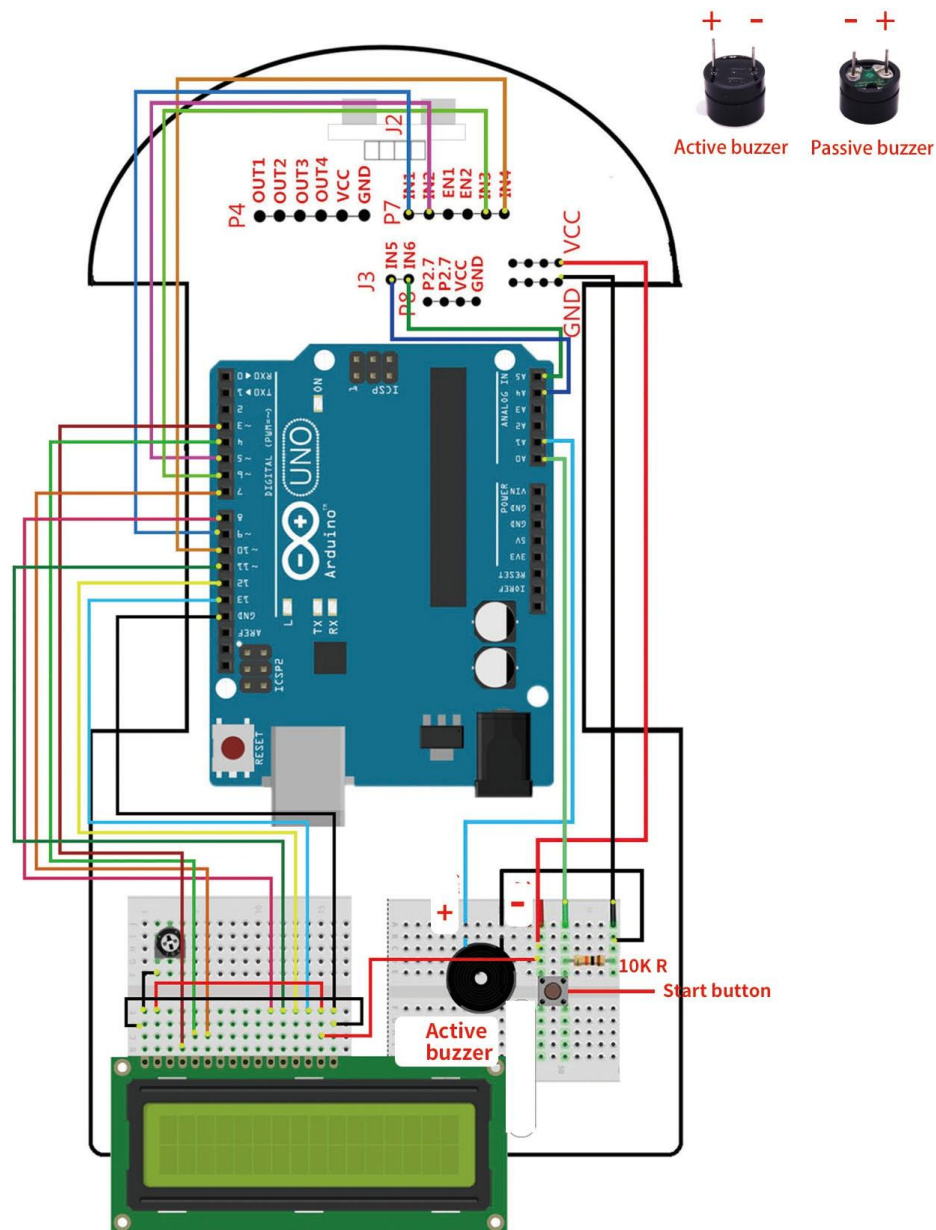


3. After the selection is completed, you need to click “→” under the menu bar to upload the code to the Arduino UNO board. When the word “**Done uploading**” appears in the lower left corner, the code has been successfully uploaded to the Arduino UNO board, as shown in the figure below.



4. Please wire the Smart Car as shown below.

4.4 Ultrasonic obstacle avoidance(no servo) wiring diagram



Note: At the J2 slot, insert the ultrasonic sensor as picture.

If you only use the ultrasonic obstacle avoidance function without displaying the distance, you can not install the 1602 sdisplay and yellow adjustable resistance.

//////////////////////////////////// **11** //////////////////////////////////////

5.Insert the ultrasonic sensor directly into the bottom plate of the smart car, turn on the power switch, adjust the adjustable resistance until the liquid crystal can display normally, you can see the value of the ultrasonic sensor measurement displayed on the liquid crystal.

