

A decorative graphic on the left side of the slide, consisting of a network of light blue lines and small circles, resembling a circuit board or a neural network diagram.

ECE387

PROJECT: LIDAR RANGE SENSOR

YIFAN

Principle

1. Emit pulsed IR light



Emitter

Photon

2. Sense reflected signal

Sensor

Target

distance

**Measured
distance**

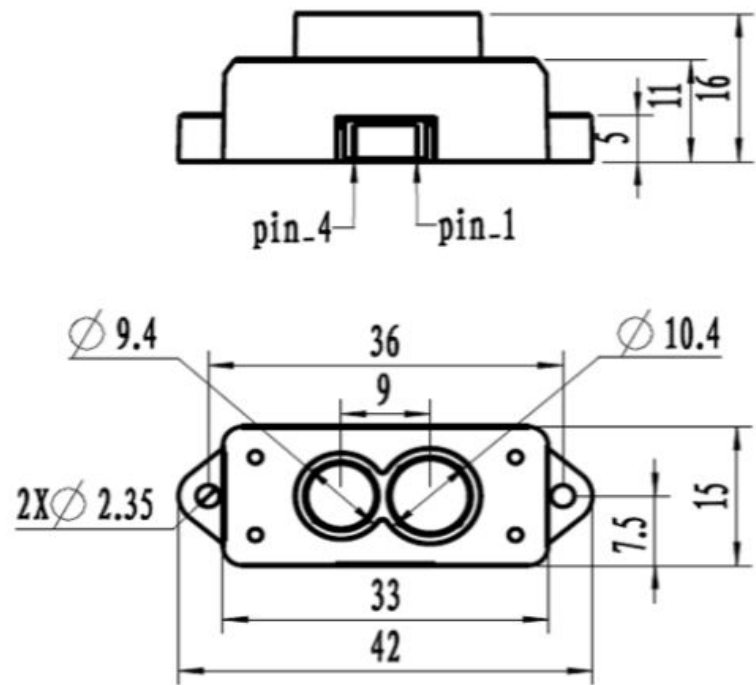
=

Photon
travel time

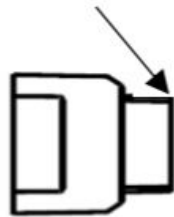
2

x

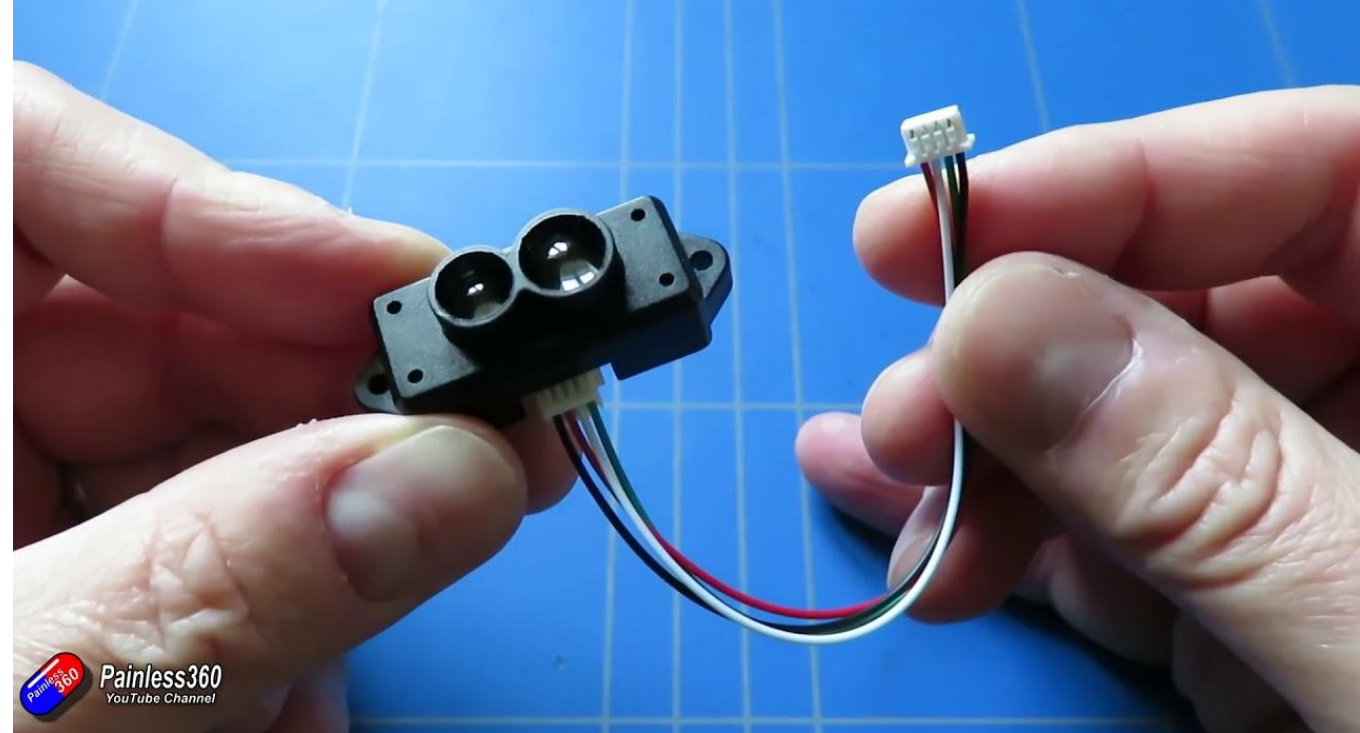
**Speed
of light**



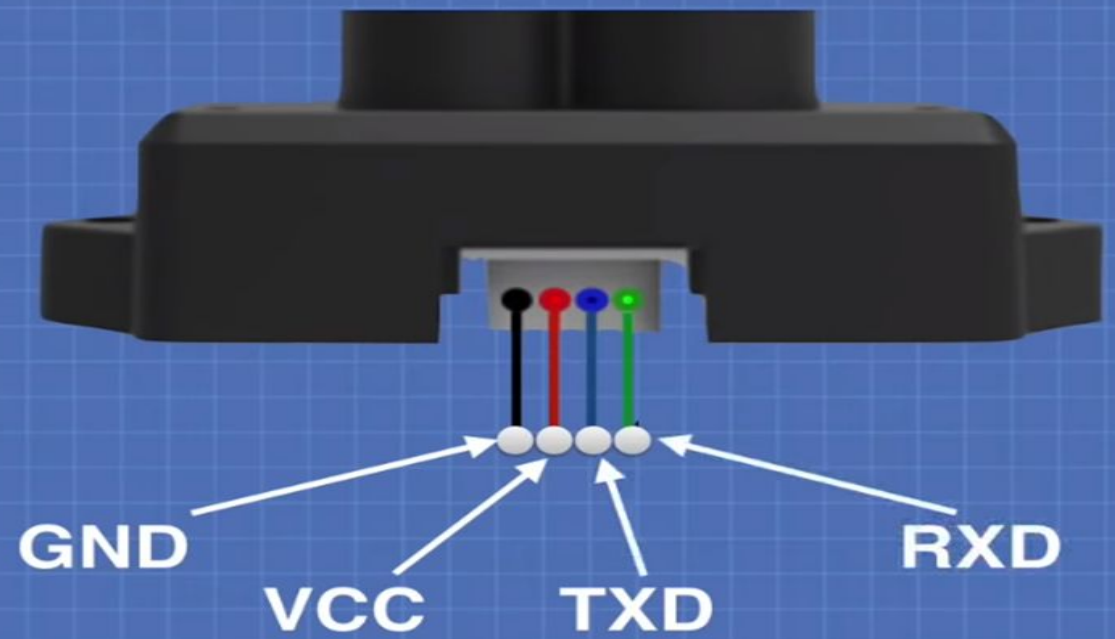
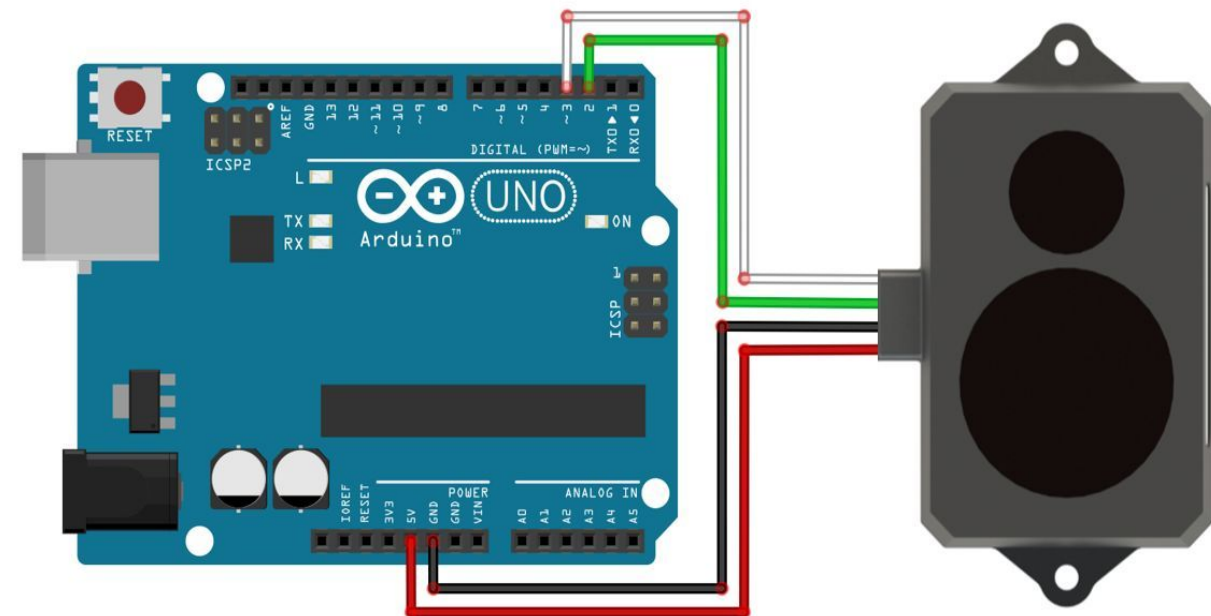
Detection
initial point



Unit: mm



Painless360
YouTube Channel



CHARACTERISTICS

Measurable distance: 30cm ~ 12m(longer than IR Light Sensor(0-10cm))

Size: 42x15x16mm

Weight: 4.7g

Price: \$35 (cost more than other range sensors)

Sampling resolution: 100Hz(higher sampling rate than radar sensor)

Accuracy: within 4cm(<6m); within 6 cm(<12m)(best one)

Voltage requirement: 5V

CODE

```
#include <LiquidCrystal.h>
#include<SoftwareSerial.h>

SoftwareSerial mySerial(11, 12);      // 12 > TXD, 11 > RXD, 5V > red cable, GND > black cable
int dis;// distance detected
int str;// signal strength
int ck;// used for saving data while checking
int i;
int j[9];//UART (Universal Asynchronous Receiver/Transmitter), which is used for transmitting data
const int C=0x59;//data package frame header

// assign arduino pin number for LCD 1602

LiquidCrystal lcd(8, 6, 5, 4, 3, 2); // pin8=RS PIN6=E pin5-2=D4-7

void setup(){
  Serial.begin(115200);//set the data transmission speed between PC and arduino
  while (!Serial); //show a signal if the system is not ready(used for determine whether there is wire connection problem)
  Serial.println ("getting ready...");
  mySerial.begin(115200);//set the data transmission speed between arduino and TFmini
  delay (1);
  lcd.begin(16, 2);//width = 16, hight = 2
```

```

void loop(){
  if (mySerial.available())//check if there is input
  {
    if(mySerial.read()==C)//check frame header
    {
      j[0]=C;
      if(mySerial.read()==C){//check frame header
        j[1]=C;
        for(i=2;i<9;i++){
          j[i]=mySerial.read();
        }
        ck=j[0]+j[1]+j[2]+j[3]+j[4]+j[5]+j[6]+j[7];
        if(j[8]==(ck&0xff))//check result
        {
          dis=j[2]+j[3]*256;//calculate distance
          str=j[4]+j[5]*256;//calculate signal strength

          // Display the measurement when signal strength >= 0
          if(str >= 0){
            Serial.print("Object Distance = ");
            Serial.print(dis);
            Serial.print(" cm      signal strength = ");
            Serial.println(str);
          }
        }
      }
    }
  }
}

```

Lidar Sensor

```
lcd.setCursor(0, 0);  
lcd.print("D=");  
//Leave a space if quantity of distance/signal strength is small (because their was some display errors(display some  
if(dis<100 && dis >=10){  
lcd.print(" ");  
lcd.print(dis);  
}  
else if(dis>0 && dis<10){  
lcd.print(" ");  
lcd.print(dis);  
}  
else  
lcd.print(dis);  
  
//does not display signal strength when str < 10  
lcd.print("cm S=");  
if(str>=100 && str<=999){  
lcd.print(str);  
lcd.print(" ");  
}  
else if(str<100 && str>=10){  
lcd.print(str);  
lcd.print(" ");  
}  
else if(str>=1000)  
lcd.print(str);  
  
}
```

LCD

MY PROJECT

- Measure distance/ signal strength
- Display results on serial/LCD
- Cost: Tfmmini \$35, LCD: <\$1, UNO: R3 '\$0', wire: \$0, resistor: \$0, bread board, TOTAL: \$36
- **interfaces("x" to UNO):**
 - TFMiNi: TXD to 12; RXD to 11; GND to GND; Vcc to 5V.
 - LCD 1602 module: VSS to GND; VDD to 5V; V0 to 5k ohm resistor to GND; RS to 8; RW to GND; E to 6; D4 to 5; D5 to 4; D6 to 3; D7 to 2; A(LED+) to 5v; K(LED-) to GN

DEMO

- YouTube demo link:
- Basic apply (display result on serial monitor)
 - > <https://youtu.be/EJtL1x808OA>
- Together with LCD 1602 Module
 - > <https://youtu.be/4Uymjrx-N8s>



EXISTING/POSSIBLE APPLICATION

- Orientation/Danger detection (running machine, agriculture, Autonomous vehicles, robot)
- Mapping/reveal image in 3D
- Measure height/distance
- Record route/motion track



REFERENCE

- [https://www.dfrobot.com/wiki/index.php/TF_Mini_LiDAR\(ToF\)_Laser_Range_Sensor_SKU:_SEN0259](https://www.dfrobot.com/wiki/index.php/TF_Mini_LiDAR(ToF)_Laser_Range_Sensor_SKU:_SEN0259)
- <https://www.dfrobot.com/blog-1016.html>