🏆 A.3.1 Learning activity

(Object detection sensor circuit, using an Arduino, an ultrasonic sensor and a 16x2 LCD I2C Display)
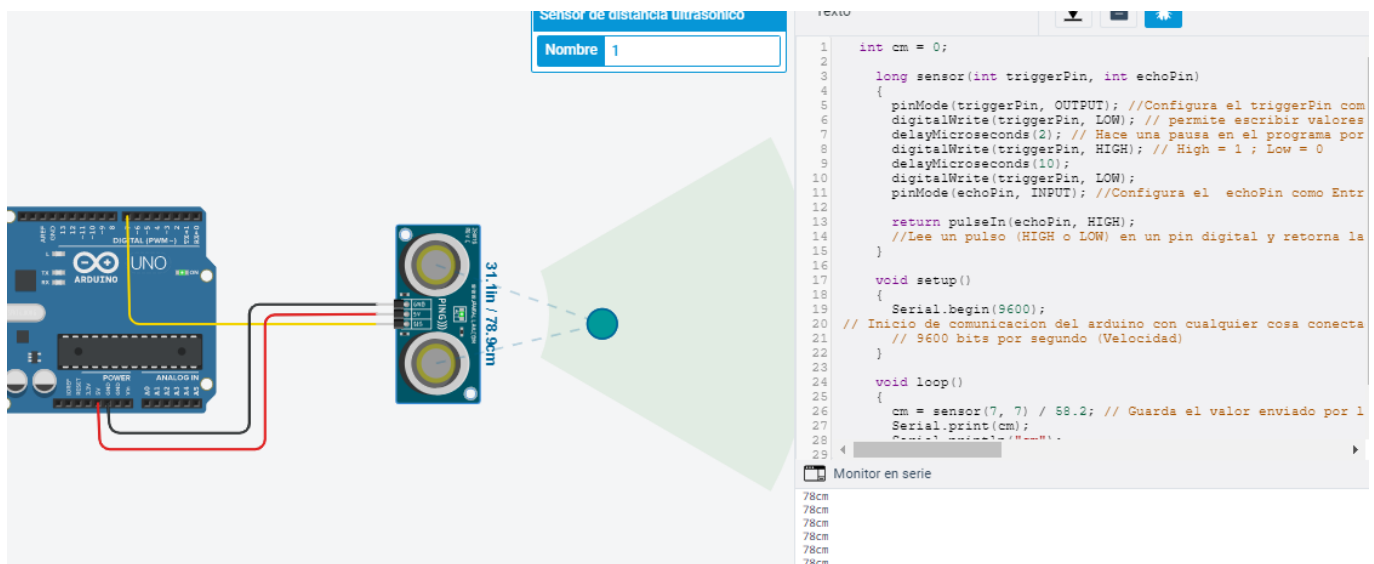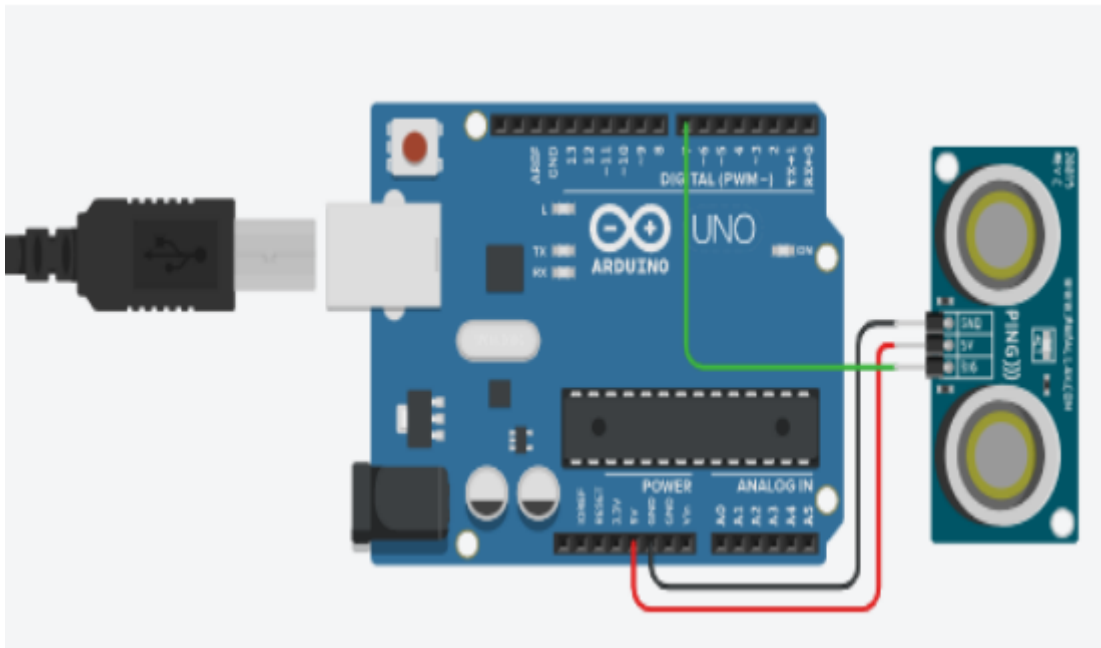
✏️ Development

1.Use the following list of materials to prepare the activity

Quantity	Description
1	Ultrasonic Sensor HC-SR04
1	16x2 LCD display
1	5V power supply
1	10K potentiometer
1	Arduino UNO

2. . Based on the image shown, assemble inside the simulator to be used, the electronic circuit indicated in the Figure 1.

3. Write the program that allows to receive the value registered by the Ultrasonic Sensor through one of the Arduino's inputs when approaching an object at different distances.

```cpp
int cm = 0;

  long sensor(int triggerPin, int echoPin)
  {
    pinMode(triggerPin, OUTPUT);
    digitalWrite(triggerPin, LOW);
    delayMicroseconds(2);
    digitalWrite(triggerPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(triggerPin, LOW);
    pinMode(echoPin, INPUT);

    return pulseIn(echoPin, HIGH);
  }


  void setup()
```

```
  {
    Serial.begin(9600);
  }

  void loop()
  {
    cm = sensor(7, 7) / 58.2;
    Serial.print(cm);
    Serial.println("cm");
    delay(100);
  }
```

4. Considering that the ultrasonic sensor has a minimum and maximum detection range based on the return time of the sonic signal, what values are obtained in the simulation under the following terms:

Number	Condition 1	Condition 2	Is the object detected?
1	5 cm distance to sensor	0 degrees to the perpendicular axis of the senso	yes
2	50 cm distance to sensor	35 degrees to the perpendicular axis of the sensor	yes
3	100 cm distance to sensor	-35 degrees to the perpendicular axis of the sensor	yes
4	5 cm distance to sensor	90 degrees to the perpendicular axis of the sensor	no
5	50 cm distance to sensor	-60 degrees to the perpendicular axis of the sensor	no
6	350 cm distance to sensor	0 degrees to the perpendicular axis of the sensor	no

5. Once the previous points have been completed, add to Figure 1, an I2C 16x2 LCD Display, and place the image of the complete circuit to this section.
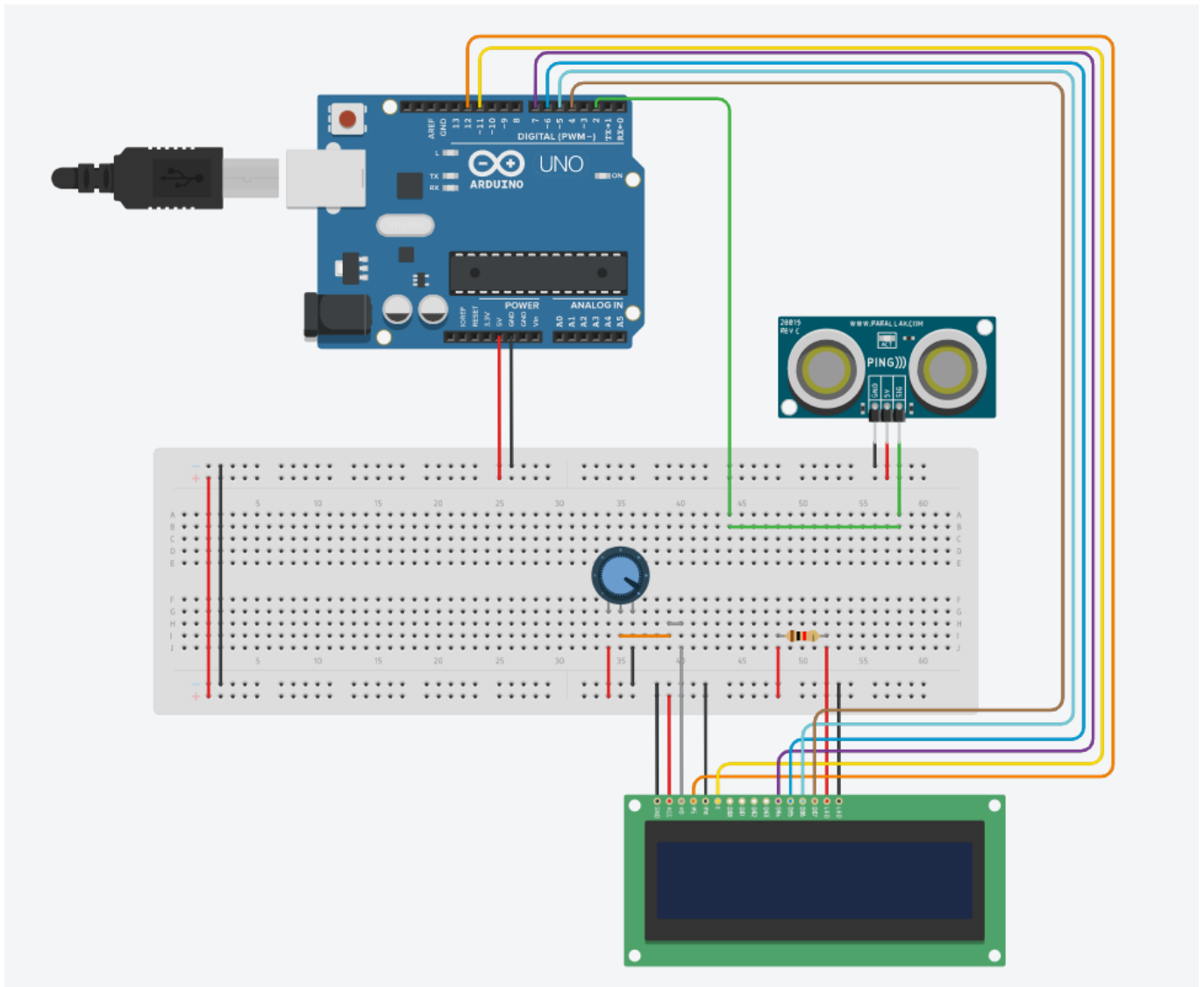
6. Once you have completed the integration of the I2C Display, modify the program so it allows you to show the following message through the display, "Target detected at? cm" ,and in case of not achieving detection, indicate the message "Target out of range ".

```cpp
#include <LiquidCrystal.h>

//lcd
int rs = 12, en =11, d4 = 7, d5 = 6, d6 = 5, d7 = 4;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

int cm = 0;

long sensor(int triggerPin, int echoPin)
{
  pinMode(triggerPin, OUTPUT);
  digitalWrite(triggerPin, LOW);
  delayMicroseconds(2);
  digitalWrite(triggerPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);
```

```cpp
      return pulseIn(echoPin, HIGH);
    }

    void lcd_imprimir_dis(int distancia) {
      if(distancia < 330) { //330 aprox la distancia max
        lcd.setCursor(0, 0);
        lcd.print("Objetivo detecta");
        lcd.setCursor(0, 1);
        lcd.print("do a ");
        lcd.print(distancia);
        lcd.print("cm");
      } else {
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Objetivo fuera");
        lcd.setCursor(0, 1);
        lcd.print("de rango");
      }
    }

    void setup()
    {
      Serial.begin(9600);
      lcd.begin(16, 2);
    }

    void loop()
    {
      cm = sensor(2, 2) / 58.2;
      //Serial.println("cm");
      lcd_imprimir_dis(cm);
      delay(500);
    }
```
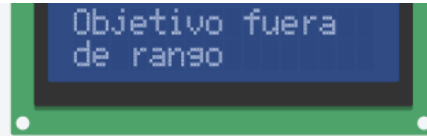
7. Place here evidence that you consider important during the development of the activity.
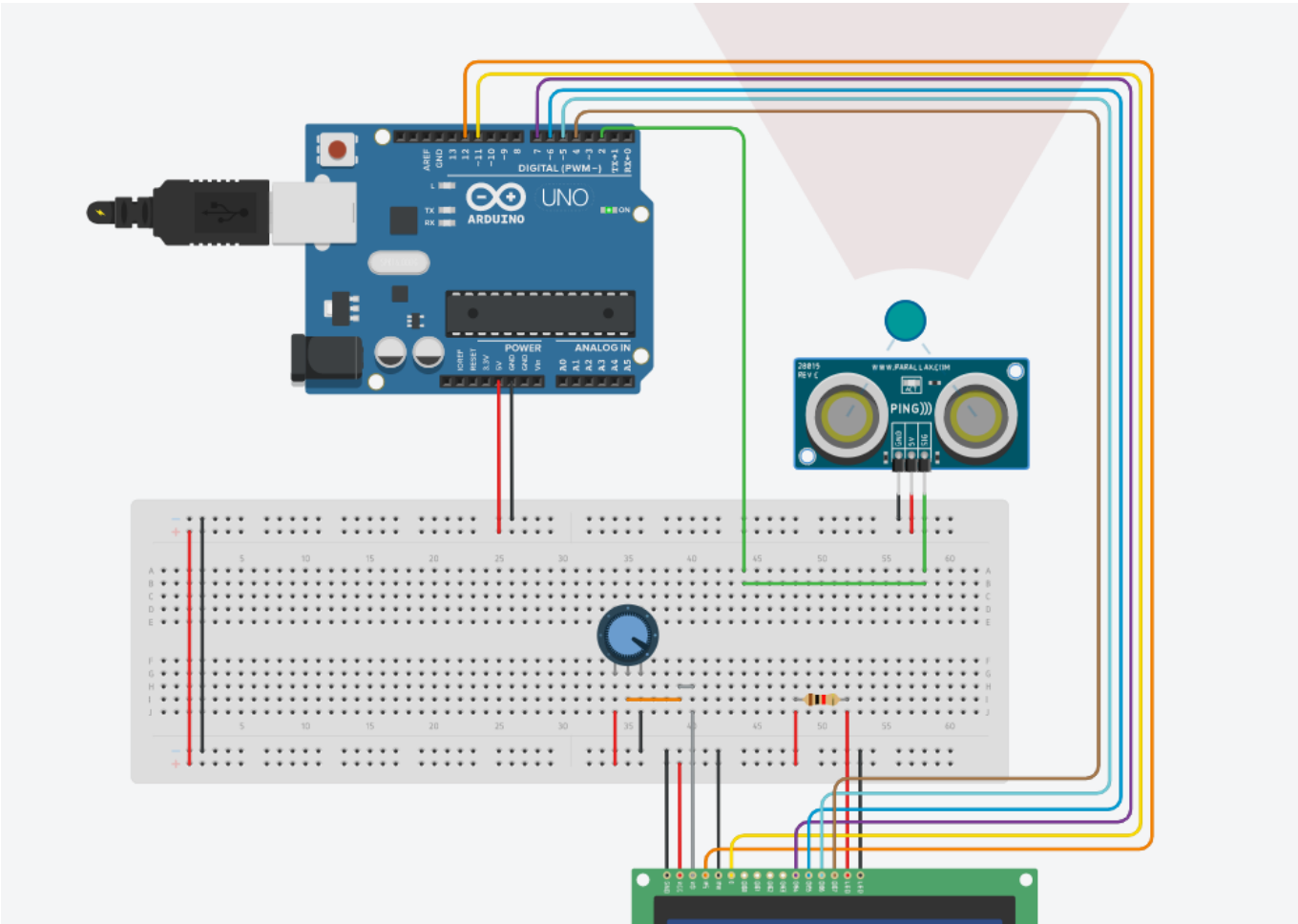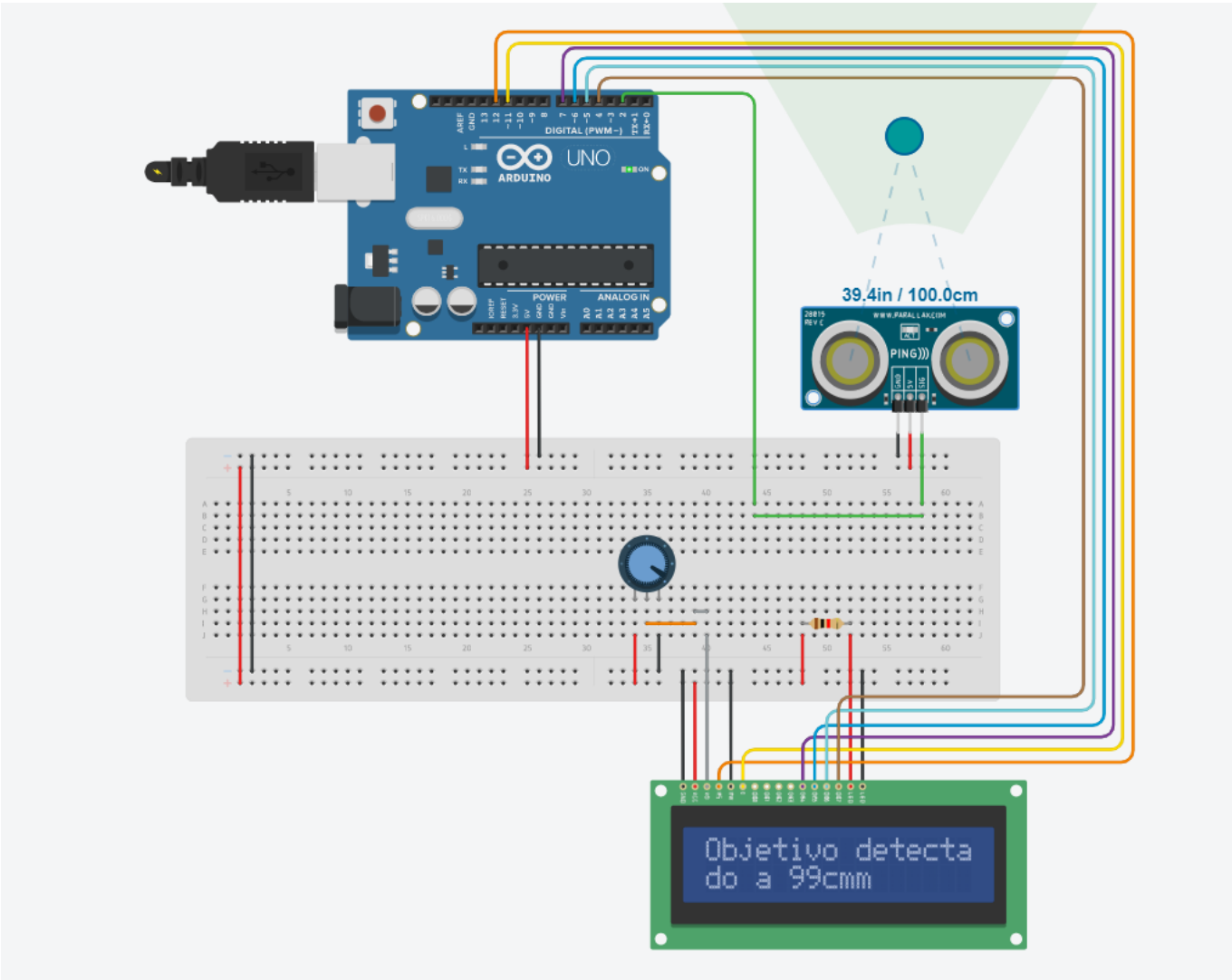
8. Insert images of evidences such as meetings of the team members held to the development of the activity.

🔒 **joserma** ☆
💬 4 | Añadir un tema   5

Sábado, 22 de mayo ⌄

EDGAR EDUARDO REGALADO LOPEZ 10:05
quieren repartir lo de la A3.1 para irlo haciendo en la semana? se entrega el jueves, pero el circuito podría ser algo tardado, si sí quieren, son 7 puntos, podríamos tomar 3 personas 2 y una persona se encargaría de hacer el circuito, porque este si es mas extenso, en particular la parte del código, ya lo tengo pero me gustaría que alguien más intentara hacerlo

bueno, el punto 2 es hacer el circuito y el 3 es poner el codigo, ahi no se como les gustaria distribuirlo, si la persona que haga el circuito hace ambos de una vez, o no se

Domingo, 23 de mayo ⌄

MAURICIO ANTONIO NAVARRO LOPEZ 22:15
Ya está el repositorio en el git para ir trabajando en el!!!

Lunes, 24 de mayo ⌄

EDGAR EDUARDO REGALADO LOPEZ 00:42
ok, gracias, aun no deciden que agarrarán?

ERICK IVAN GARCIA GONZALEZ 12:19
voy haciendo el 1, de las definiciones

José Gerardo Ramirez 13:48
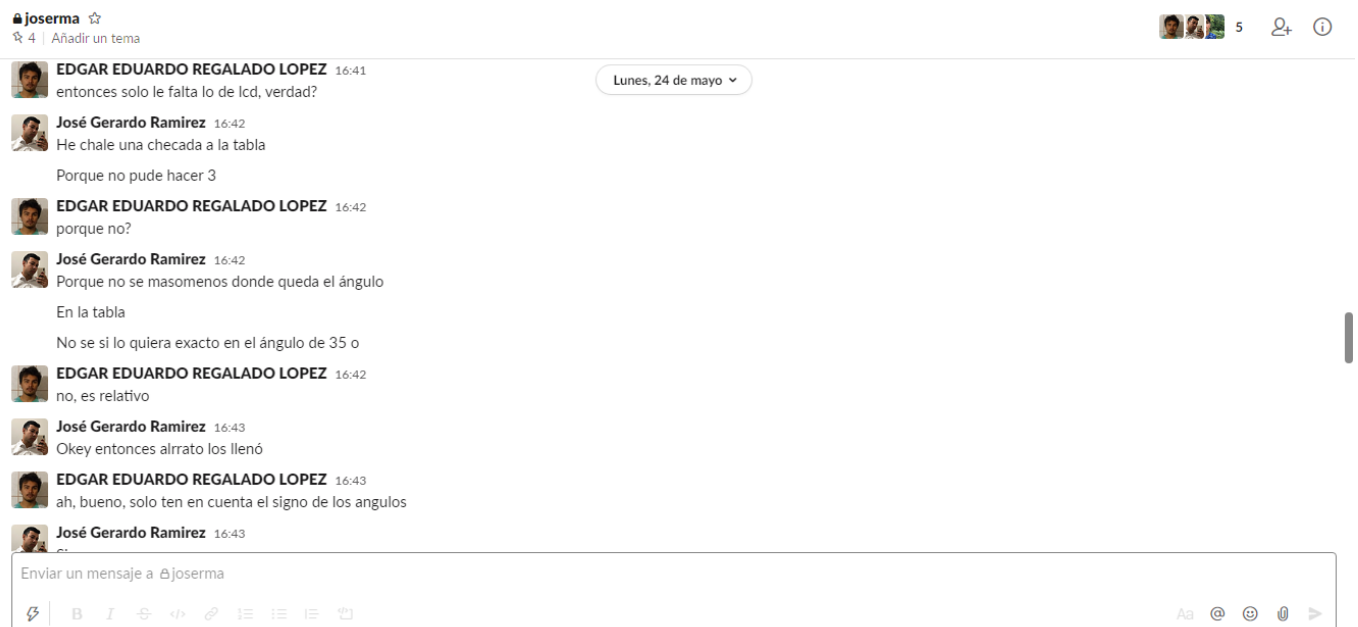Alguien está ahí

Creo que ya hice el sensor

🔒 **joserma** ☆
💬 4 | Añadir un tema   5

José Gerardo Ramirez 13:48
Alguien está ahí

Lunes, 24 de mayo ⌄

Creo que ya hice el sensor

La primera parte

Por si lo pueden chocar

Checar

https://www.tinkercad.com/things/6MAxD2fZPuY-funky-trug/editel?sharecode=VrtIvZIp_oACboGyur-8MOIU0JDH6v3Ciqw83LW5bRI

🟨 **Tinkercad**
Tinkercad | From mind to design in minutes
Tinkercad is a free, easy-to-use app for 3D design, electronics, and coding.

EDGAR EDUARDO REGALADO LOPEZ 14:06
oh, el profe había comentado que lo hicieramos con el que tenía trigger, pero no creo que haya problema, si funciona bien

José Gerardo Ramirez 14:39
Entonces no esta bien así ?

EDGAR EDUARDO REGALADO LOPEZ 14:40
pues no se, osea funciona, pero no se si el profe tenga problemas, el otro dia que mencionó sobre eso no me quedó claro si fue recomendación o que lo quería así al final, la verdad

joserma ☆
4 | Añadir un tema   5

EDGAR EDUARDO REGALADO LOPEZ 16:41
entonces solo le falta lo de lcd, verdad?   Lunes, 24 de mayo ∨

José Gerardo Ramirez 16:42
He chale una checada a la tabla

Porque no pude hacer 3

EDGAR EDUARDO REGALADO LOPEZ 16:42
porque no?

José Gerardo Ramirez 16:42
Porque no se masomenos donde queda el ángulo

En la tabla

No se si lo quiera exacto en el ángulo de 35 o

EDGAR EDUARDO REGALADO LOPEZ 16:42
no, es relativo

José Gerardo Ramirez 16:43
Okey entonces alrrato los llenó

EDGAR EDUARDO REGALADO LOPEZ 16:43
ah, bueno, solo ten en cuenta el signo de los angulos

José Gerardo Ramirez 16:43

Enviar un mensaje a 🔒joserma

B *I* S̶ ⟨⟩ � ⌢⌢ ⌢⌢ ⌢⌢ ⌢   Aa @ ☺ 📎 ➤

9. Include the individual conclusions and results observed during the development of the activity.

Edgar Regalado

I found using the distance sensor fairly easy to use, you just have to send a PWM and translate the PWM that you receive as a result, containing the time it took the sensor to get the sound to bounce back at it. I think the hardest part of this practice was using the LCD because it requires you to connect a lot of pins in order to get it to work, and its not very intuitive cause you have to change the column manually, put its easy than setting each pixel individually, which is something i had to do for a virtual 7 segment display in another class.

Navarro Mauricio

The main objective of this activity is to understand the operation of the ultrasonic sensor, as is that it particularly does not measure distances but the time when the wave of the emitted frequency take to return, in the same way evaluated the different ranges with which it is handled, a plus in the objective of this activity was to add the display to be able to appreciate the different ranges with which this sensor works.

Jose Gerardo

The integrated circuit of this practice consists of two phases, where the first phase only involves measuring with an ultrasonic sensor certain circumstances requested in the practice and we had a bit of problems in which reference point to use for the measurements of the degrees. In the second phase the complications began when wanting to apply an LCD screen, we helped ourselves with quite a few guides due to the complexity that the handling of so many pins presented.

Erick Garcia

We used a three-pin ultrasound sensor, the one that tinkercad provided and well what we saw is that first before anything else out of range the object shows the highest value it can, I imagine because it assumes that the object is at a very far distance, and then using the value that returns and multiplying by 0.01723 is how we convert to cm, this value is printed on the monitor.

💣 Rubrica

Criteria	Description	Score
Instructions	Is each of the points indicated in the Instructions section fulfilled?	10
Developing	Was each one of the points requested within the development of the activity answered?	60
Demonstration	Does the student introduce himself during the explanation of the functionality of the activity?	20
Conclusions	Is a personal opinion of the activity included by each of the team members?	10

[My Github](#)