WIDGETS FOR THIS LESSON PLAN INCLUDE THE FOLLOWING:

Table of Content

- Class Duration
- Teacher Resources
- Student Resources
- Introductory Video
- Activities
  - Standard
    - Interfacing ultrasonic sensor with Arduino
    - ThingSpeak IoT Platform
- Project
  - Digital Ruler using ultrasonic sensor

FC IoT- LESSON PLAN -5- MEASURING DISTANCE

Topic	Sense it up..!
Class Duration	55-60mins.
The goal of the class	• Learn the basics of ultrasonic sensor and its pin configuration • Learn how to interface ultrasonic sensor to Arduino board • Understand the basics of IoT and ThingSpeak Platform.
Teacher Resources	• Desktop/Laptop (Mac/Windows) • Good Internet Connection • Earphone / Headphone • Lesson Plan resources (LP+)
Student Resources	• Desktop/Laptop (Mac/Windows)

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

	• Good Internet Connection • Earphone / Headphone
The key activities	
Teacher Activity	**Student Activity**
<u>Theoretical Class</u> **Teacher Activity Flow** • Greet the student • Check the status of L4 project • Discuss today's class agenda • Warm up and Wrap up Quiz **VA will be used throughout the class to teach both practical and theoretical concepts** **Practical class** - Hands-on-activities • Learn the pin configuration of the ultrasonic Sensor and how to interface it with the Arduino board. • Learn how IoT works using the ThingSpeak platform.	**<u>Theoretical + Practical Class Warm up and Wrap up Quiz</u>** Students will follow the teacher's instructions and perform the activity. Warm up Quiz - To be performed before the class Wrap up Quiz - To be performed after the class
The flow of the class (<u>**note: **An extra 5 minutes** can be added, based on the category of the student(Category of students - **BA**, **AA** and **BS**. Every teacher will **use VA** to execute the lesson ensuring no **disturbance** in the flow of content and activities.</u>) Colors used Green - Screen Share/Screen stop Yellow - Points to remember Orange - Class/Activity/Project starts Blue- Instructions Magenta - explanation of the concept and for teacher reference	
Story - Teacher reference	

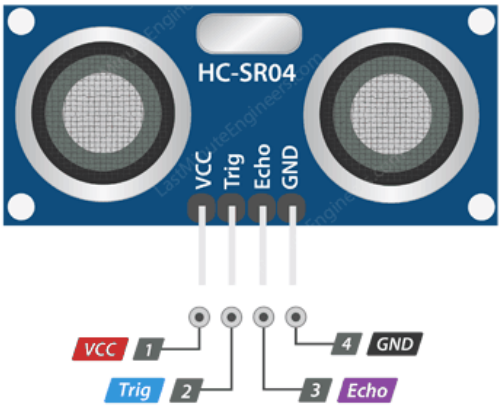
© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

CLASS BEGINS	
Teacher - Section	**Student Section**
Teacher: Hello student, how are you doing? I am happy to see you in today's class. Before starting today's class, can you update the L4 project status? Are you facing any issues? (In case the student is facing any issue, spend 5 - 7 mins to help them. If it extends, ask the student to send email and attend to the issue through email) **Teacher:** Let's start today's class.	
THE CONTENT OF THE CLASS BEGINS - Use of VA throughout the class	
Slide 1 - Lesson 5 - Measuring Distance **Teacher:** In the last session, we learnt how sensors and microcontrollers can be used to automate a system. In this lesson, let's learn about an interesting sensor that is widely used. **Slide 2 - Agenda** Teacher will give a brief overview of the class and read the agenda topics from the VA. **Teacher:** In this lesson, let's understand how ultrasonic sensors play an important role in IoT and also let's learn some more applications of microcontrollers. **Slides 3,4,5: Warm-up Quiz** Teacher conducts the warm-up quiz to refresh the concepts learnt during the previous sessions. **Slide 6 - Applications of a microcontroller** **Teacher:** Students, we already learnt in our previous lessons that microcontrollers act as a brain of the control system or any automation systems. Not only the automation systems, microcontrollers are used in every part of our daily life. Home appliances such as microwave ovens, air conditioners, washing machines, refrigerators contain many microcontrollers. They are helpful in motor control, LED/LCD displays, front panel controls and so on.	

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

Remote patient monitoring systems gain a huge importance nowadays. They are used in cases where the patient's health should be monitored on a regular basis. For example, a heart patient's heartbeat should be monitored continuously. It's impossible to have a doctor at home who can continuously check the heartbeat of the patient. In such cases, microcontrollers will do the work for us. Using sensors, the patient's health will be monitored continuously and if there is an emergency, the doctor or the caretaker will be notified. By using this technology, we can reduce the number of emergency department visits, hospitalizations, and duration of hospital stays. In rockets, microcontrollers cover functions such as monitoring the state of the rocket, controlling certain flight parameters, air-to-ground communication and recovery event management. All of these functions are made possible by correctly functioning microcontrollers. The principal piece of rocketry avionics is a flight computer and this generally consists of a microcontroller and sensor suite combined on a printed circuit board (PCB). If you are a gamer, you will probably compare the different types of playstations available in the market based on their performance. It's all because of the processing board that will house microcontrollers and microprocessors. Graphics, WiFi and many other functions will be controlled by the microcontrollers. We use our sense organs while driving cars. Similarly self-driving cars are autonomous. They use sensors to detect what's happening around them. So the brain of an automatic system, that is our microcontroller plays a major role. All the sensors present in an automobile will communicate with each other using microcontrollers. So we can say microcontrollers are the heroes of any automatic system. Now let's learn an important sensor called ultrasonic sensor and let's learn the applications. **Slide 7: Ultrasonic Sensor** **Teacher:** Ultrasonic sensor has four pins.	

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Let us understand what each pin does.

The red one is the VCC pin. This pin is used to give power to the sensor.

The blue pin is used to trigger ultrasonic sound pulses. In simple words they make the beep sound when we reverse a car or try to park the car.

The violet pin is called the echo pin. We all know what an echo is. When we make noise in a closed room, we hear our voice again. That is an echo.

How does an echo happen? When we throw a ball on the wall it bounces back to us, right .It is the same with an echo.

When we make a noise, it gets back from the wall because it cannot go outside the room.

Whenever we park the car, the beep starts and when we get close to the wall or any other object it gets reflected and returns.

This echo will give the warning not to move closer as there is an obstacle.

This is how an ultrasonic sensor works.

The black pin is a ground pin.

Let us all keep this deep in our minds .Anything concerned with electricity ,circuits ,wires ,power will always have something called ground connection.

This ground connection is for safety, so that there is no damage to the circuits or appliances or the humans.

It will prevent the current from moving outside the device or any object we are working on.

Now, let's know what are the different applications where ultrasonic sensors are used.

Slide 8: Applications of Ultrasonic Sensor

Teacher:

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

Measurement is one of the areas Ultrasonic is widely used. We all know the concept of ultrasonic.
Sound pulses are the input from the sensor. The sound pulses travel until it reaches the obstacle. The moment it touches the obstacle it will travel back and create the output as echo. The time it takes from the sensor to create an echo is used to measure the distance.

We learnt in our previous lesson that the first IOT device was a Coca-Cola vending machine at Carnegie Mellon University.

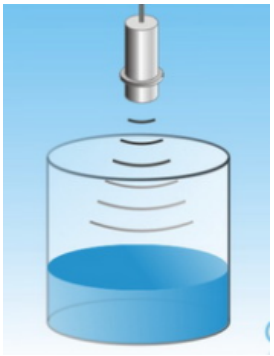
You all know what a vending machine is.

When we put cash or coins, we get the drink from the machine. What happens when the drink finishes. People have to wait until they refill it. To avoid the waiting, in 1980, the coke used IOT to inform the company when the coke gets over. When it is about to get over the company gets the information and they refill it.

If there is more distance between the sensor and the liquid surface then it will take more time for the echo.

If the distance is less then it echoes faster and we understand the distance.

This is how ultrasonic is used to measure liquids.



Ultrasonic sensors are widely used in automobiles. Let's see an example.

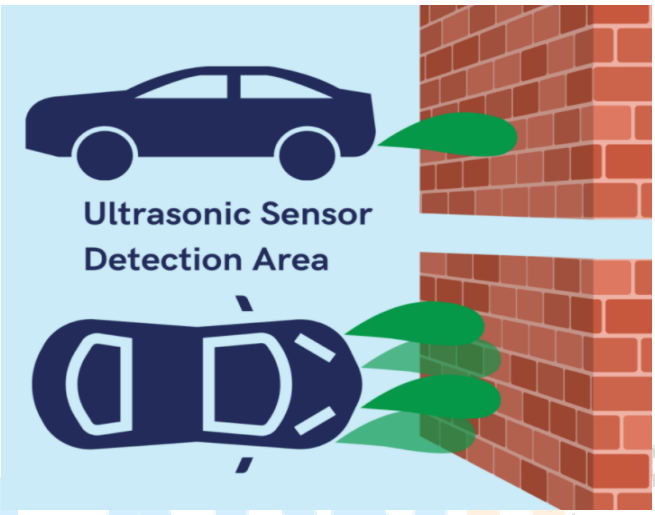
© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

Cars are designed with sensors for various other functions. Parking was very difficult earlier. Nowadays cars come with park assists.

Do you know what park assist means? Let me tell you .It means we have sensors to help us park without much difficulty.

How does it work? Simply, they have a lot of sensors to perform every simple task to make it easier.

Ultrasonic sensors are used in measuring the distance.



When I was small, when we used to park a car, somebody needed to get out of the car and see if it touched the wall behind it. Since we have park assistance now we hear a beep, when we go very close to the wall .The beep is a warning that we are very close to the call and not to go further.Parking assist also helps us to park at a safe distance from other cars giving us more safety.

Ultrasonic sensors are used in robots. For sensing an obstacle, a robot needs to use sensors. The ultrasonic sensor can be used for detecting objects or obstacles in between the paths. The main motto of this robot is to avoid accidents which will generally happen in congested areas by applying emergency brakes. So basically it is a robot that can move automatically in different directions with the help of an ultrasonic sensor. This robot can take its decision itself, if there is something in front of the robot it will change its direction. The robot first scans the left and right direction and it will move to the direction in which it finds more free space.

Now, let's do an activity and understand how an ultrasonic sensor works.

ACTIVITY BEGINS

Slide 9 - SA- I and TA1- Tinkercad

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

Teacher shares her Tinkercad screen and performs the activity by following the steps given below .

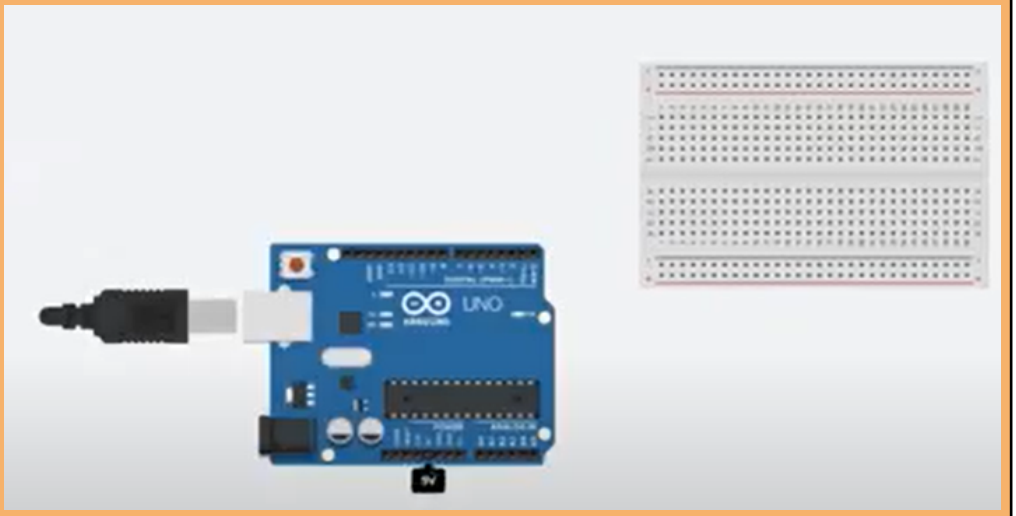
TA1 STARTS: Interfacing ultrasonic sensor with Arduino

Goal: To understand the pin configuration of an ultrasonic sensor and how to connect it to the Arduino UNO board and program the same.
Task: Design a circuit in Tinkercad using ultrasonic sensor and Arduino board to understand how the distance is being measured by the sensor.

Steps:
Step 1: Login to Tinkercad.
www.tinkercad.com

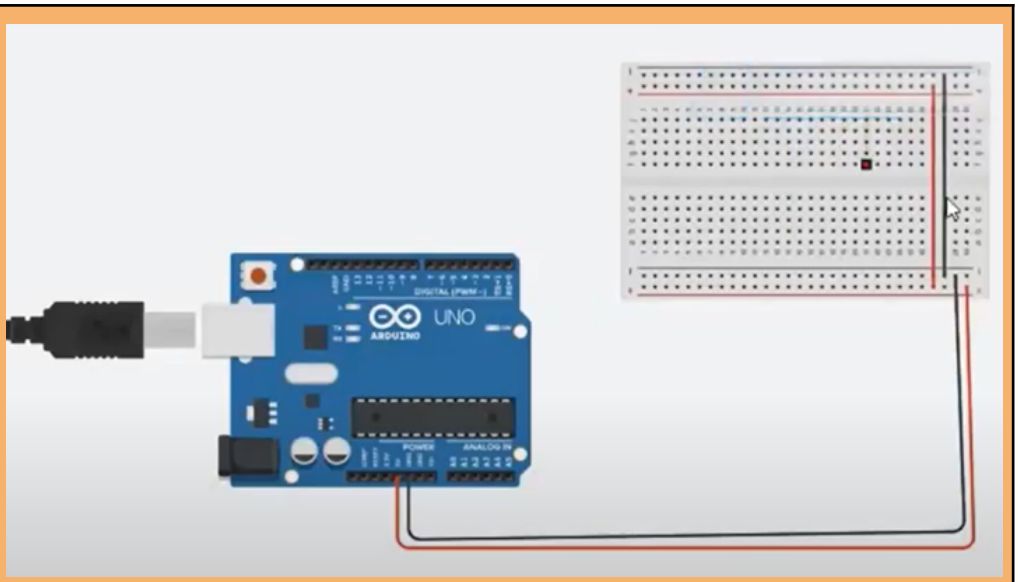
Step 2: Click on circuits and create a new circuit.

Step 3: Take an Arduino board and a breadboard from the list of components.



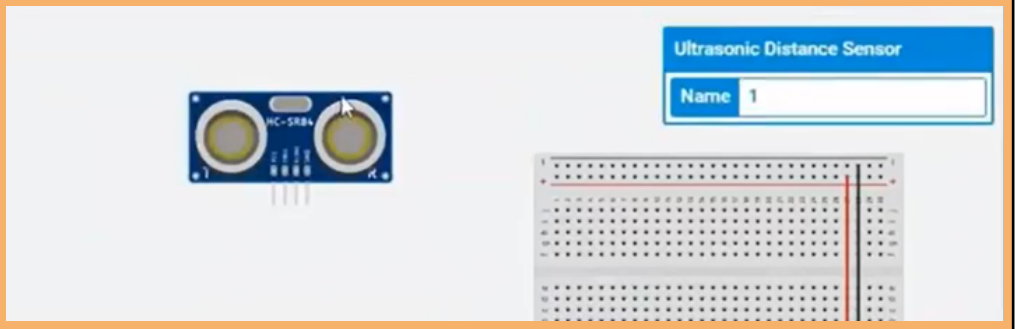
Step 4: Make the power and ground connections as shown below.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



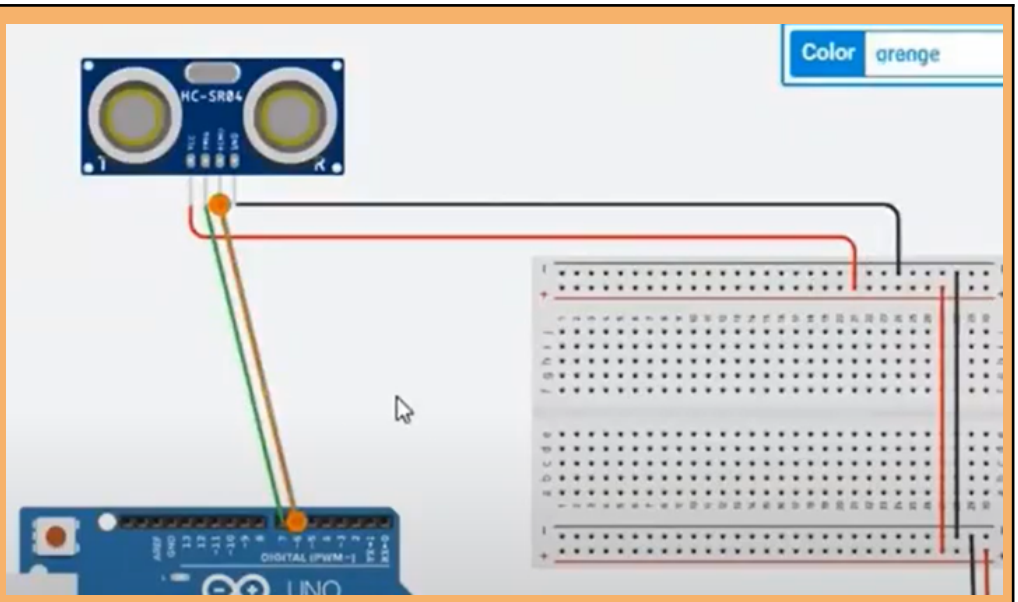
Connect the 5V pin of the Arduino to the positive rail of the breadboard and the GND pin to the negative rail of the breadboard.

Step 5: Drag and drop an ultrasonic sensor from the list of components.

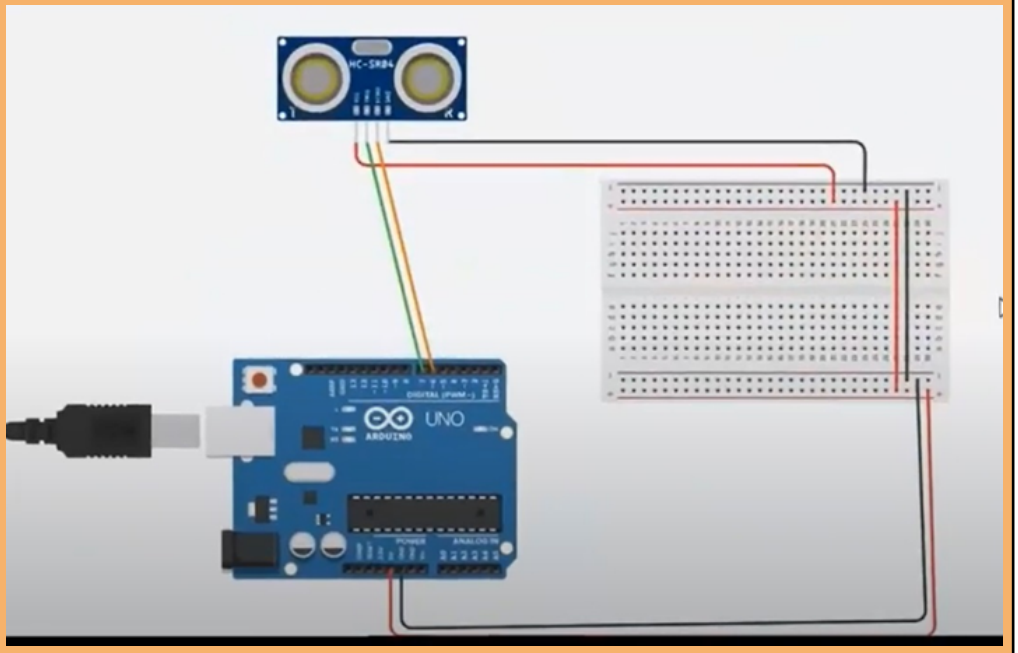


Step 6: Connect the ultrasonic sensor to the Arduino board. Vcc – positive rail of breadboard, GND – negative rail of the breadboard, TRIG - Pin 7 of Arduino, ECHO – Pin 6 of Arduino.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 7: The final circuit will resemble the image shown below.



Step 8: Click on code and type the below mentioned code.

```
int trig=7;
int echo=6;
long distance,duration;
void setup()
{
  Serial.begin(9600);
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
}
```


© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
void loop()
{
  digitalWrite(trig,LOW);
  delayMicroseconds(2);
  digitalWrite(trig,HIGH);
  delayMicroseconds(10); // Wait for 1000 millisecond(s)
  digitalWrite(trig, LOW);
  delayMicroseconds(10);
  duration=pulseIn(echo,HIGH);

  distance=((duration/2)/(29.1*2.5));
  Serial.print(distance);
  Serial.print(" cm approx. rounded.");
  Serial.println();
  Serial.println();
  delay(250);
}
```

Code Description:

```
int trig=7;
int echo=6;
long distance,duration;
```

We are initializing the trigger and echo pins. Trigger is connected to pin 7 and echo to pin 6. Define the variables distance and duration.

```
void setup()
{
  Serial.begin(9600);
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
}
```

Trigger pin will be set as output and echo pin will be set as input. As we will be using a serial monitor, we are setting the baud rate to 9600.

```
void loop()
{
```


© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
digitalWrite(trig,LOW);
delayMicroseconds(2);
digitalWrite(trig,HIGH);
delayMicroseconds(10); // Wait for 1000 millisecond(s)
digitalWrite(trig, LOW);
delayMicroseconds(10);
```

We are sending a signal by turning on the trigger pin. First trig will be low, which means no signal is being transmitted. Then we will turn it on to send a signal for 10ms and then turn it off.

```
duration=pulseIn(echo,HIGH);
```

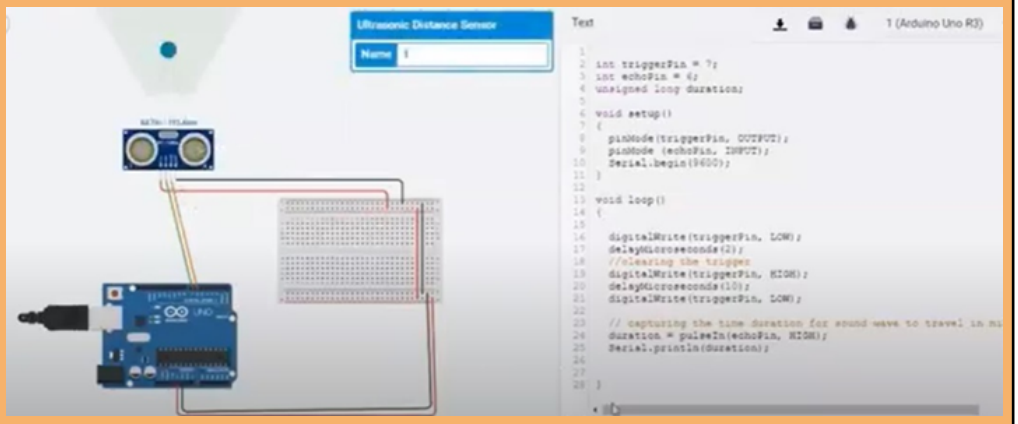
The time taken for the signal to come back is the duration.

```
distance=((duration/2)/(29.1*2.5));
```

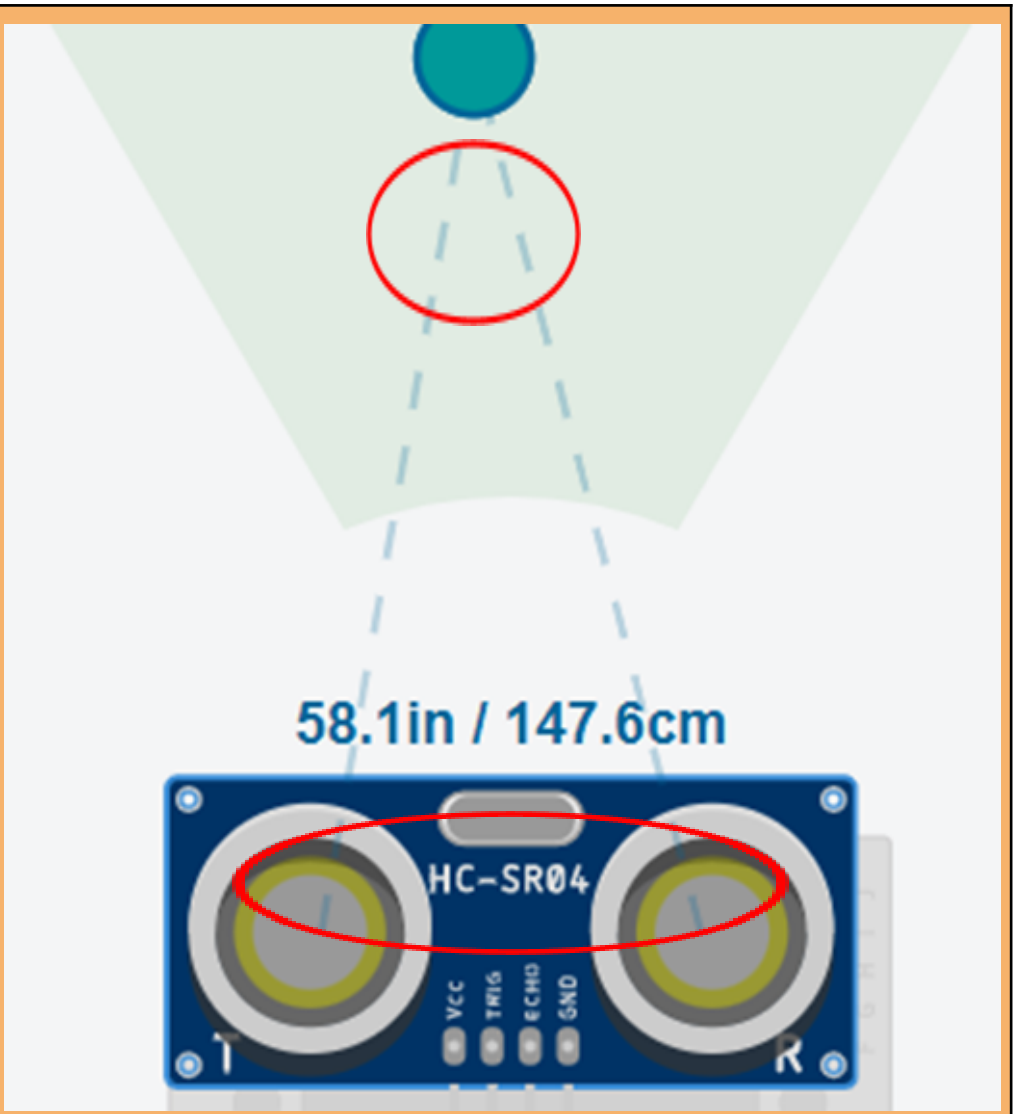
From the duration, the distance of the obstacle is calculated using the above formula.

Step 9: Click on start simulation.

Step 10: Click on the ultrasonic sensor to see the target area and the target. Click, hold and drag the target ball to move it. Observe the distance changing when the target/obstacle is moved.



© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 11: Click on the serial monitor at the bottom right of the Tinkercad screen to view the distance.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

1 (Arduino Uno R3)

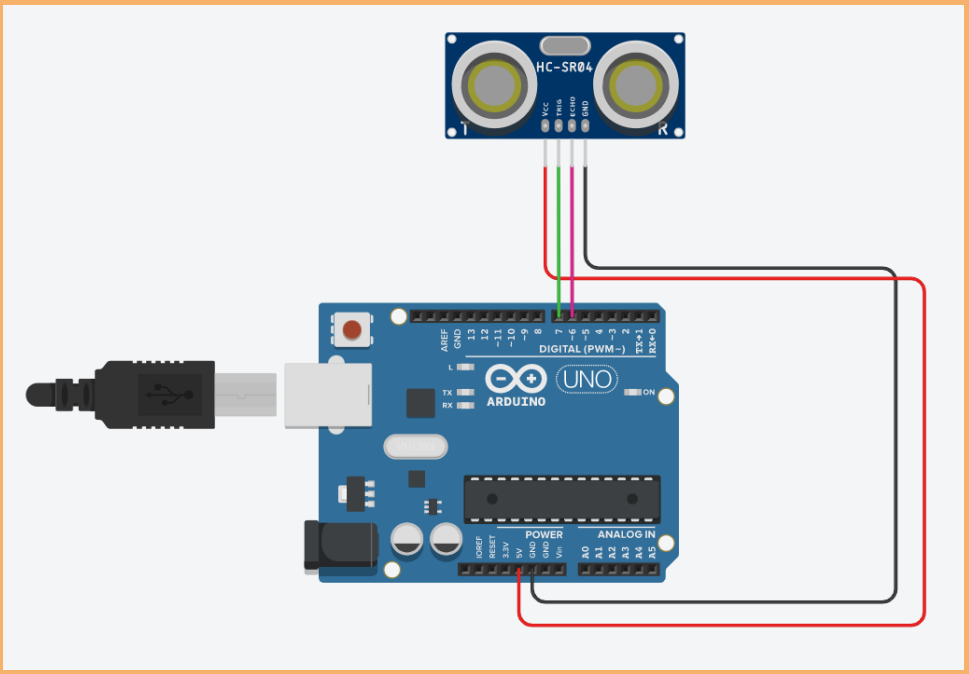
```
int trig=7;
int echo=6;
long distance,duration;
void setup()
{
  Serial.begin(9600);
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
}

void loop()
{
  digitalWrite(trig,LOW);
  delayMicroseconds(2);
  digitalWrite(trig,HIGH);
  delayMicroseconds(10); // Wait for 1000 millisecond(s)
  digitalWrite(trig, LOW);
  delayMicroseconds(10);
  duration=pulseIn(echo,HIGH);

  distance=((duration/2)/(29.1*2.5));
  Serial.print(distance);
  Serial.print(" cm approx. rounded.");
  Serial.println();
  Serial.println();
```

Serial Monitor

```
54 cm approx. rounded.

54 cm approx. rounded.

54 cm approx. rounded.

54 cm approx. rounded.
```

Send Clear

Note: The above activity can be performed without a breadboard also.



TA Link: https://www.tinkercad.com/things/e2IMzak90hm

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

Teacher stops sharing her screen and asks the student to share his/her screen to perform the activity.

SA1 STARTS: Interfacing ultrasonic sensor with Arduino

Teacher: Now you have understood the pin configuration of the ultrasonic sensor and how to interface it with the Arduino board. Hope that was interesting. Now it's your time. You are going to design your own circuit and see it working.

Are you excited?

Instruct the student to follow the same steps of TA1 and complete the circuit.

Note: Instruct the students to rename every circuit they create by clicking on the random name generated.

SA Link: https://www.tinkercad.com/things/5QWsCkU0Fko

Teacher: Well-Done Feature to motivate kids and maintain feel good factor in class

Teacher asks the student to stop sharing his/her screen and starts sharing her screen again for TA2.

TA2 STARTS: Social Distance Alert System

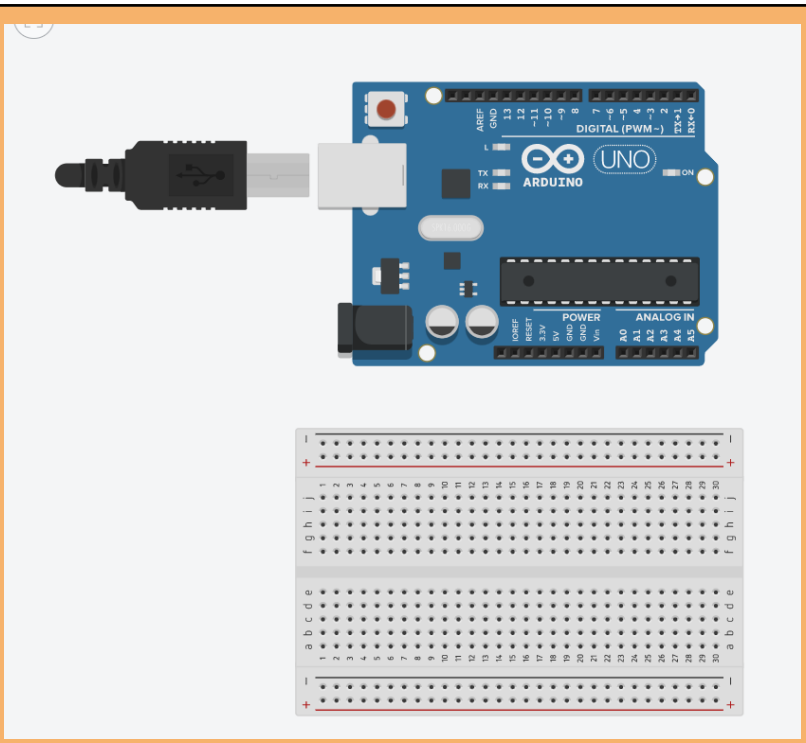
Goal: To understand how to use an ultrasonic sensor to design a social distance alert system.
Task: Design a circuit in Tinkercad using ultrasonic sensor, LED strip and Arduino board to make a social distance alert system.

Steps:
Step 1: Login to Tinkercad.
www.tinkercad.com

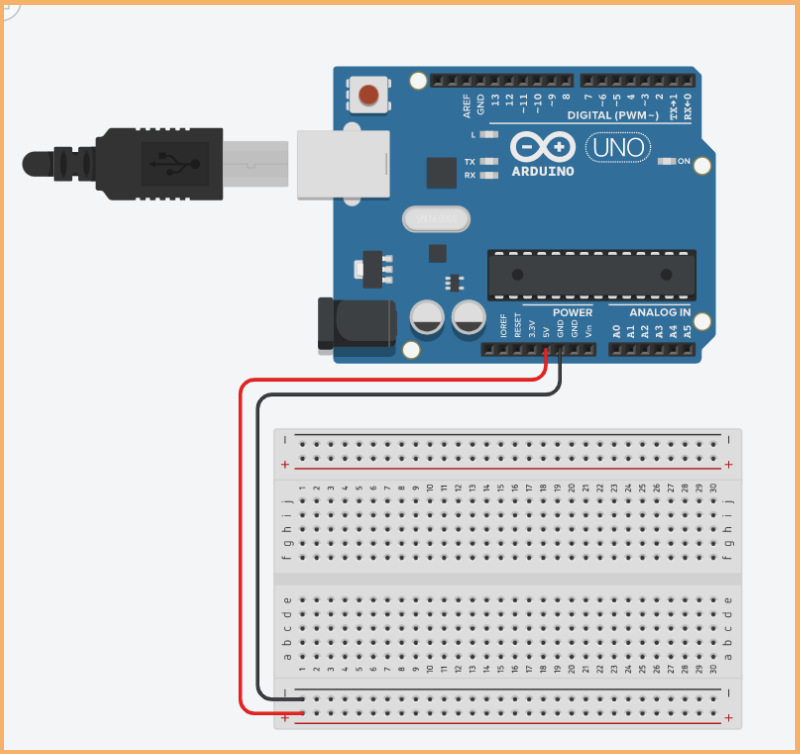
Step 2: Click on circuits and create a new circuit.

Step 3: Take an Arduino board and a breadboard and place it on the workplane.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

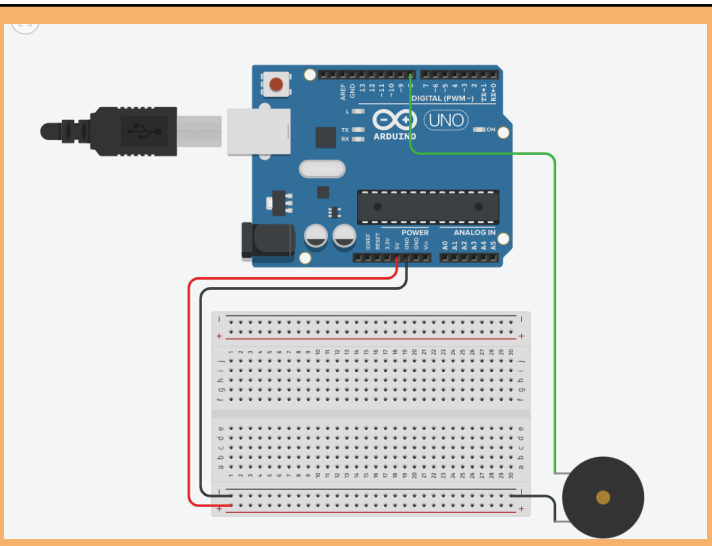


Step 4: Make the power and ground connections.

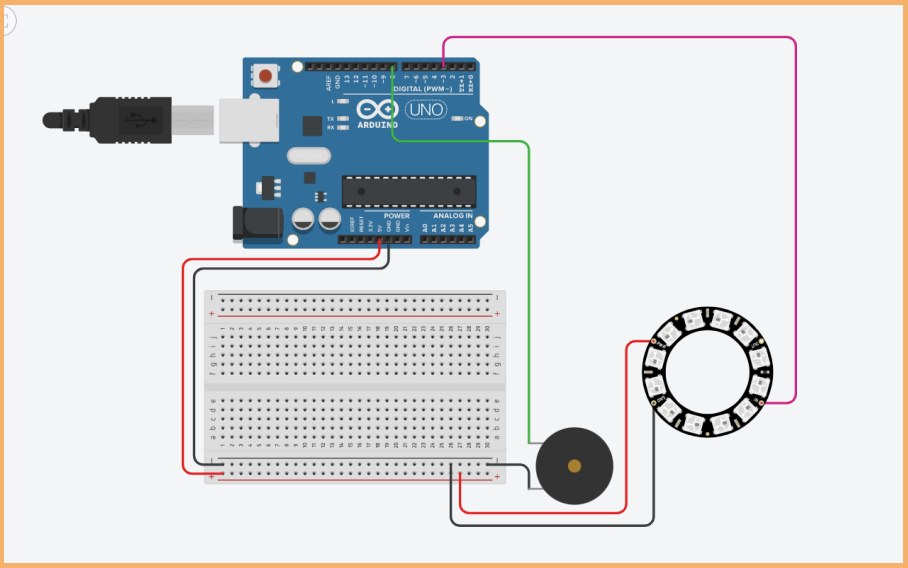


Step 5: Drag and drop a buzzer. Connect the positive of the buzzer to Pin 8 of Arduino and negative of the buzzer to negative of the breadboard.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

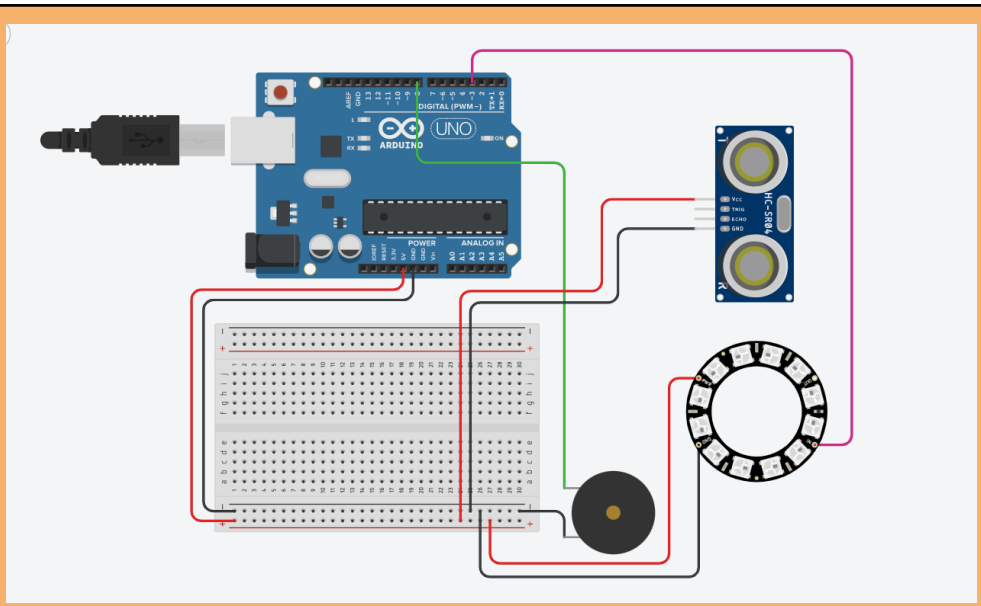


Step 6: Drag and drop an LED ring (NeoPixel Ring12). Connect Power of the LED ring to the positive of the breadboard. COnnect Ground of the LED ring to the negative of the breadboard. Connect input (IN) of LED Ring to Pin 3 of Arduino.

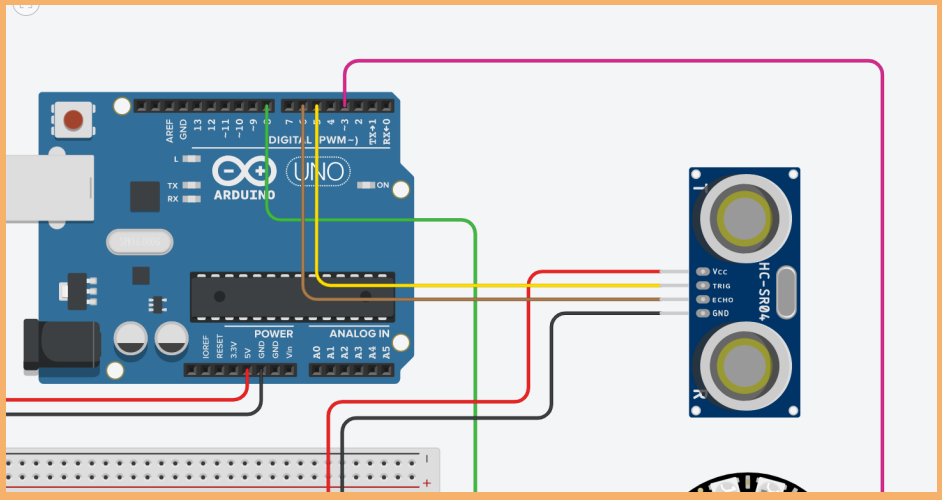


Step 7: Drag and drop an ultrasonic sensor. Connect the Vcc pin to the positive of the breadboard. Connect the GND pin of the ultrasonic sensor to the negative rail of the breadboard.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

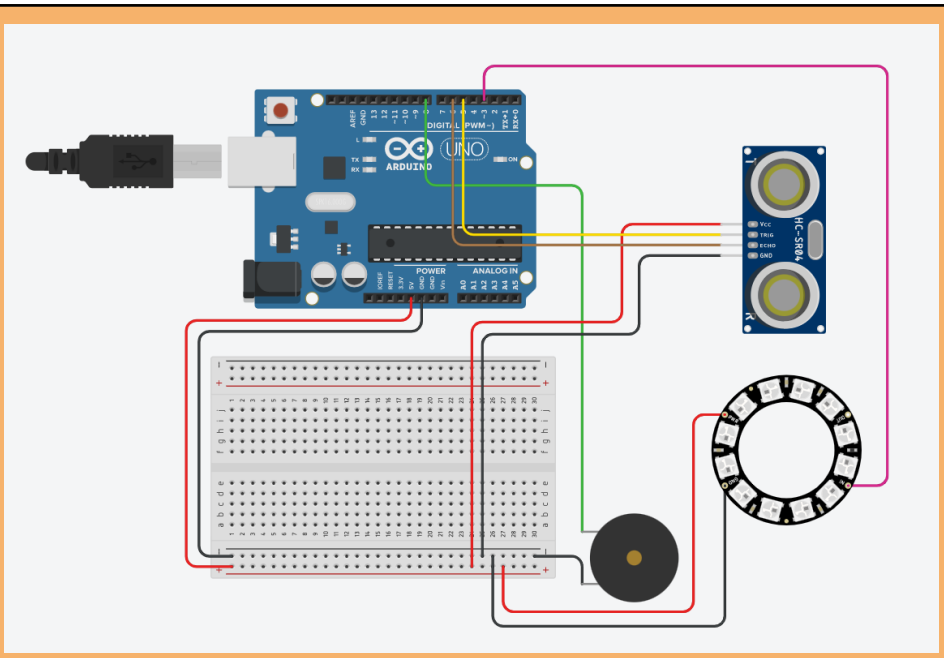


Step 8: Connect TRIG pin to Pin 5 of Arduino and ECHO pin to Pin 6 of Arduino.



The entire circuit is given below for your reference.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 9: Click on code and type the code given below.

```
#include <Adafruit_NeoPixel.h>

int ledPin= 3;
int ledNo= 12;

Adafruit_NeoPixel strip=
Adafruit_NeoPixel(ledNo,ledPin,NEO_RGB+NEO_KHZ800);


int buzzerPin= 8;
int echoPin= 6;
int trigPin= 5;
int minDistance = 100;
int maxDistance = 300;

void setup()
{
  pinMode(buzzerPin, OUTPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial. begin(9600);
  strip.begin();
  for(int i = 0; i < ledNo; i++)
  {
   strip.setPixelColor(i,strip.Color(0,0,0));
  }
  strip.show();
}
```


© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
void loop()
{
  int distance = calcDistance();
  Serial.println(distance);
  int ledsToGlow = map(distance, minDistance, maxDistance, ledNo, 1);
  Serial.println(ledsToGlow);
  if(ledsToGlow == 12)
  {
    digitalWrite(buzzerPin, HIGH);
  }
  else
  {
    digitalWrite(buzzerPin, LOW);
  }
  for(int i = 0; i < ledsToGlow; i++)
  {
    if(i < 4)
    {
      strip.setPixelColor(i,strip.Color(50,0,0));//green,red,blue
    }
    else if(i >= 4 && i < 8)
    {
      strip.setPixelColor(i,strip.Color(50,50,0));//green,red,blue
    }
    else if(i >= 8 && i < 12)
    {
      strip.setPixelColor(i,strip.Color(0,50,0));//green,red,blue
    }
  }
  for(int i = ledsToGlow; i < ledNo; i++)
  {
    strip.setPixelColor(i,strip.Color(0,0,0));
  }
  strip.show();
  delay(50);
}

int calcDistance()
{
  long distance,duration;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration/29/2;
```


© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
  if(distance >= maxDistance)
  {
    distance = maxDistance;
  }
  if(distance <= minDistance)
  {
    distance = minDistance;
  }
  return distance;
}
```

Code Description:

```
#include <Adafruit_NeoPixel.h>

int ledPin= 3;
int ledNo= 12;

Adafruit_NeoPixel strip=
Adafruit_NeoPixel(ledNo,ledPin,NEO_RGB+NEO_KHZ800);
```

We should include the library as we are using NeoPixel LED rings. Above lines of code will set the pin to which the LED strip is connected (Pin 3) and also the number of LEDs. We have 12 LEDs in the ring.

```
int buzzerPin= 8;
int echoPin= 6;
int trigPin= 5;
int minDistance = 100;
int maxDistance = 300;
```

We are initializing the pins for buzzer, echo, trigger. They are connected to Pins 8, 6 and 5 of the Arduino board respectively. Also minimum distance is set as 100 cms and maximum distance is set as 30 cms.

```
void setup()
{
  pinMode(buzzerPin, OUTPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial. begin(9600);
  strip.begin();
```

We are initializing the input and output pins. Sensor's echo pin is the input

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

and the Trigger and buzzer pins are set as output.

```
  for(int i = 0; i < ledNo; i++)
  {
   strip.setPixelColor(i,strip.Color(0,0,0));
  }
  strip.show();
}
```

Initially the number of LEDs that glow (ledNO) will be zero. With decreasing distance, the above loop will increase the number of LEDs glowing.

```
void loop()
{
  int distance = calcDistance();
  Serial.println(distance);
  int ledsToGlow = map(distance, minDistance, maxDistance, ledNo, 1);
  Serial.println(ledsToGlow);
```

The above loop will calculate the distance and tell how many LEDs should glow. Based on the calculated distance the number of LEDs that should glow will be determined. Calculating the distance function is defined at the end of this code.

```
  if(ledsToGlow == 12)
  {
    digitalWrite(buzzerPin, HIGH);
  }
  else
  {
    digitalWrite(buzzerPin, LOW);
  }
```

The above code will give us the condition under which the buzzer will be turned ON and OFF. If all the 12 LEDs glow, the buzzer will be turned ON. If not, the buzzer will be turned OFF.

```
  for(int i = 0; i < ledsToGlow; i++)
  {
    if(i < 4)
    {
      strip.setPixelColor(i,strip.Color(50,0,0));//green,red,blue
    }
```

When the distance is safe, 4 green LEDs should glow. So when the number of LEDs that glow are 4 and below, the color will be green.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
    else if(i >= 4 && i < 8)
    {
      strip.setPixelColor(i,strip.Color(50,50,0));//green,red,blue
    }
```

Next 4 LEDs are yellow. So when the number of LEDs that glow are between 5 and 8, Red and Green colors will be enabled so that we can see yellow light.

```
    else if(i >= 8 && i < 12)
    {
      strip.setPixelColor(i,strip.Color(0,50,0));//green,red,blue
    }
```

When the distance is very less, the red LED should glow and so we pass the value RED. If the number of LEDs that glow are between 9 and 12, RED LEDs will glow.

```
  }
  for(int i = ledsToGlow; i < ledNo; i++)
  {
    strip.setPixelColor(i,strip.Color(0,0,0));
  }
  strip.show();
  delay(50);
}

int calcDistance()
{
  long distance,duration;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration/29/2;
```

The above loop is to calculate the distance. Trigger pin will send the signal and the echo pin will receive it. Based on the time taken for the signal to come back, the distance is calculated.

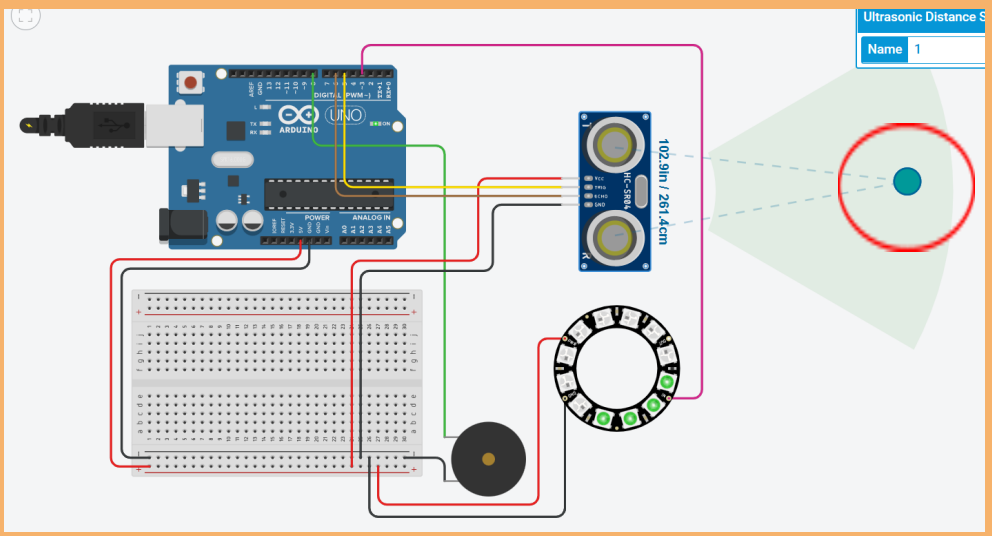
```
  if(distance >= maxDistance)
  {
    distance = maxDistance;
  }
  if(distance <= minDistance)
```


© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

```
  {
    distance = minDistance;
  }
  return distance;
}
```

Try to remember that we set the minimum and maximum distance in the beginning. Any value that is greater than maximum distance will be considered as 300. Any value that is lesser than minimum distance will be considered as 100. The same value will be returned.

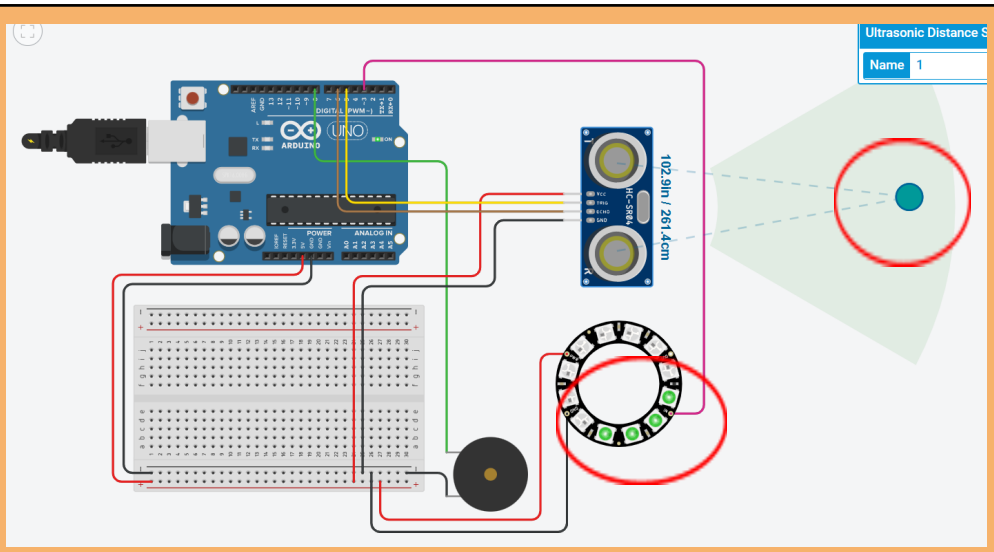
Step 10: Click on start simulation.
Step 11: Once you start the simulation, click on the ultrasonic sensor to see the sensing area and the target. Click, hold and drag the blue ball to move the target/person.



Step 12: Based on the distance between the target and the sensor, the LEDs will indicate if we are at a safe distance or not.

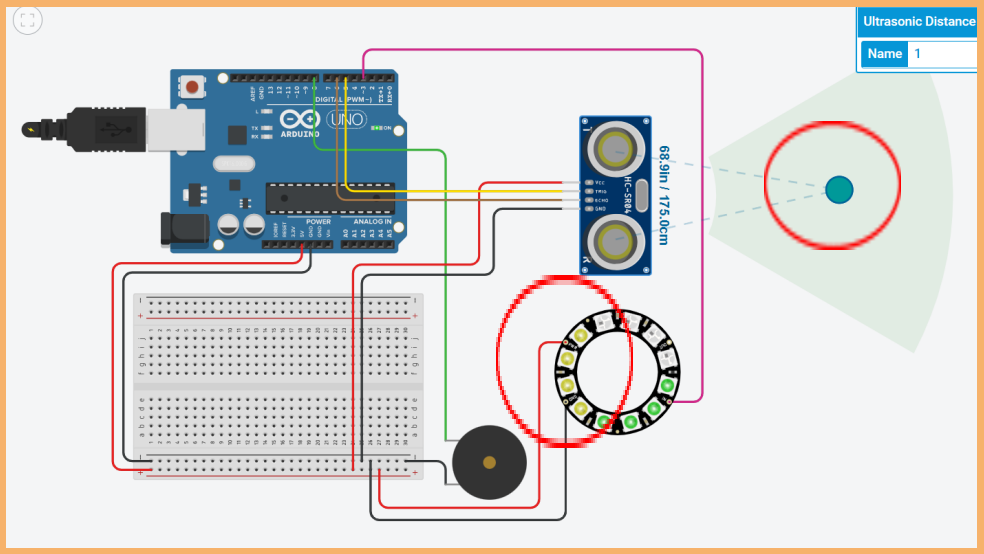
Case 1: When the person is at a safe distance:

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Result: Green LEDs will glow indicating that social distancing is being followed.

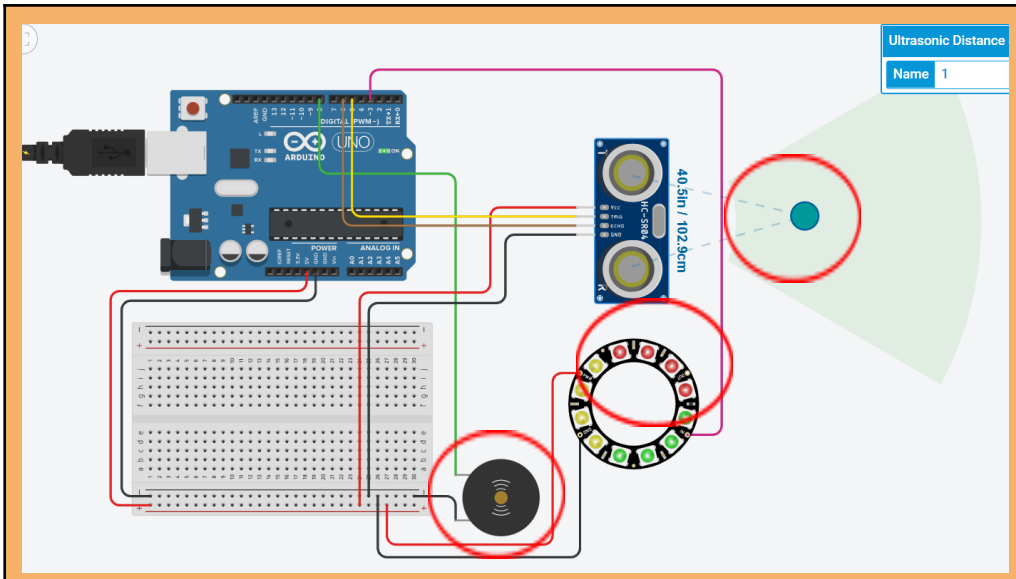
Case 2: When the person is moving closer to another person but not very close:



Result: Orange LEDs will glow indicating that you are about to break social distancing norms.

Case 3: When the person breaks social distancing norms:

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Result: Red LEDs will glow indicating that you are not following social distancing norms and the buzzer will also start ringing.

TA Link: https://www.tinkercad.com/things/iOd8iRyYp5L

Teacher stops sharing her screen and asks the student to share his/her screen to perform the activity.

SA2 STARTS: Social Distance Alert System

Teacher: Now you have understood how to connect an ultrasonic sensor to an Arduino board and program the same. Hope that was interesting. Now it's your time. You are going to design your own circuit and see it working.

Are you excited?

Instruct the student to follow the same steps of TA2 and complete the circuit.

Note: Instruct the students to rename every circuit they create by clicking on the random name generated.

SA Link: https://www.tinkercad.com/things/lNK3V1PaybH

Teacher: Well-Done Feature to motivate kids and maintain feel good factor in class

Teacher asks the student to stop presenting his/her screen and share her screen again.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

TA3 STARTS: ThingSpeak Platform

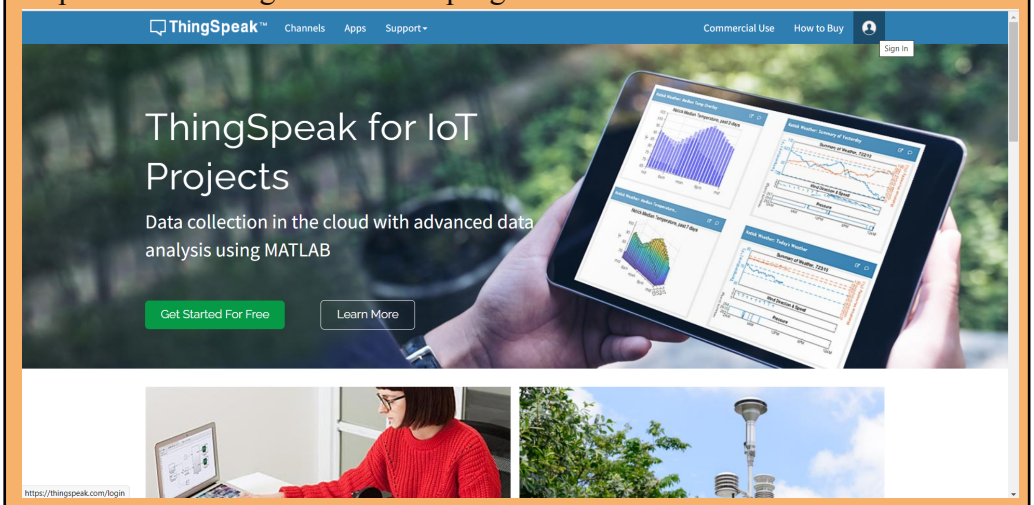
Goal: Expose themselves to the world of Internet of Things (IoT) and demonstrate its concept.

Task: Using ThingSpeak platform to understand the basic concepts of IoT by creating a Gauge channel.

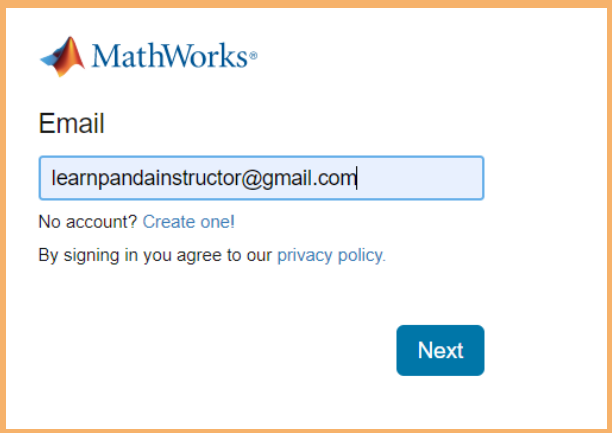
Steps:

Step 1: Use the below link to open the ThingSpeak Platform.
IoT Analytics - ThingSpeak Internet of Things

Step 2: Click on Sign In on the top right corner of the screen.

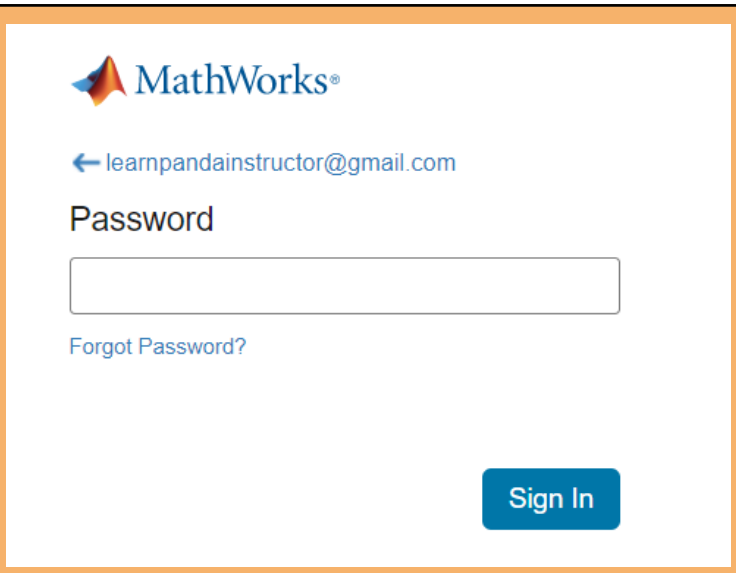


Step 3: Enter your email for which you created an account last class and click on Next.

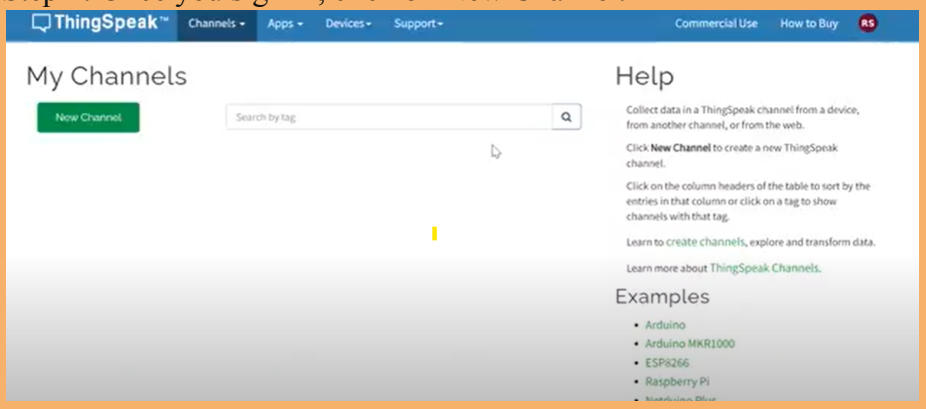


Step 3: Enter your password and click on Next.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

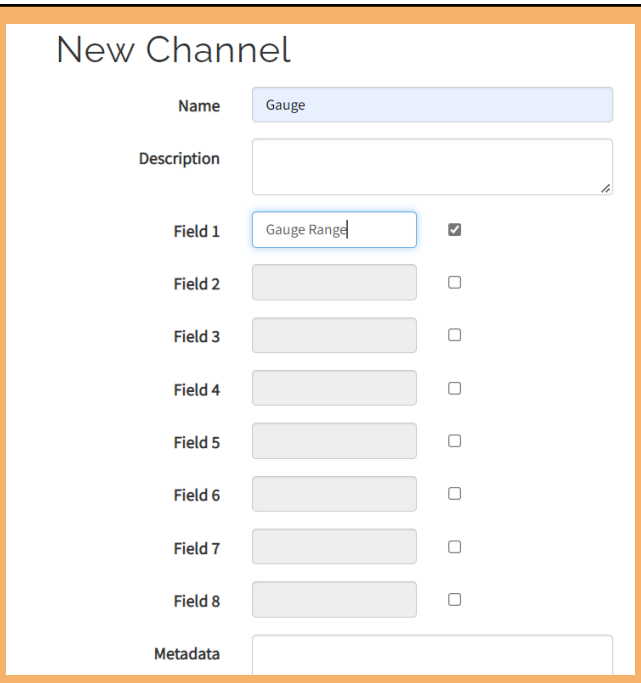


Step 4: Once you sign in, click on New Channel.

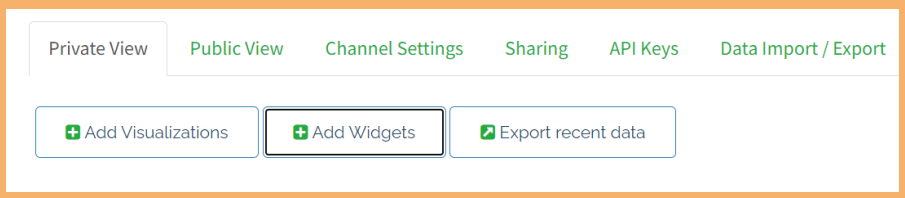


Step 5: Give a channel name and enter details in Field 1. Scroll down and click on save channel.

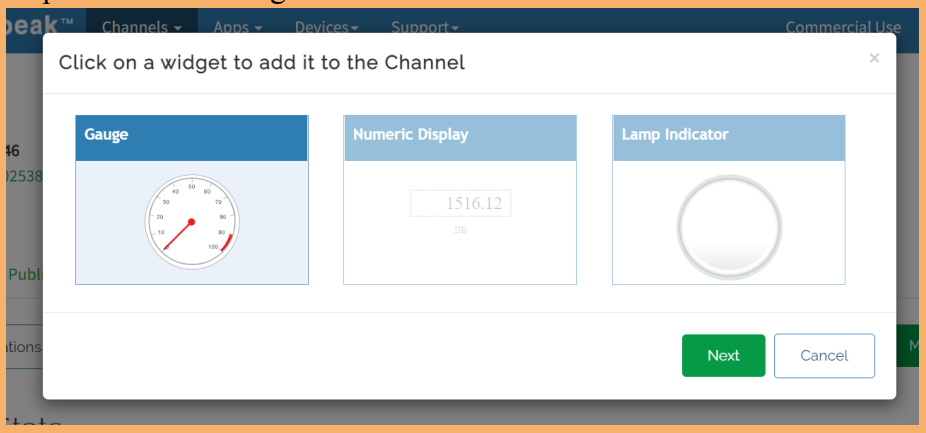
© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 6: Click on Add Widgets.

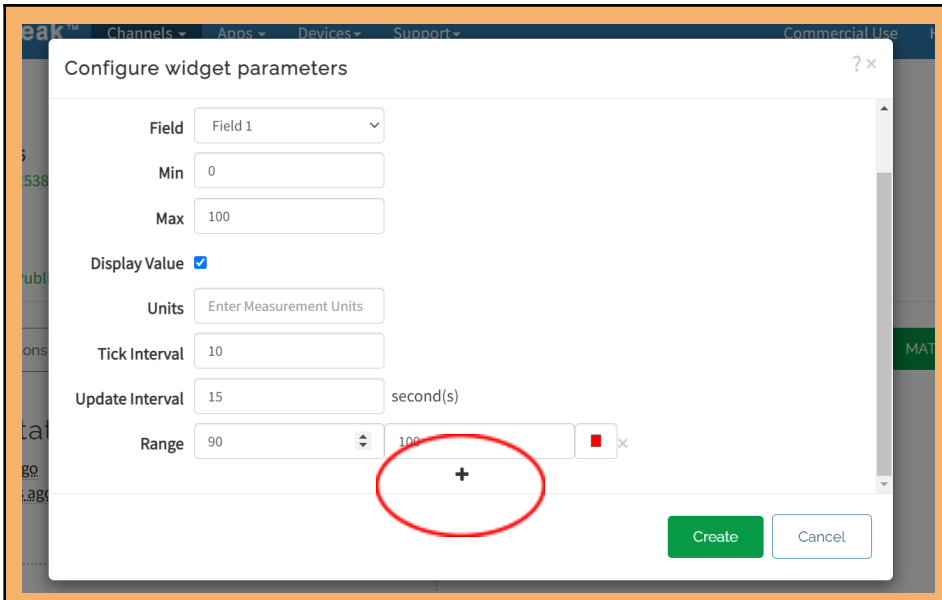


Step 7: Click on Gauge and click Next.



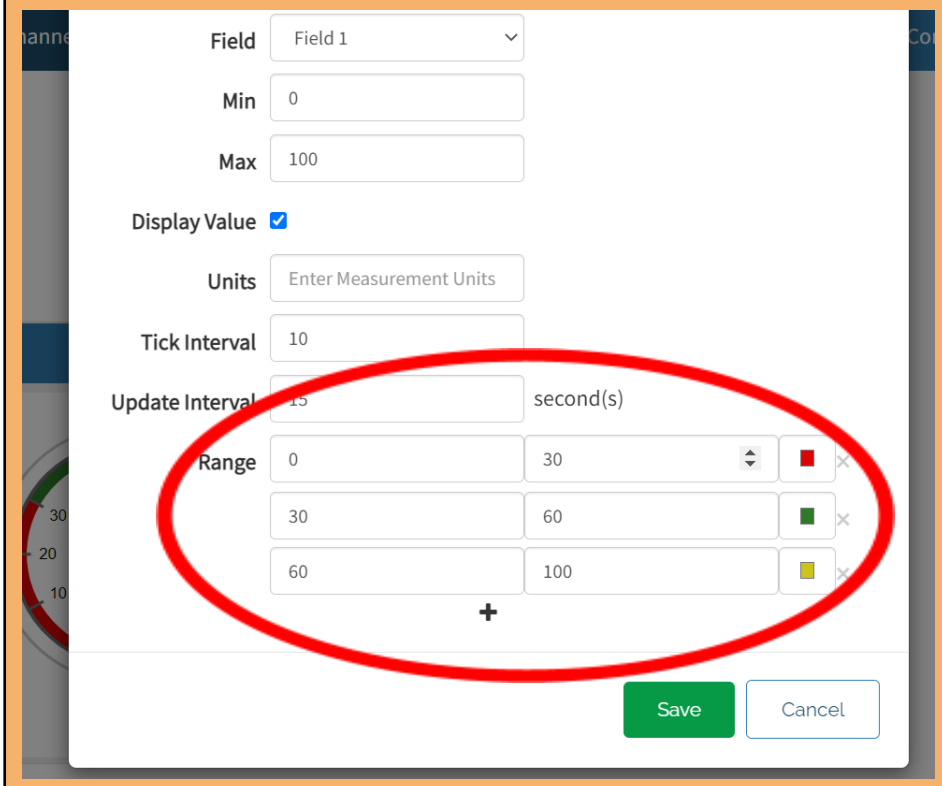
Step 8: The below screen will appear.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



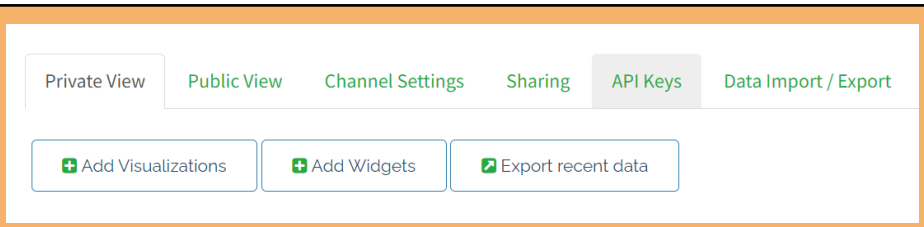
Click on the '+' sign below the range to define the range of the Gauge.

Step 9: Add the ranges as shown in the below image and change the color of it and click save.

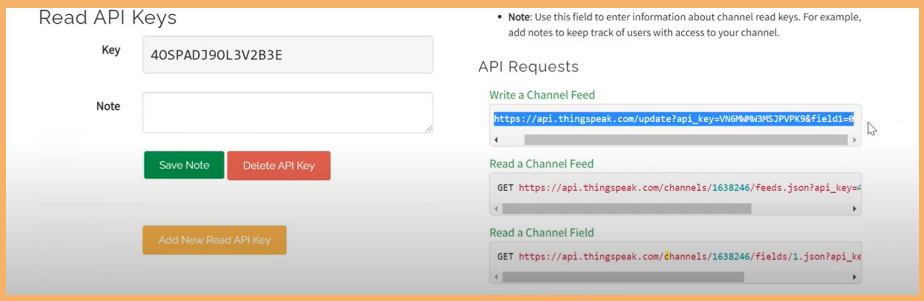


Step 10: Click on API Keys.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 11: Scroll down and copy the API request.

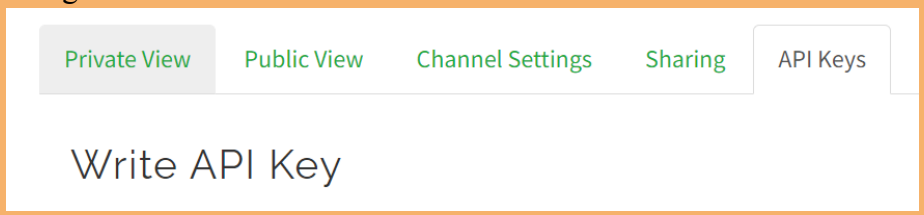


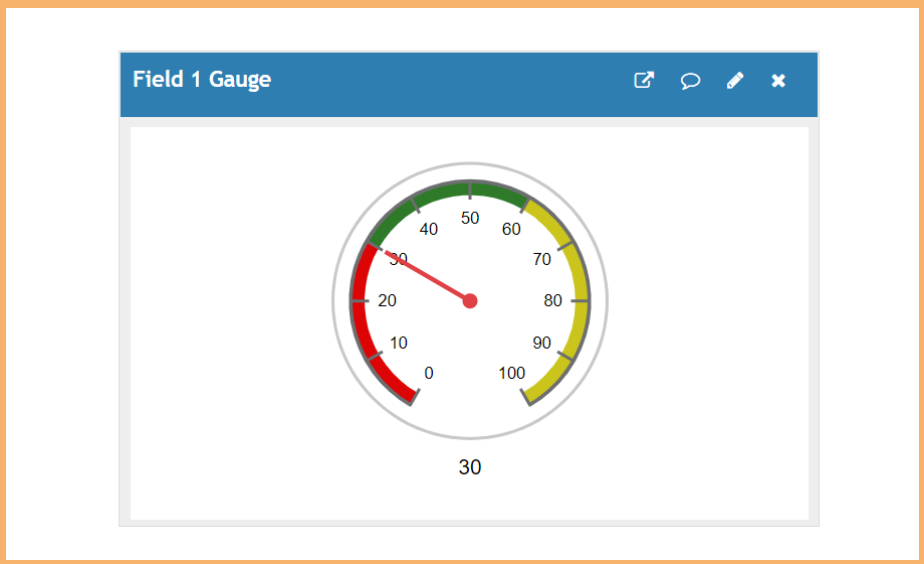
Step 12: Open a new tab in your browser and paste the copied API request.

https://api.thingspeak.com/update?api_key=VN6MWMW3MSJPVPK9&field1=0

Step 13: You can change the last value from 0 to 30.

Step 14: Go back to ThingSpeak and click on the Private view to view the changes made.





© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

You will see the value that you have entered. You can change the values from 0 to 100 to observe the changes in the gauge.

Teacher stops sharing her screen and asks the student to share his/her screen to perform the activity.

SA3 STARTS: ThingSpeak

Teacher: Now you have understood how the devices connected in IoT communicate with each other. Hope that was interesting. Now it's your time. Let's do the activity to see it working.

Are you excited?

Instruct the student to follow the same steps of TA3 and complete the circuit.

Teacher: Well-Done Feature to motivate kids and maintain feel good factor in class

Teacher shares her Tinkercad screen and performs the activity by following the steps given below .

TA4 STARTS: Digital Ruler

Goal: Explain the usage of LCD 16*2 and how it is connected, hence students can use it in their project

Note: Teacher can directly open the Project solution link below and help students understand the connection and purpose of LCD 16*2

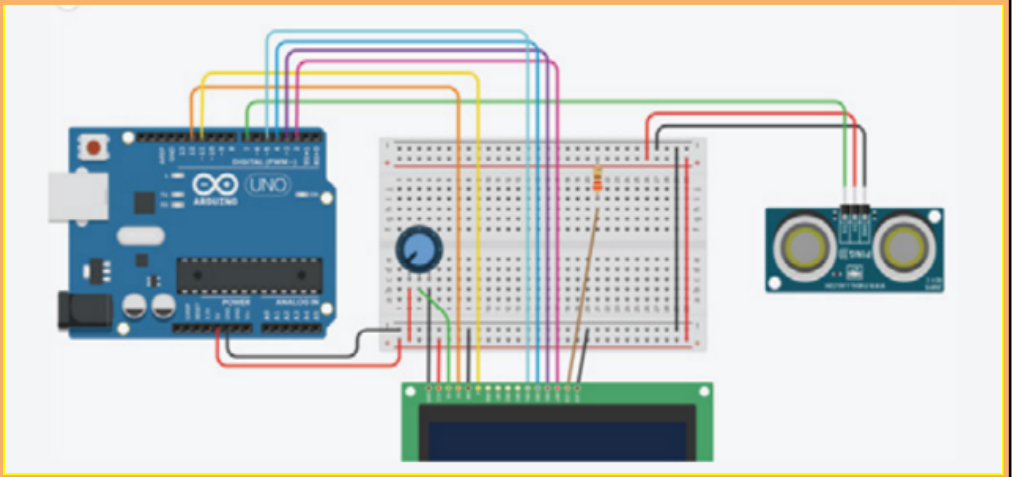
Teacher: An electronic device that is used to display data and the message is known as LCD 16×2. It can display 16 characters per line and there are 2 such lines.

Step1: Open the template code below
https://www.tinkercad.com/things/eAHSLHYkZsp-copy-of-fc-iot-l5-pa1-tc-projectsolution-digital-ruler/editel?tenant=circuits

Step 2: Complete the connection as shown below.

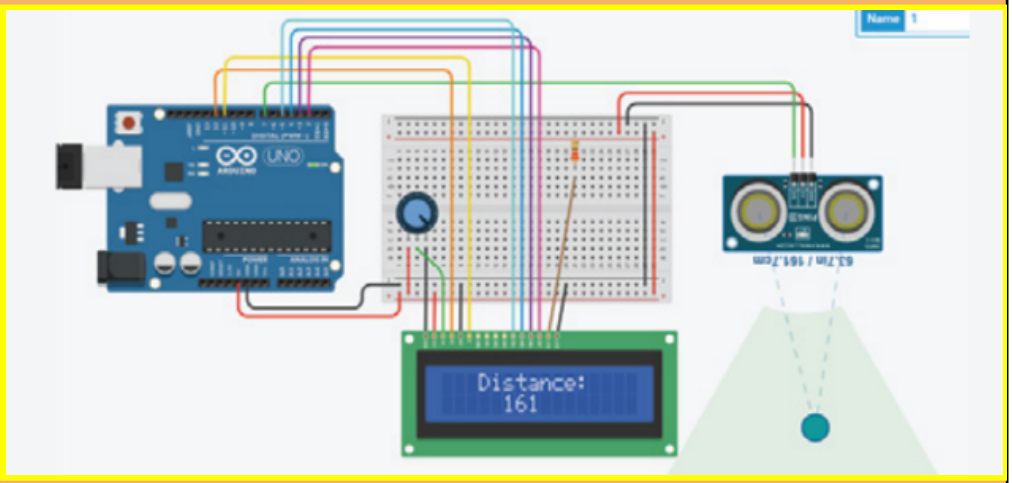
(Hint : - Note the connections. RS - 12, E-11, RW - negative rail of breadboard, DB4 - 5 , DB5 - 4, DB6 - 3 , DB7 - 2, DB0 to DB3 - no connections)

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.



Step 3:
Once the code is complete, click on start simulation.

Step 4:Once you click on start simulation, click on the ultrasonic sensor to see the target object. Click, hold and drag the blue colour circle to make it move to check the distance in the LCD display.



Teacher continues presenting the screen and complete wrap-up quiz and project explanation.

Slides 10,11,12: Wrap-up Quiz
Teacher encourages the students to participate in the wrap-up quiz.

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

NOTE: GUIDE THE STUDENTS TO USE THEIR CLASS NOTES EFFECTIVELY (WRAP-UP QUIZ AND CONCEPT NOTES) **Teacher will share the screen for project explanation.** **Slide 13: Project Explanation**	
PA Solution: **https://www.tinkercad.com/things/ilrq9J3mZBZ**	
Resources Links	
Teacher Activities(From this section no links to be shared with student during class or after class except student activities) 1. Visual Aid/PPT https://docs.google.com/presentation/d/1X3y9GpIbl8QOfTzmdHmAg9Vi_-ymWk8S6zFqnrB5sJg/edit#slide=id.g10bb6351686_0_0 2. Teacher Activities: Platform Links: 1. www.tinkercad.com 2. www.thingspeak.com a. TA1- Interfacing ultrasonic sensor with Arduino https://www.tinkercad.com/things/e2IMzak90hm b. TA2 - Social distance alert system https://www.tinkercad.com/things/iOd8iRyYp5L c. TA3 - ThingSpeak www.thingspeak.com d. TA4-Digital Ruler https://www.tinkercad.com/things/eAHSLHYkZsp-copy-of-fc-iot-l5-pa1-tc-projectsolution-digital-ruler/editel?tenant=circuits 3. Teacher Training video for class and project activity https://drive.google.com/file/d/1Zl67OUdEwWwDfUTSo8dd7rqW5EdXic4B/view?usp=sharing	

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

https://drive.google.com/file/d/1OCIwn2l3dCeNJf1qDOvFAKwVzZW_-pV9/view?usp=sharing

https://drive.google.com/file/d/1m0YFA7G0YH_QnDBlRL1zBUlHZricKB94/view?usp=sharing

https://drive.google.com/file/d/1Mz8IUQ5-M9_POQ1wAO9gw9XB5Ge7uiO5/view?usp=sharing

4. Teacher LP
https://docs.google.com/document/d/1zWC-NIXBGCxWZPHnJEqssj1W9HeKBowz/edit

5. Teacher Resources

https://docs.google.com/document/d/1l8LW-voMPLo7WS3qggX1u2Avg8rCyPQJYXIsFDnjYdI/edit

Student Activities

1. Tinkercad activities

Platform Links:

1. www.tinkercad.com
2. www.thingspeak.com

a. SA1- Interfacing ultrasonic sensor with Arduino
https://www.tinkercad.com/things/5QWsCkU0Fko

b. SA2 - Social distance alert system
https://www.tinkercad.com/things/lNK3V1PaybH

c. TA3 - ThingSpeak
www.thingspeak.com

Project
https://drive.google.com/file/d/1NC7yy-bxCLBuDiD_FnWjCY92De6-NeUe/view?usp=sharing

Abbreviations

- FC - Foundation Course

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.

- ESR - Expected student response
- TA- Teacher Activity
- SA-Student Activity
- LP - Lesson Plan
- VA - Visual Aid
- BA - Below Average
- AA - Above Average
- BS - Bright Student
- NS- Not to be shared

LEARNPANDA
Your future begins with us

© InnovEd K-12 Technologies Pvt. Ltd.
Not to be copied or shared without written permission.