



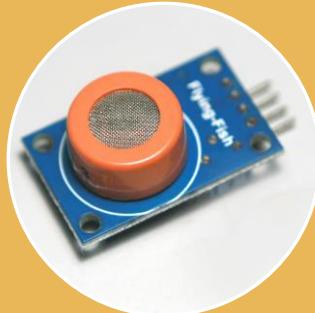
Railway Alarm System

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Topics to be covered



Objectives



Sensor
description



Circuits and working

- Object detection on railway track
- Railway crossing barrier
- Fire alarm system in train



Objective

- Object detection on track -used to detect the object on the track.
- The railway crossing barrier
- The gas alarm system that detects smoke and alert passengers.

SENSORS



1. Object detection on railway track :

Ultrasonic Distance Sensor (HC-SR04)

2. Railway crossing barrier :

Ultrasonic Distance Sensor (HC-SR04)

Force Sensor

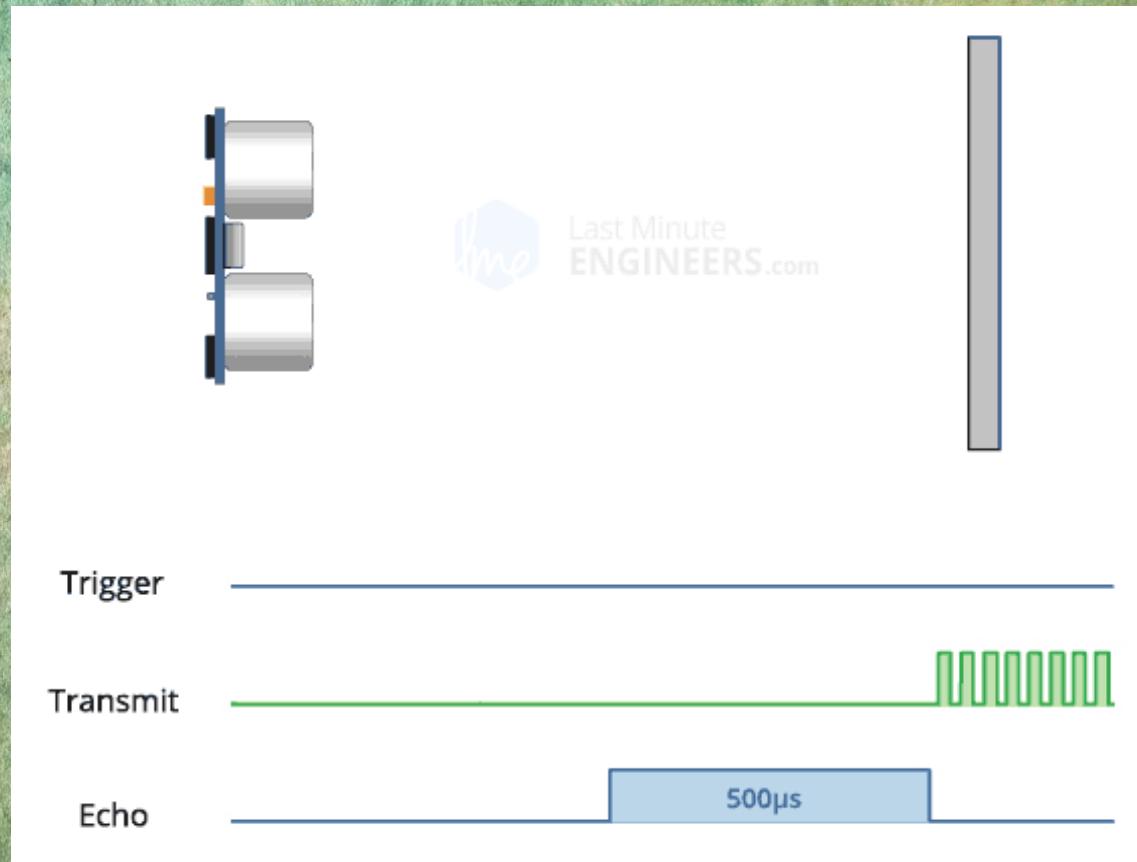


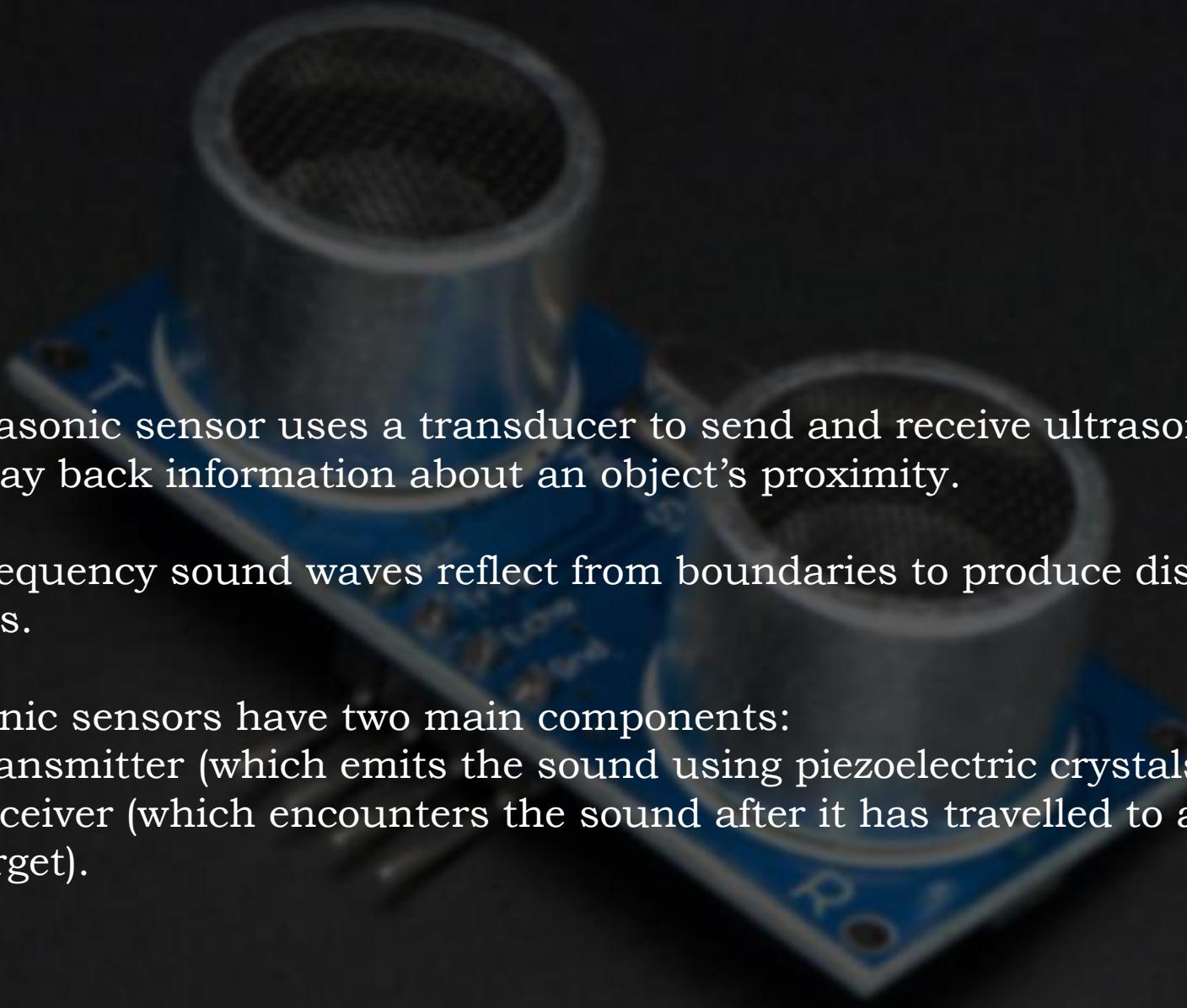
3. Fire alarm system in train :

Gas Sensor

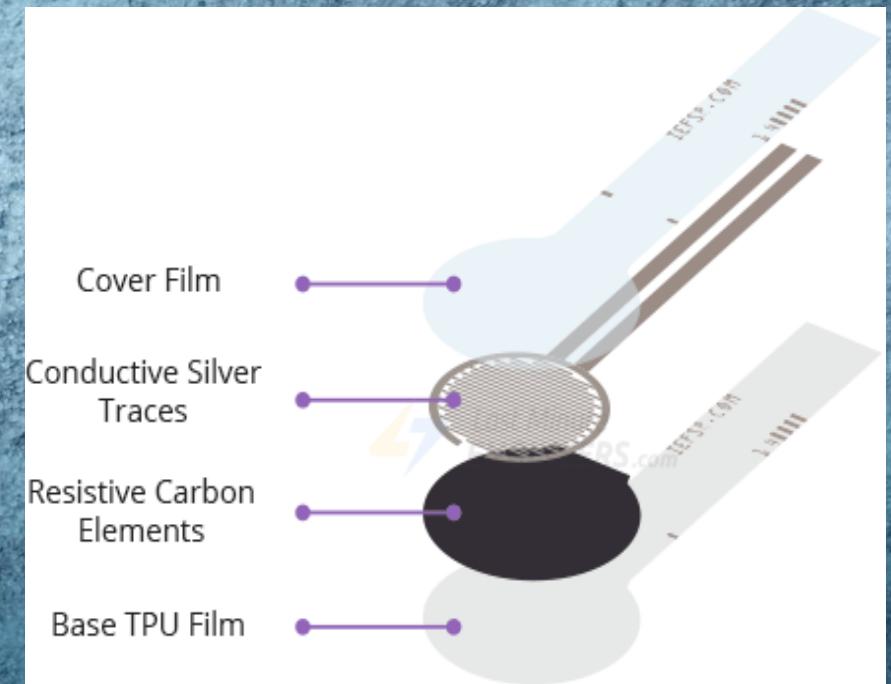
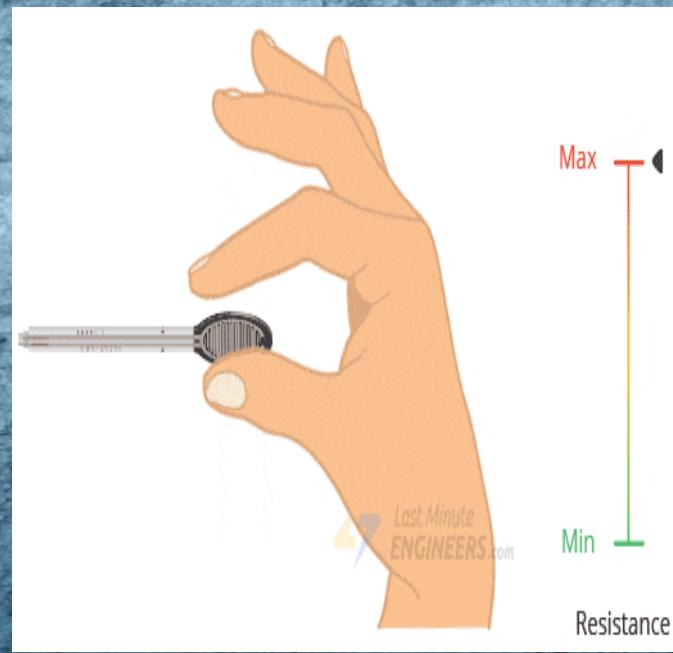
Ultrasonic Distance Sensor (HC-SR04)

$$\text{Distance} = 0.5 * \text{Time} * \text{Speed of sound}$$

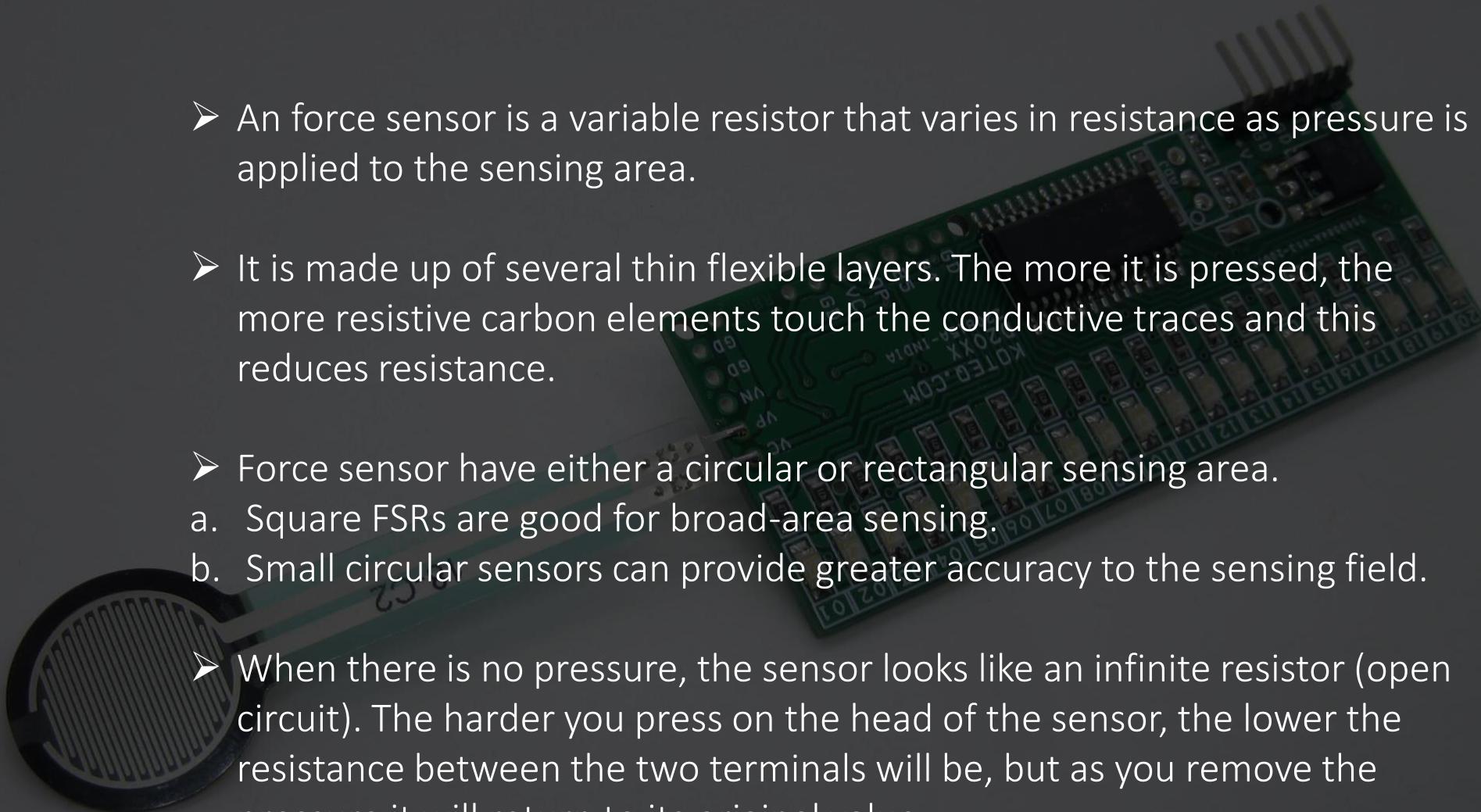


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- An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.
 - High-frequency sound waves reflect from boundaries to produce distinct echo patterns.
 - Ultrasonic sensors have two main components:
 - a. The transmitter (which emits the sound using piezoelectric crystals)
 - b. The receiver (which encounters the sound after it has travelled to and from the target).

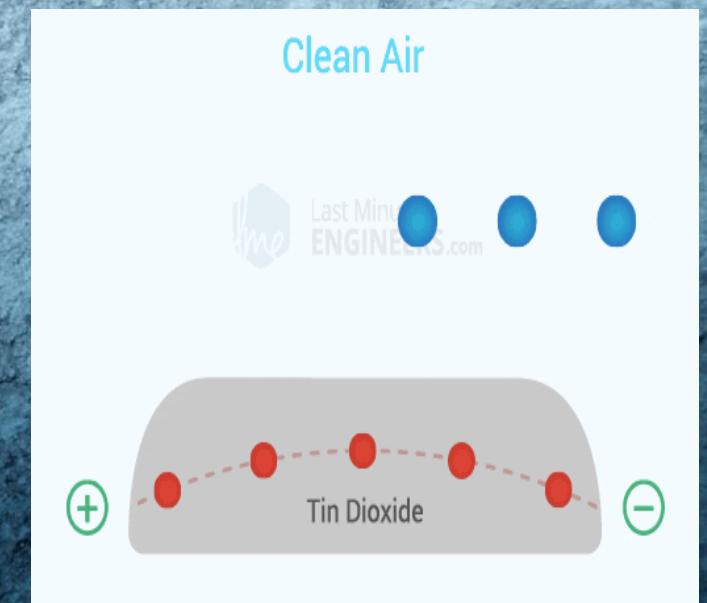
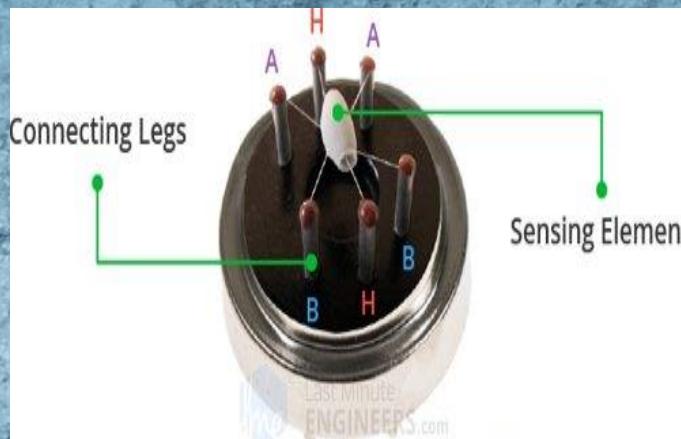
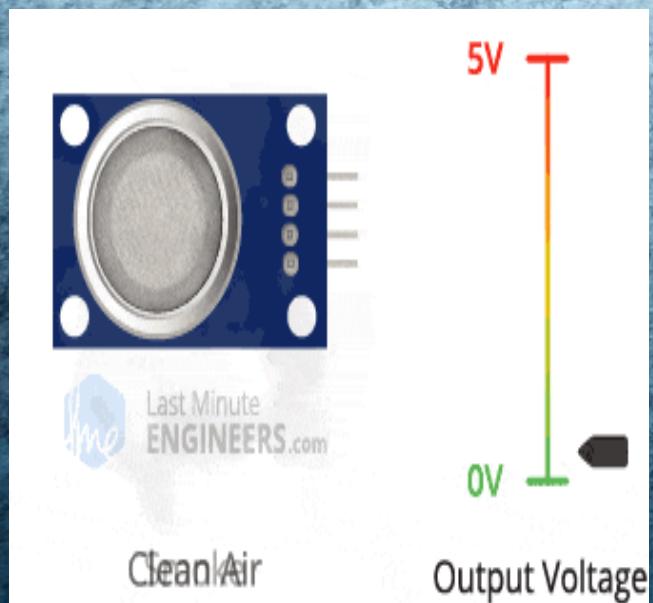
Force Sensor

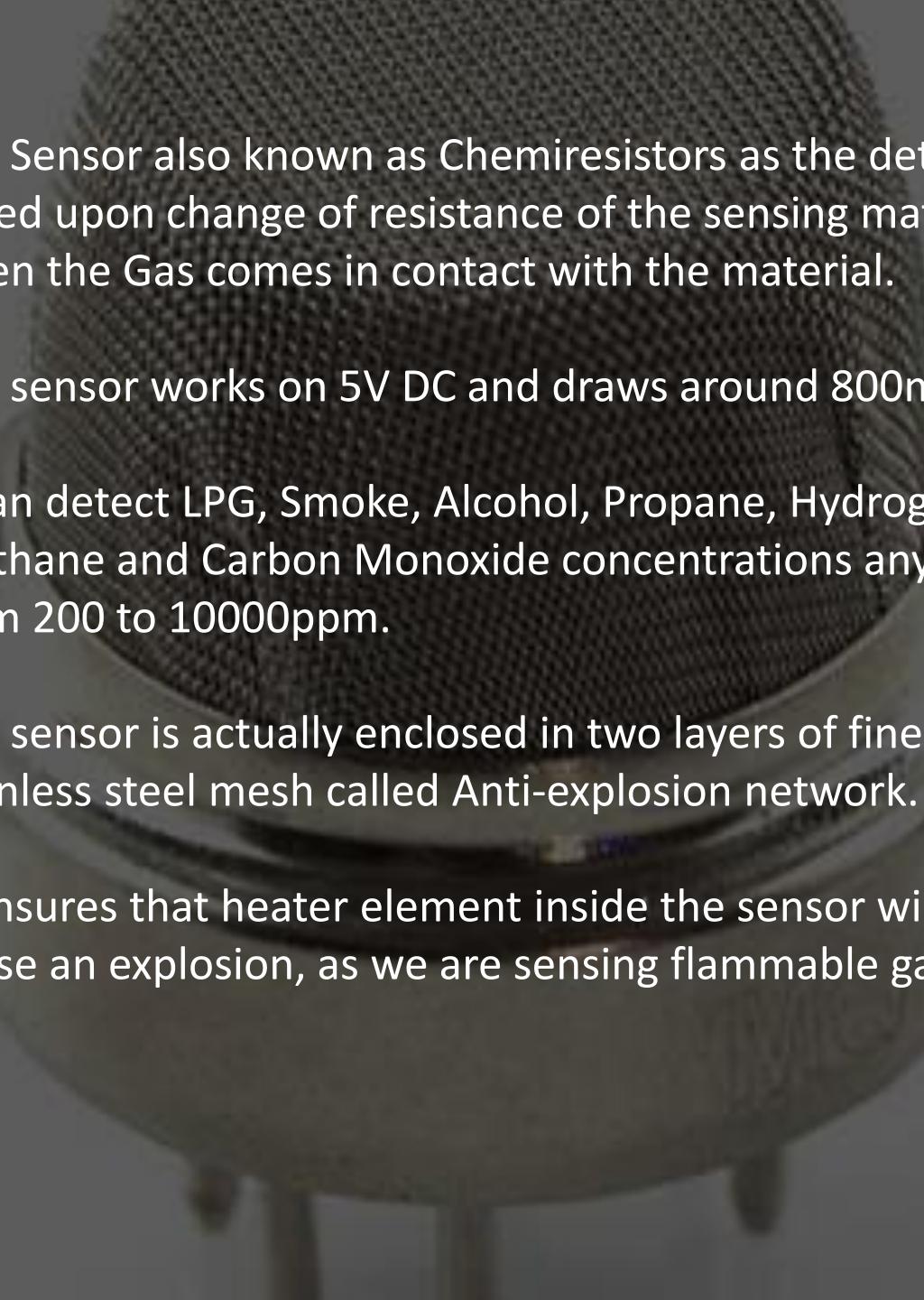


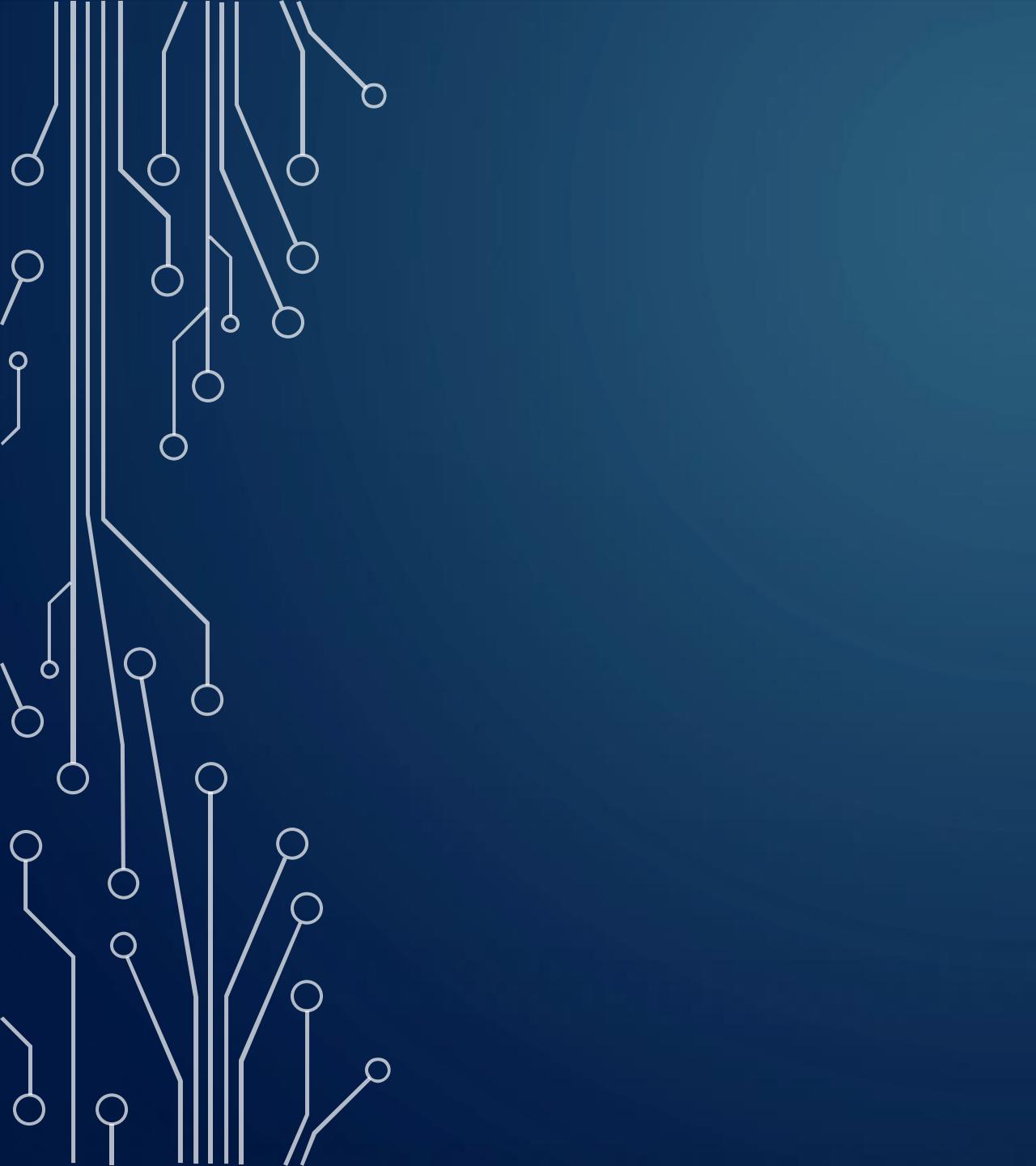
- An force sensor is a variable resistor that varies in resistance as pressure is applied to the sensing area.
- It is made up of several thin flexible layers. The more it is pressed, the more resistive carbon elements touch the conductive traces and this reduces resistance.
- Force sensor have either a circular or rectangular sensing area.
 - a. Square FSRs are good for broad-area sensing.
 - b. Small circular sensors can provide greater accuracy to the sensing field.
- When there is no pressure, the sensor looks like an infinite resistor (open circuit). The harder you press on the head of the sensor, the lower the resistance between the two terminals will be, but as you remove the pressure it will return to its original value.



Gas Sensor

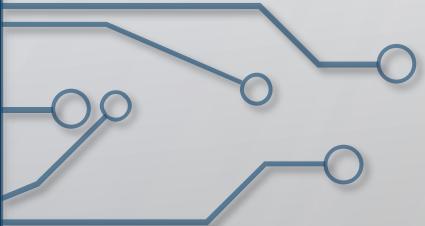
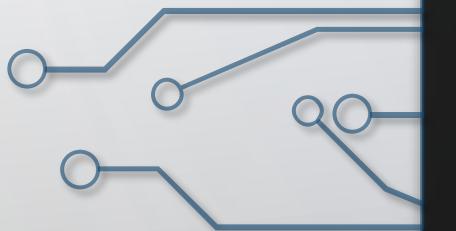


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- Gas Sensor also known as Chemiresistors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material.
 - Gas sensor works on 5V DC and draws around 800mW.
 - It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations anywhere from 200 to 10000ppm.
 - The sensor is actually enclosed in two layers of fine stainless steel mesh called Anti-explosion network.
 - It ensures that heater element inside the sensor will not cause an explosion, as we are sensing flammable gases.



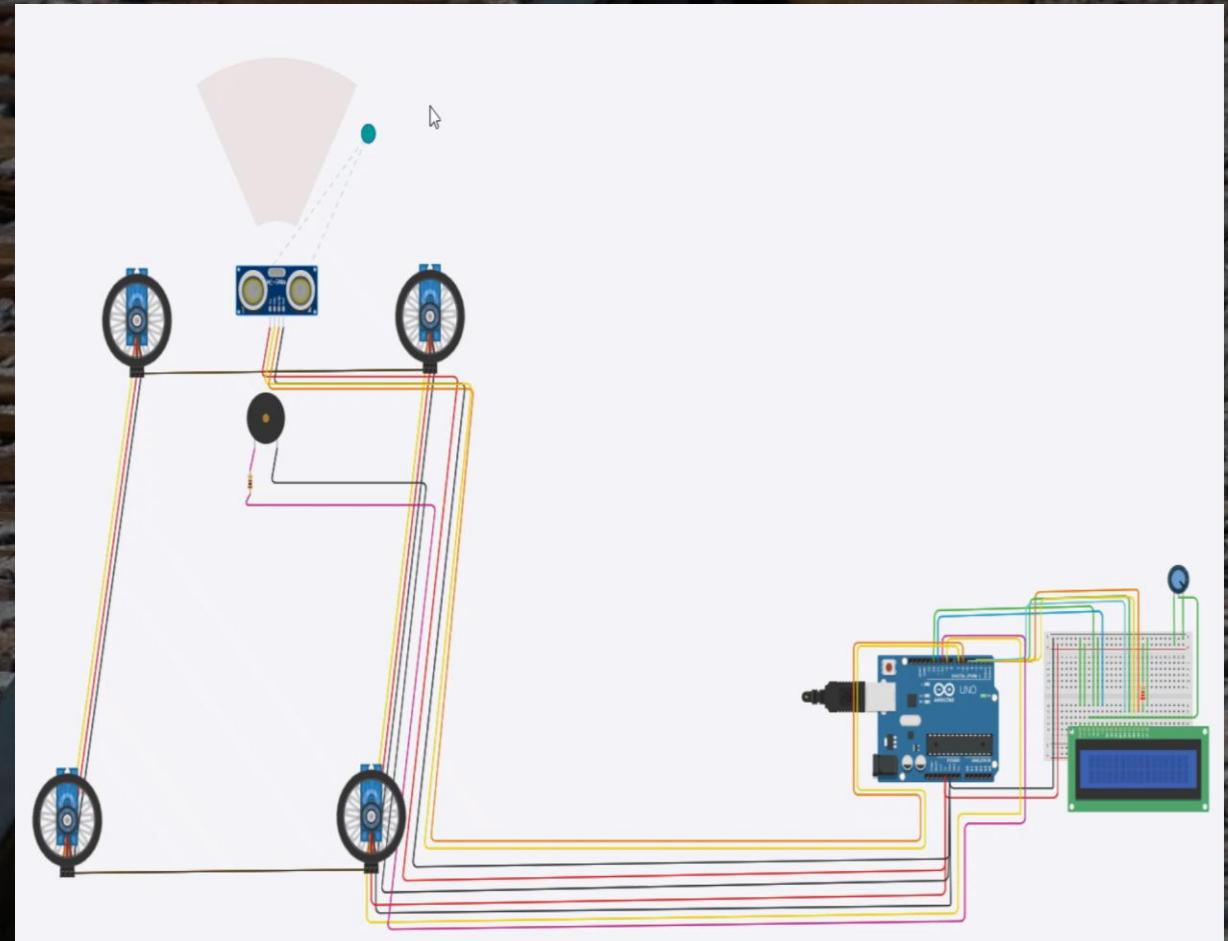
CIRCUITS

OBJECT DETECTION SYSTEM



Circuit components

- Arduino
- Lcd display
- buzzer
- Ultrasonic sensor
- Motors
- Potentiometer

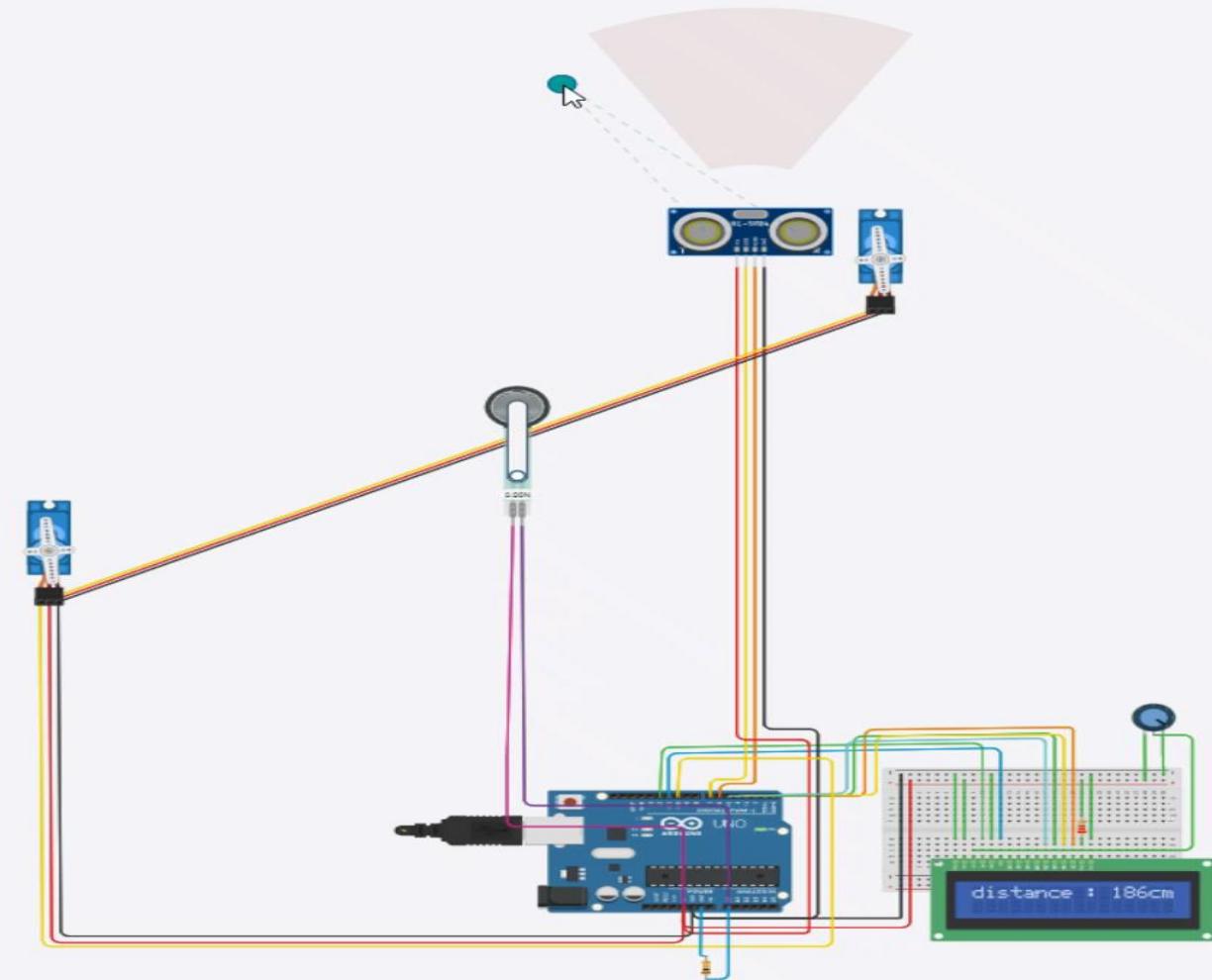




RAILWAY CROSSING BARRIER SYSTEM

Circuit components

- Arduino
- Lcd display
- Force sensor
- Ultrasonic sensor
- Motors
- Potentiometer and resistor

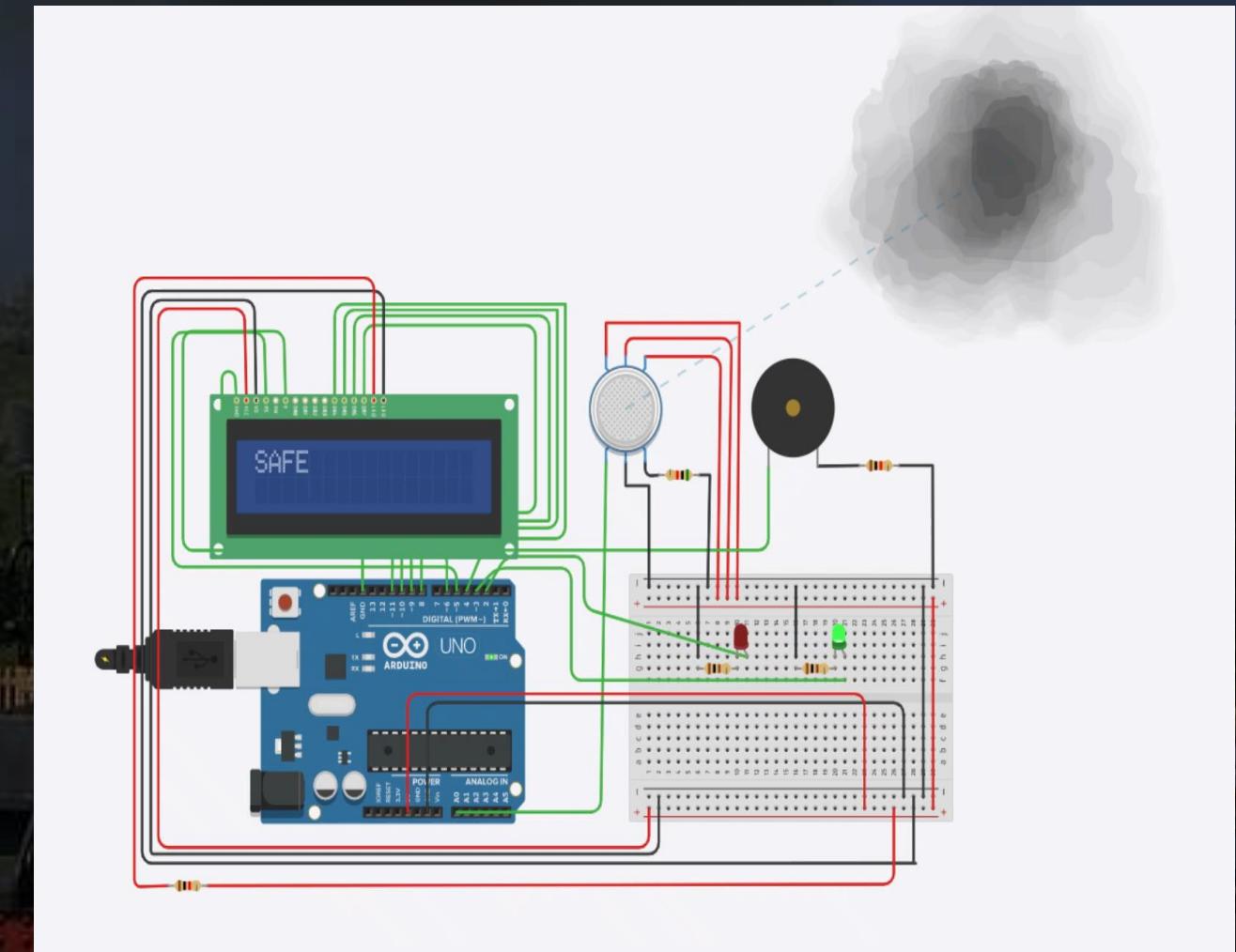


FIRE ALARM SYSTEM



Circuit components

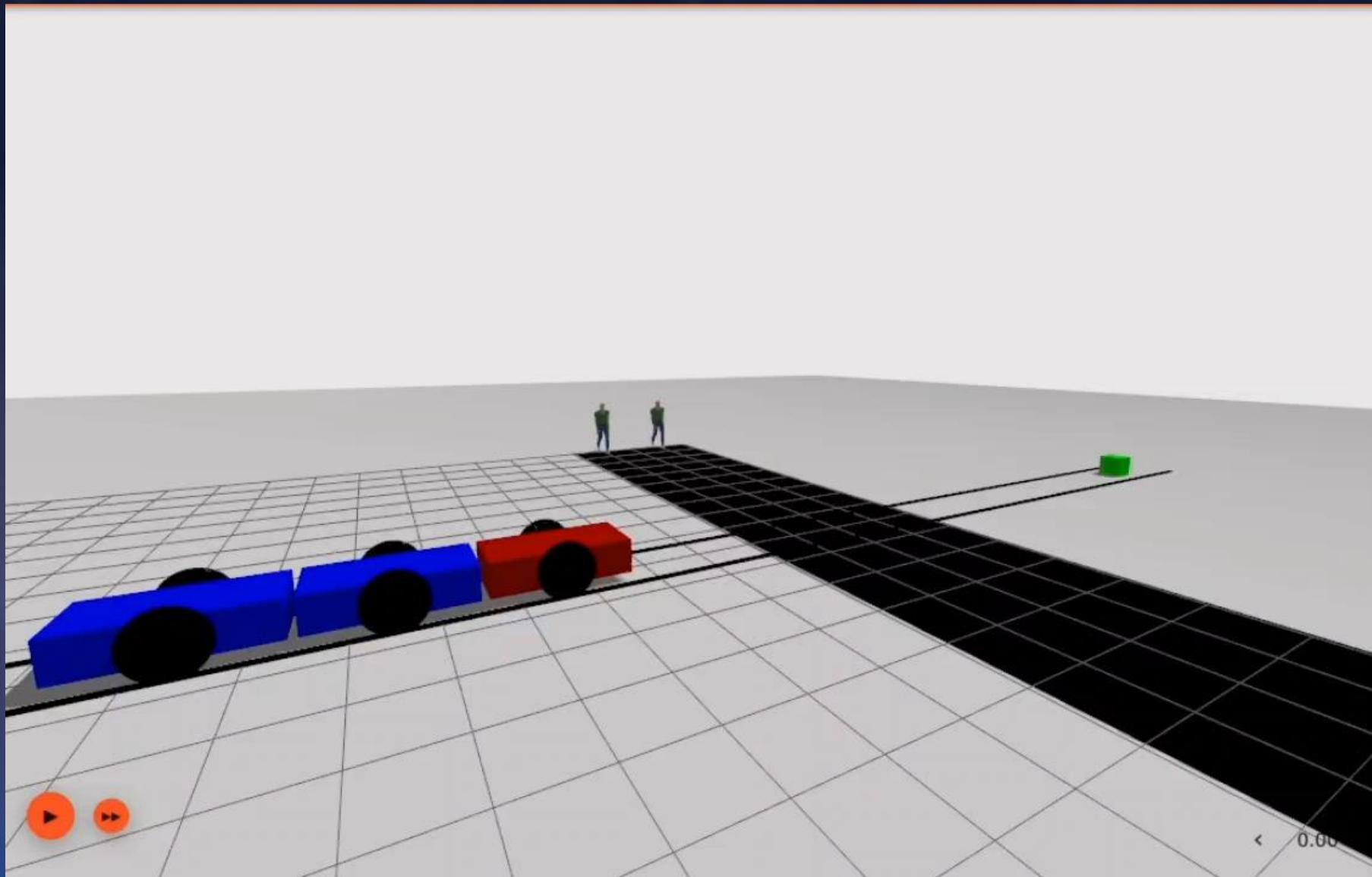
- Arduino
 - Lcd display
 - Gas sensor
 - Leds
 - Buzzer
 - Resistor

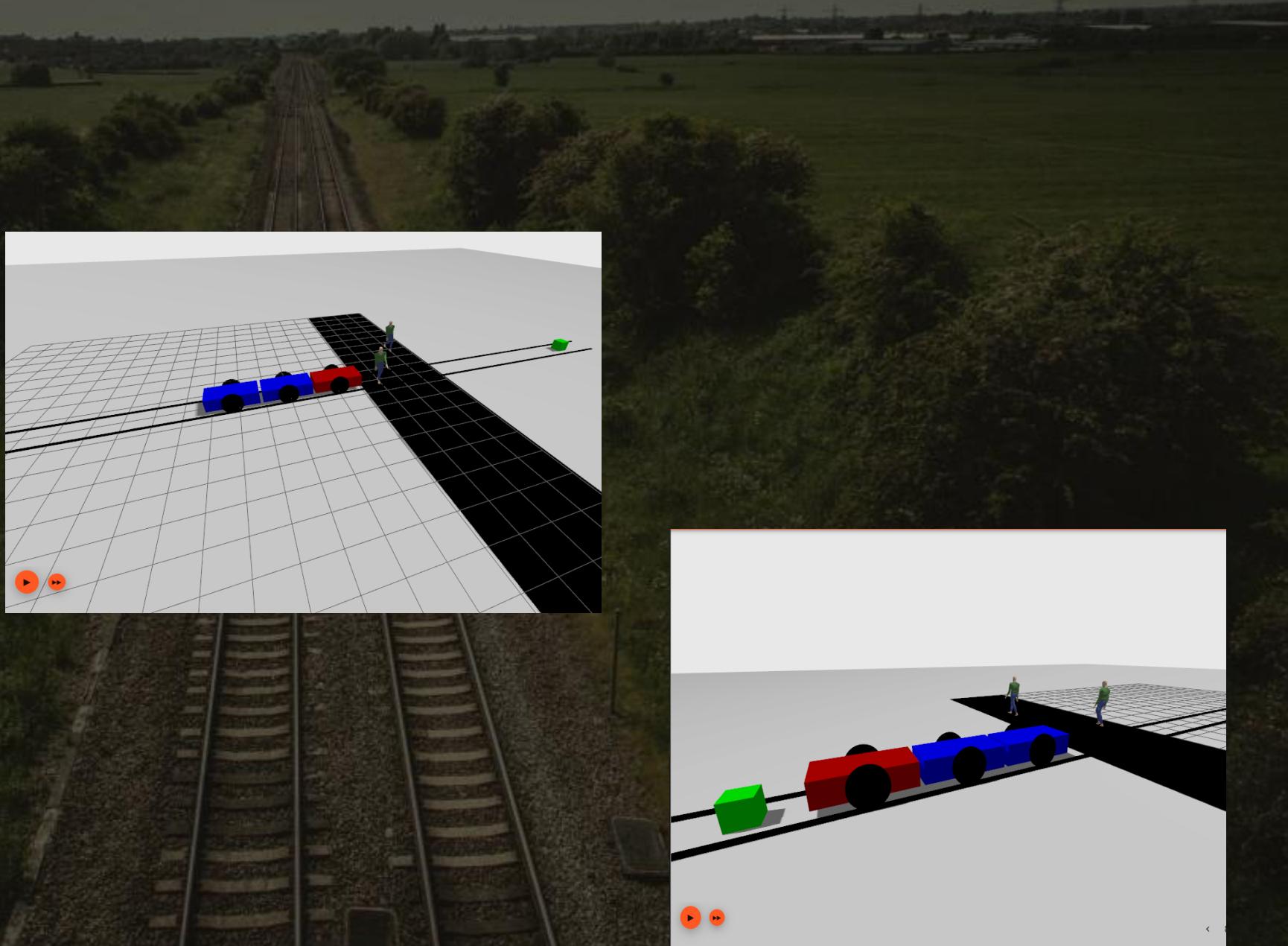
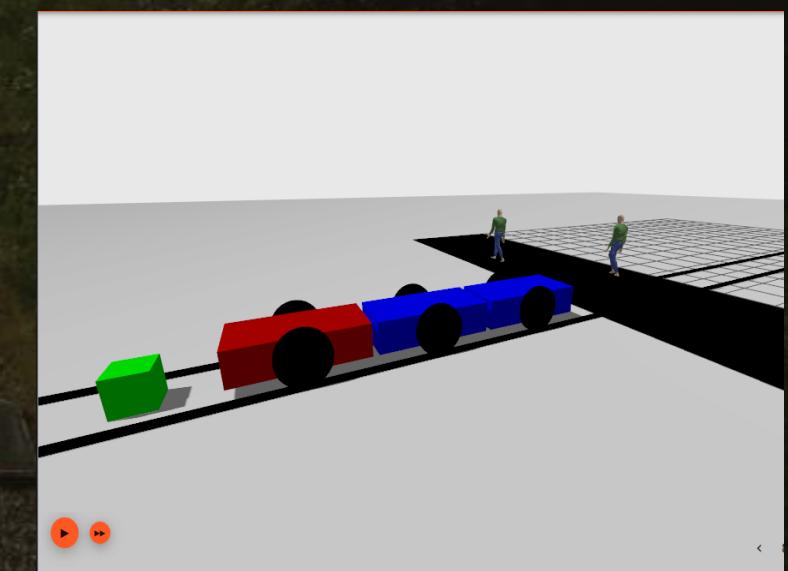
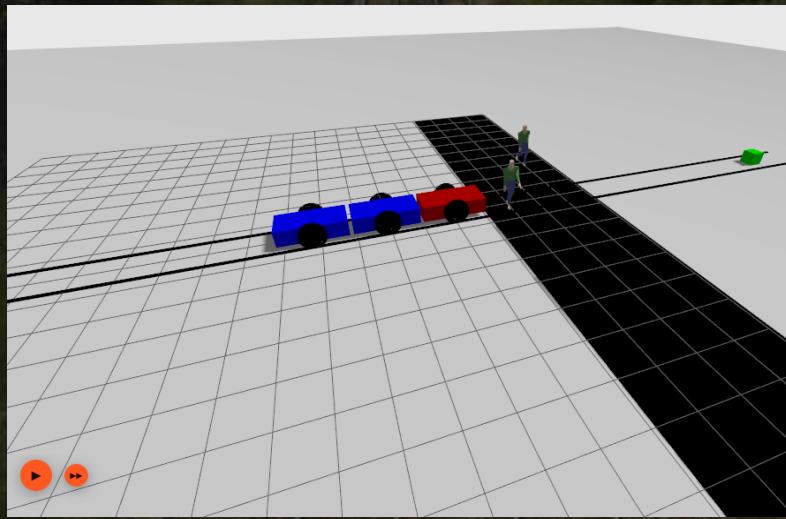
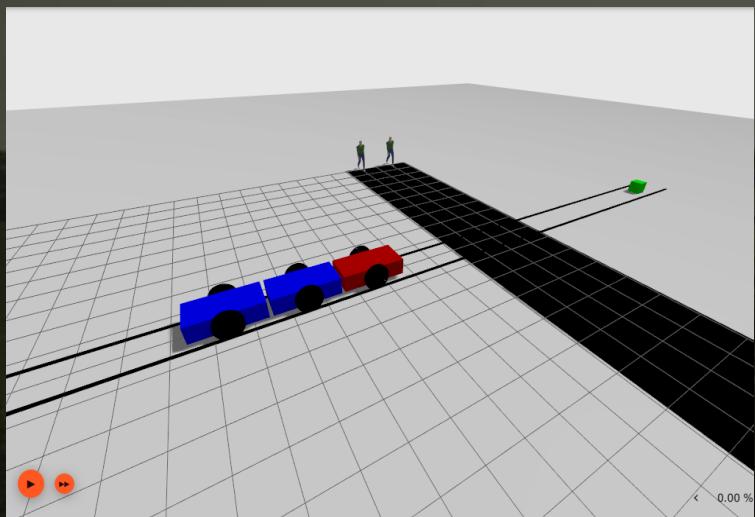




SIMULATION

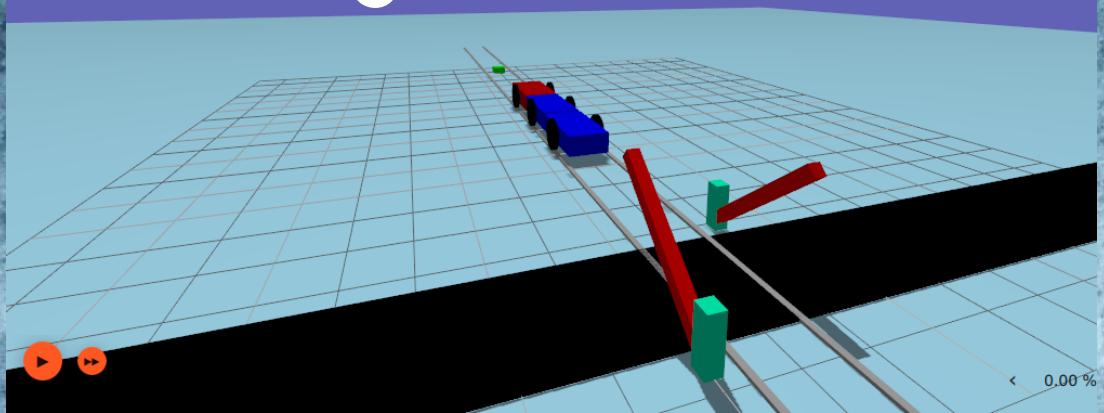
OBJECT DETECTION SYSTEM



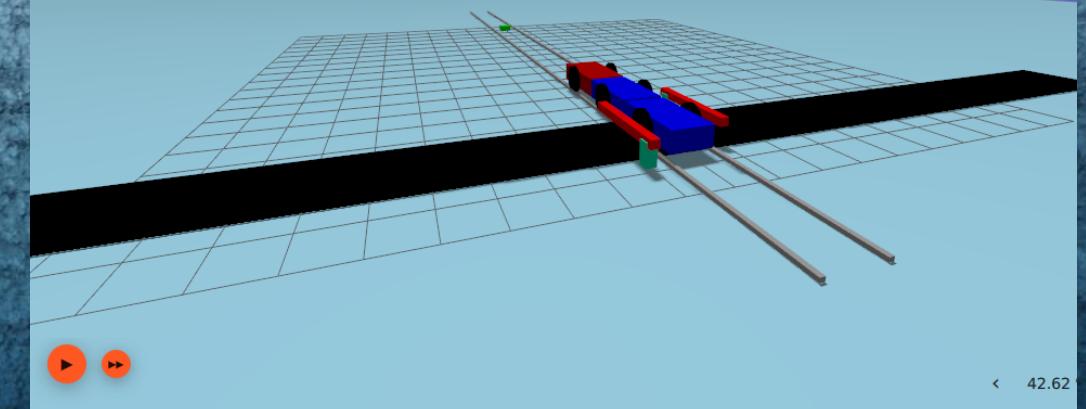


RAILWAY CROSSING BARRIER SYSTEM

Open gate



Closed gate





THANK YOU