

# **RAILWAY ALARM SYSTEM**



## **Team Members**

1. Akash Jha
2. Malay Kalavadia
3. Mritunjay Choubey
4. Shivanshu Kumar
5. Vidhi Khosla

## **Key Features -**

1. Railway crossing barrier
2. Object detection on track
3. Fire alarm system in train

## **ROADMAP**

1. First, we will design the sensor system for each of the above key features.

This includes a gas alarm system placed inside the train, an ultrasonic system for railway crossing barrier and object detection on track.

The railway crossing gate consists of ultrasonic sensors

- a) The sensors detect the train and close the barrier.
- b) This is done using an Arduino system that takes input using an ultrasonic sensor. In response to this, the barrier motors rotate and close the gate when the train approaches the railway crossing junction.

Object detection on track is done using an ultrasonic sensor (HC-SR04)

- a) The sensor detects an object on track and sends a signal to the system.
- b) In response to the signal, the train stops.

The gas alarm system detects smoke and alert passengers on three levels-

- a) Level 1- smoke level is indicated by LED. (SAFE)
- b) Level 2- smoke level indicated by a buzzer. (ALERT)
- c) Level 3- At this level, the train stops for evacuation. (DANGER LEVEL)

2. After that, we will do mathematical analysis regarding the distance at which the ultrasonic sensor will detect the object and close the gate in response. Furthermore, it will stop the train. We will also analyse the ranges for 3 levels of smoke alarm.
3. Then, we will create those circuits on Tinker CAD and check their working
4. Next, we will design the project environment on an online simulation platform and integrate the circuits into the environment.
5. If possible offline, we will make a train model with the above-specified smoke and object detection system and the model of an automatic railway crossing junction with features as specified above.

## **Components-**

### **1. Railway crossing barrier-**

Arduino uno  
Jumper wires  
Ultrasonic sensor  
Motors (Stepper)  
LEDs  
Resistors  
Breadboard  
Potentiometer  
Arduino uno shield

### **2. Object detection on track**

Arduino uno  
Jumper wires  
Ultrasonic sensor  
IR sensor  
LEDs  
Resistors  
Breadboard  
Arduino uno shield

### **3. Fire alarm system in train**

Arduino uno  
Jumper wires  
Gas sensor  
LEDs  
Resistors  
Breadboard  
Potentiometer  
LCD board  
Arduino uno shield

### **4. Train Model**

Arduino uno  
Arduino uno shield  
Motors with tyres (DC)  
Breadboard  
Potentiometer  
Resistors

## Technical specifications

### **Object detection on railway track:**

The object detection system uses the ultrasonic sensor and checks the presence of any object in the range of the ultrasonic sensor on the railway track. The ultrasonic sensor emits radiations of 40 kHz, which, after reflecting back from any object or any obstacle in the line of radiation, is received by the sensor. The time duration between the emitted and received radiation is used to calculate the distance of the obstacle from the sensor. Thus, using the ultrasonic sensor, we can detect the presence of any obstacle in the range of the ultrasonic sensor, along with the approximate distance of the obstacle from the sensor.



### **Railway barrier crossing:**

Railway barrier crossing system uses the ultrasonic sensor to detect the train passing through the train road junction, and accordingly sends signal to the Arduino which in turns rotates the motors of the barrier thereby closing it. A force sensor is also used in this system to detect the pressure on track, this helps in closing of the barrier only when train crosses the junction.



## Gas detection system:

Gas detection system is used in our project to detect the presence of fire or any harmful gas inside the train. The gas sensor uses a chemi-resistor, whose resistance changes with the extent of harmful gases or fire present in its proximity. There are various gas sensors which detect the presence of different gases, which depends on the property of the chemi-resistor used in the gas sensor. In the presence of any harmful gas or fire in proximity of the gas sensor, the resistance of the chemi-resistor changes due to which the current in the gas sensor changes slightly. This current is passed through a load resistor inside the gas sensor. The gas sensor gives the voltage across this load resistor as an analog output. It can also give a digital output, stating whether gas is present or not as high or low, using a particular threshold value.

In our system, the gas sensor gives the analog voltage output, which signifies the concentration of the gas in the proximity of the sensor. We have chosen different threshold values for safe limit, alert and danger limit.

Gas detection system-sensor output depends on the smoke level in the atmosphere. the sensor detects the change in smoke level



CONTROL PANEL

INSIDE LAYOUT



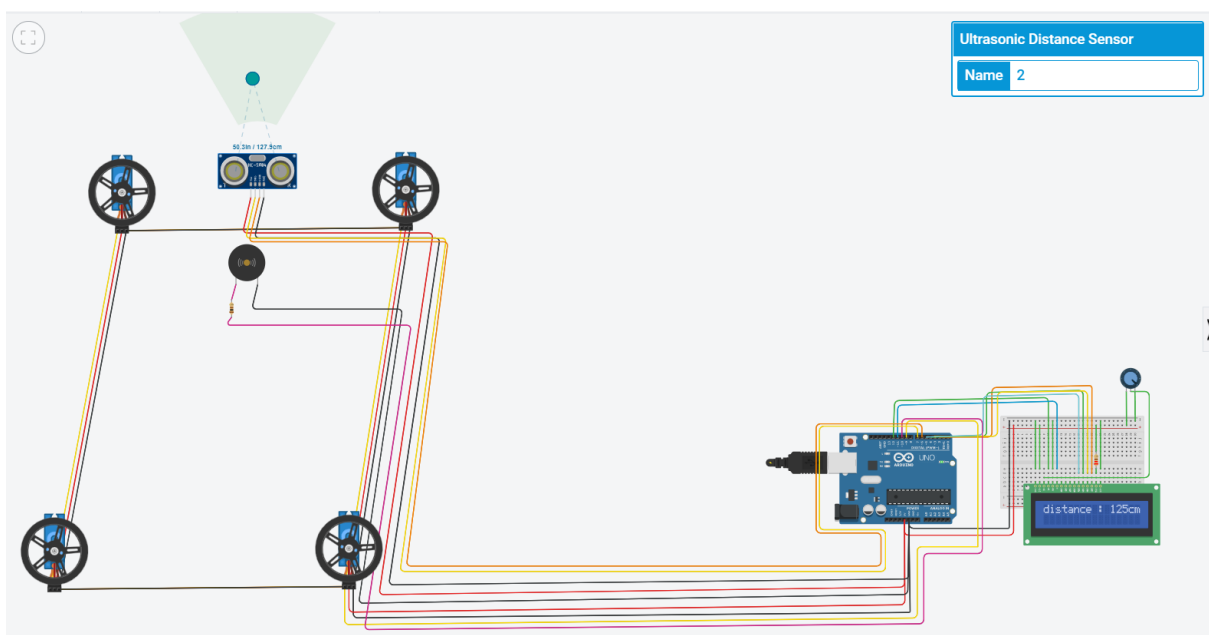
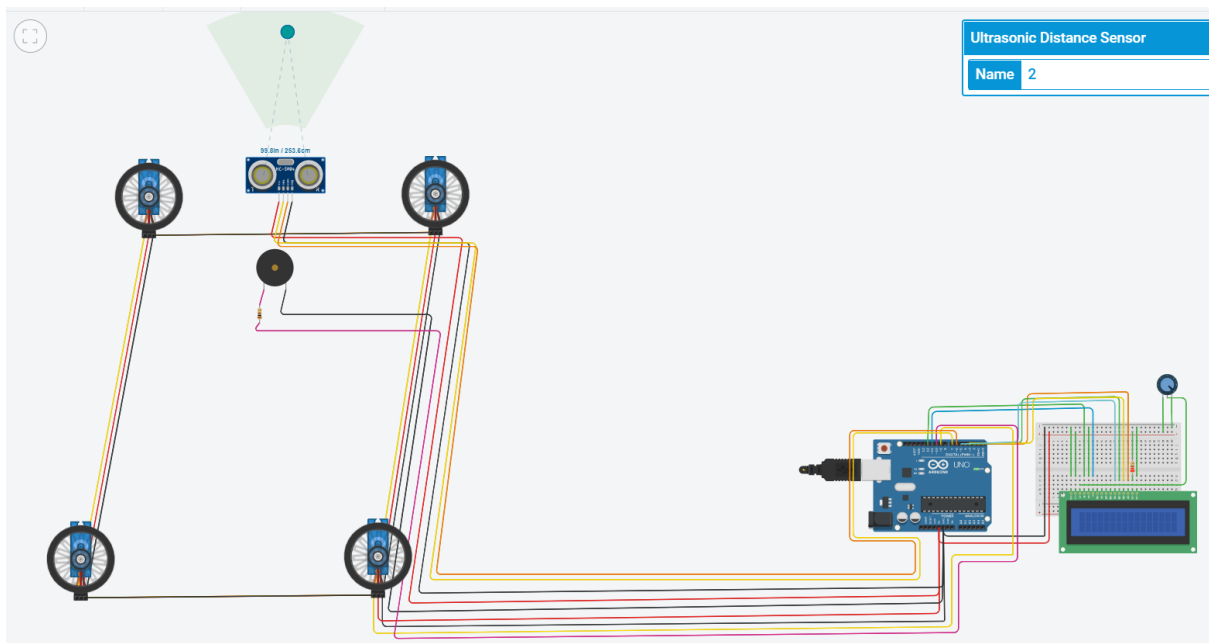
## FEASIBILITY IN ONLINE MODE

Feasibility of this project in online mode depends on availability of simulation platforms, and their ability to combine working environment and circuits.

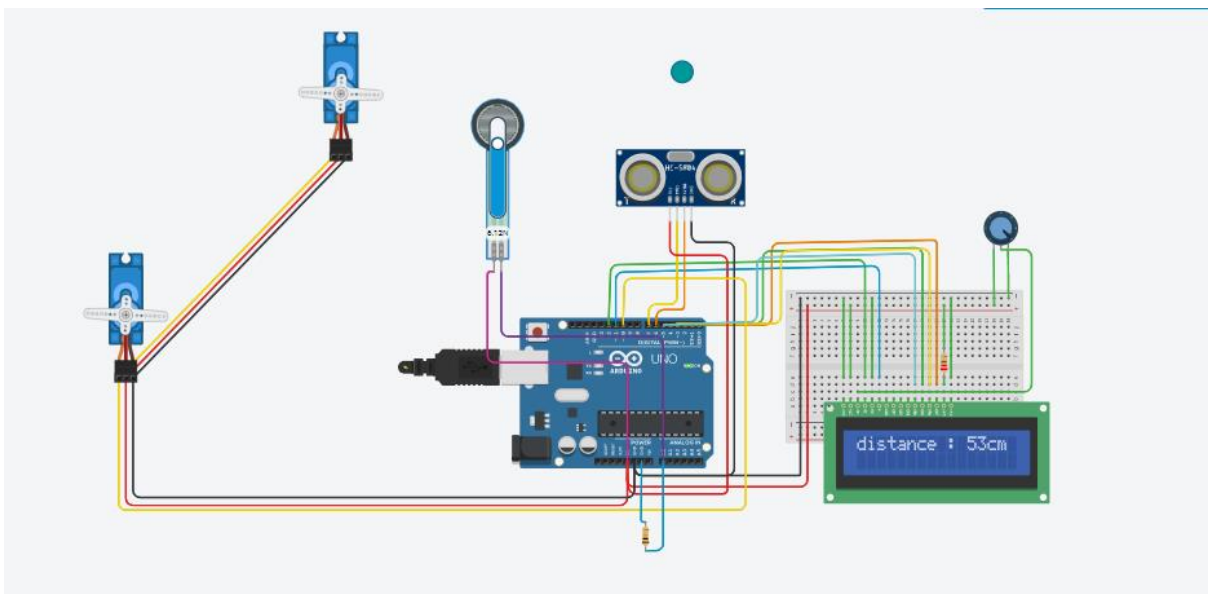
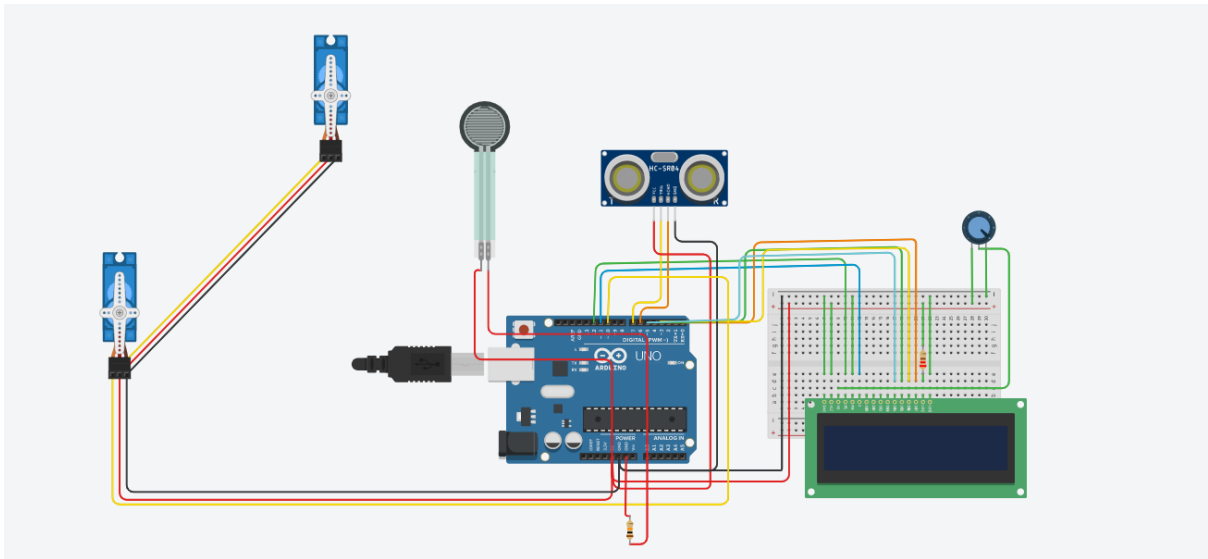
Since the project uses many hardware components so it is difficult to represent the model in online mode, but we are trying to find simulations for proper representation of working of our model.

## CIRCUITS

### Object detection system using ultrasonic sensor



## Railway crossing barrier system using ultrasonic sensor



# Fire Safety Alarm

