

## SMART MONITORING OF THE TRAIN AND TRAIN TRACKS TO PREVENT RAILWAY HAZARDS

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### ABSTRACT

Smart monitoring of the train and train track is very important in the Indian railway to prevent accidents. Especially in India it is very important. The Indian railway system is lagging regarding smart monitoring of train with the other countries. By smart monitoring of the train, it can find breakage of train track it can prevent accident between two train if two train is on the same track due to miss matching of signal, it can find whether there is any obstacle present in railway track, it can also detect whether two coaches of the train get separated during the motion of the train due to manufacturing defect. It helps to detect fire in the pantry car . Smart monitoring of the Indian railway help to monitor the train and its track in a very effective way .It can implement in Indian railway that helps to avoid the accident and save lots of people's life

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### I. INTRODUCTION

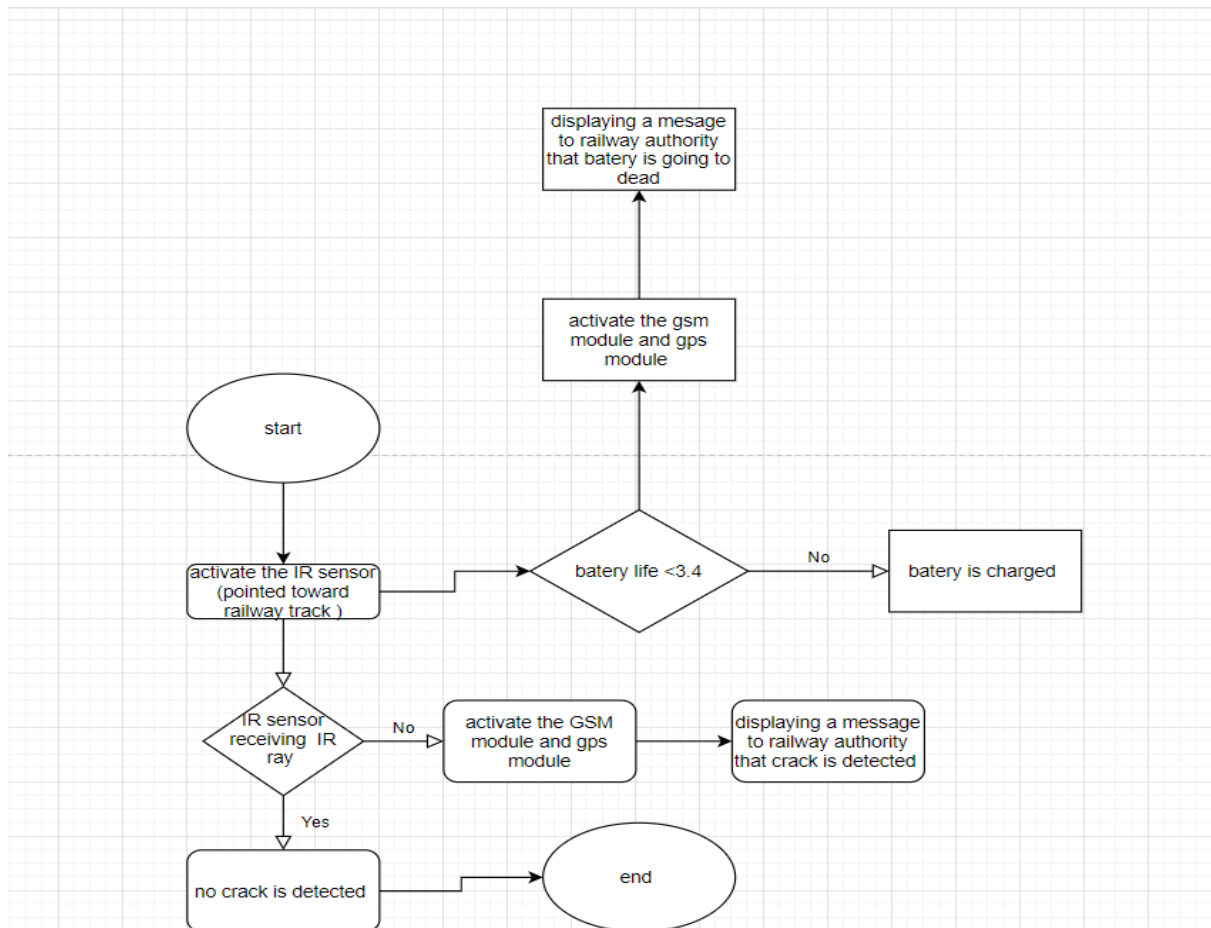
The first train in India ran between Bori Bonder and thane on 16 April 1853 which is run on a steam engine .It was the first passenger train in India from there lots of development has taken place. At that time there is no ac coach in that train but now both ac and sleeper coaches are there . Besides all these development , lots of development are needed for the Indian railway which will help the Indian railway a lot .Indian railway not only act as a mode of transportation for people it will also help in transporting goods from one place to another so for all these things smart monitoring of train is very important that will reduce the risk of an accident K. Gayathiri al.[1] in their work they use the seismic sensor to detect vibration the level of vibration will be high or low depending upon the direction of acceleration if the vibration value is not normal then there must be a defect in the track . Abhi Ladola al.[2] in their work to prevent an accident of train they built a device that can detect the crack in railway track using Infrared sensor and charge the battery of the Arduino with the help solar panel cell. C. Narendra Singh al.[3]in their project they use magnetic penetration to detect the crack by using the hall sensors .Wong Wei qing[4] in his project used an ultrasonic sensor to detect the object and use LED to show whether the obstacle is present or not. Muhamad Nizam Bin Mustapha [5] built a fast track quality measurement using a gyro sensor.Mohaiminul Islam.[6]Khan.in his thesis show how to keep a track on the train by using the GSM module and also describe how to send the current location of the train by using the GPS module.To charge an Arduino by solar cell [2]only work in some restricted area such as Karnataka, Tamilnadu, charging of the solar panel will not take place during the monsoon season and that place where there is cloudy weather. So for that, we have to look at some other form of energy that can charge our Arduino Using vibration sensor to detect the crack present in

train track [1] it is sensitivity to higher frequency noise but some time due to some external factor the railway track get the same vibration as that of passing a train through the track then at that time it will not be going to work

## II. METHODOLOGY

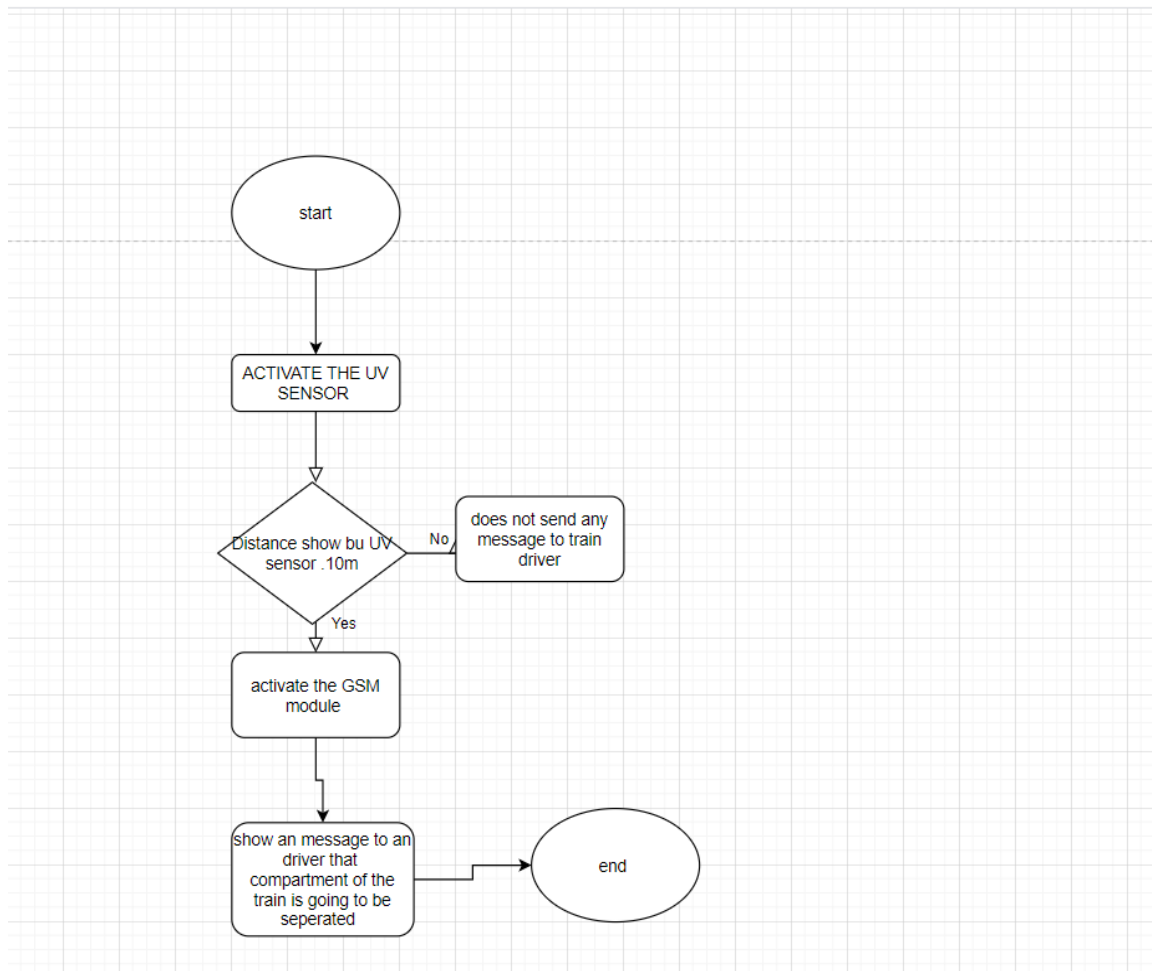
(1)To detect a crack in railway track

IR sensor is used for detecting the breakage and cracks in railway track by sending and receiving IR signal .if crack is found in railway track then by using GPS, the latitude and longitude coordinates will be sent to railway authority by using GSM Module after sending message to railway authority they comare this location to the location where crack is intensly there to prvent thermal expression



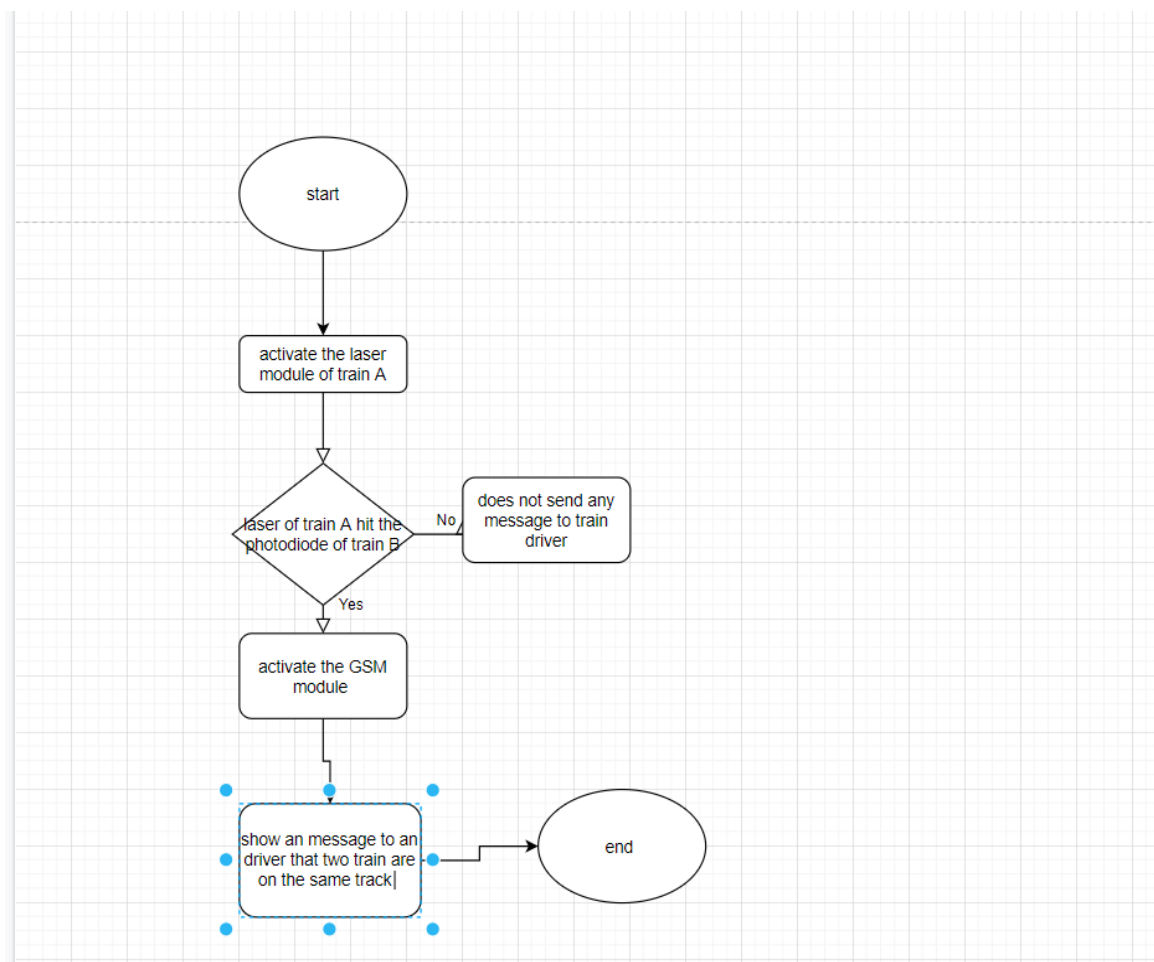
(2)To prevent separation of train Compartment due to manufacturing defect

Connect one ultrasonic sensor between two compartment that maintains a constant distance between them if the distance will increases then with the help of the attached GSM module Arduino will send a notification to the train driver that Compartment is going to be separated then he will stop the train and inform railway authority that particular train Compartment is going to be separated



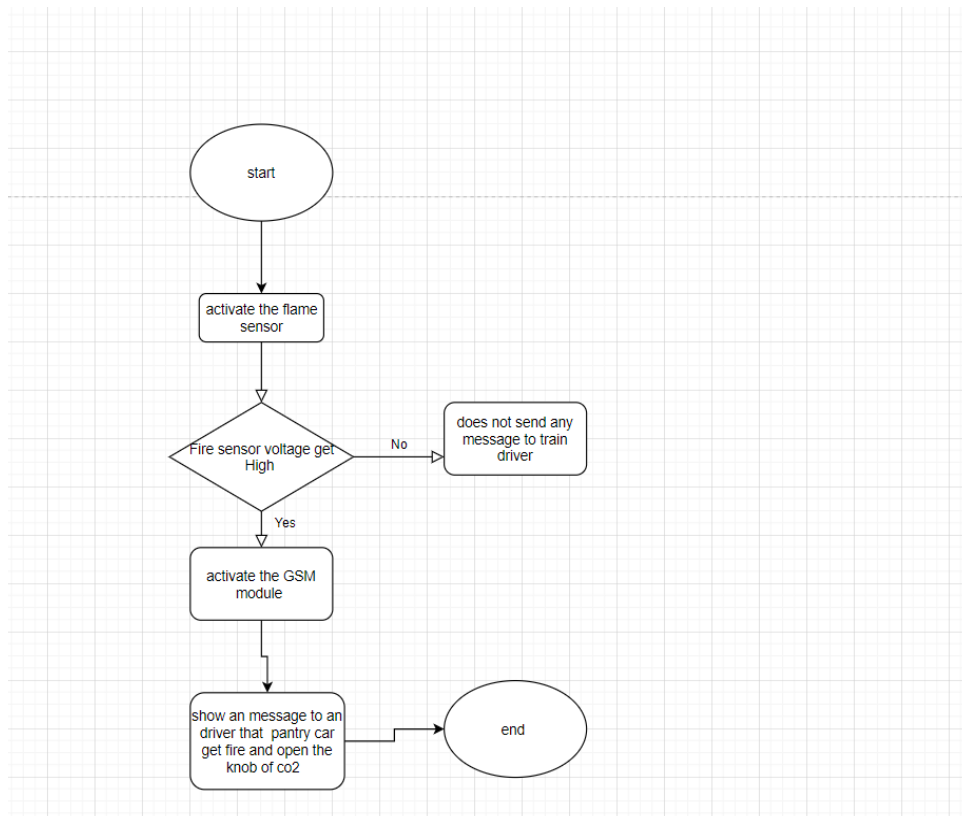
### (3)To prevent the collision between two train

when the tracks of the train are straight When two trains are on the same track(due to mismatching of the signal or fault in signaling process ) for example train A and train B is on the same track train A is ahead of train B then train B will send laser light toward the back of the train B. when laser light of train A hit the photodiode of train B then Arduino of train B will send a message to railway authority that train A is on my track then railway authority alert the train A driver



#### (4)Fire detection in pantry car

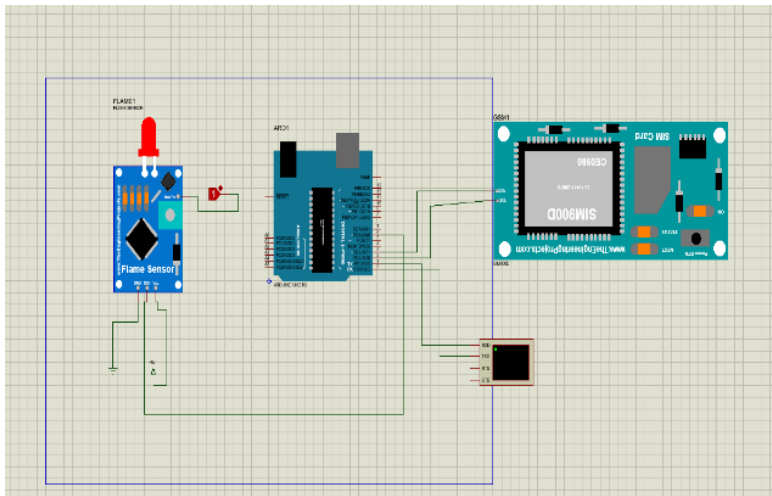
When pantry car is being got fired by accident then fire sensor will detect that fire and inform to the train driver then train driver then driver will open the nob of co2 gas



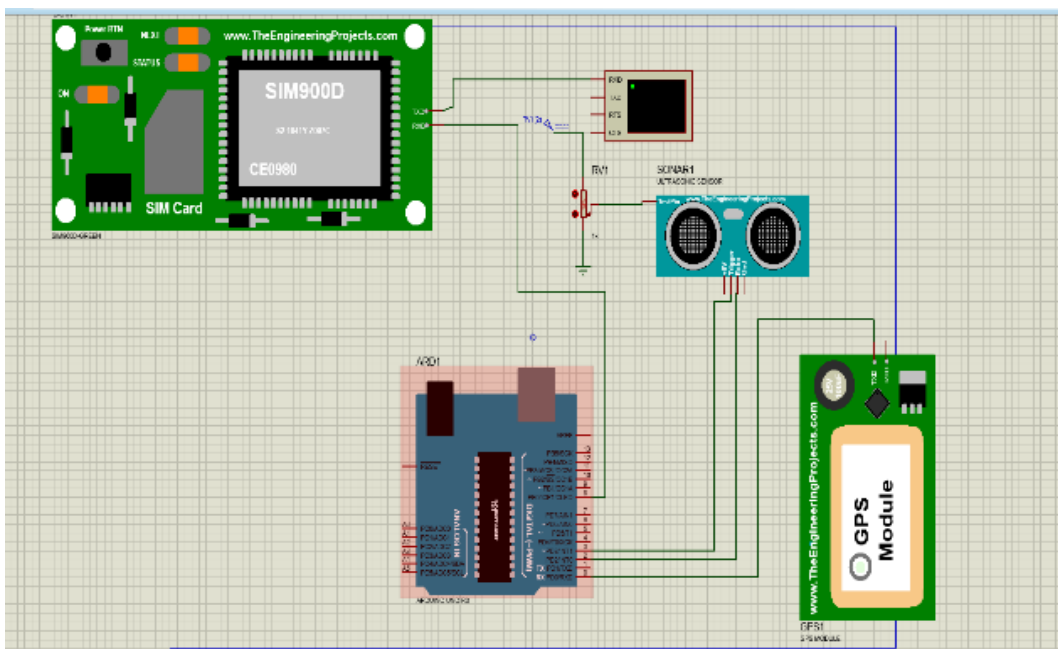
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## I. MODELING AND ANALYSIS

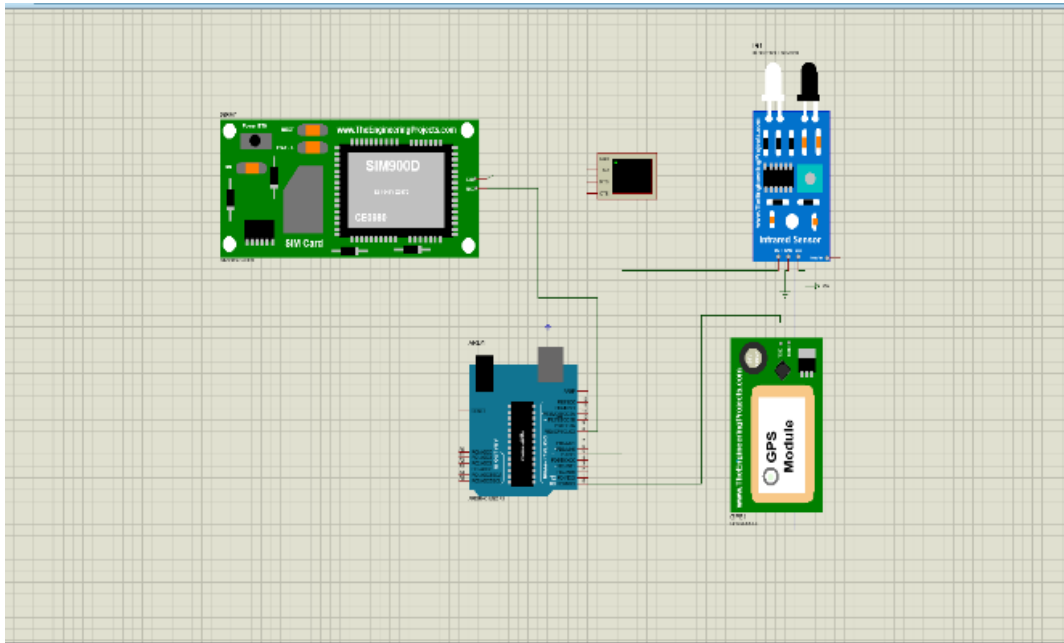
Model to detect Fire in pantry Car



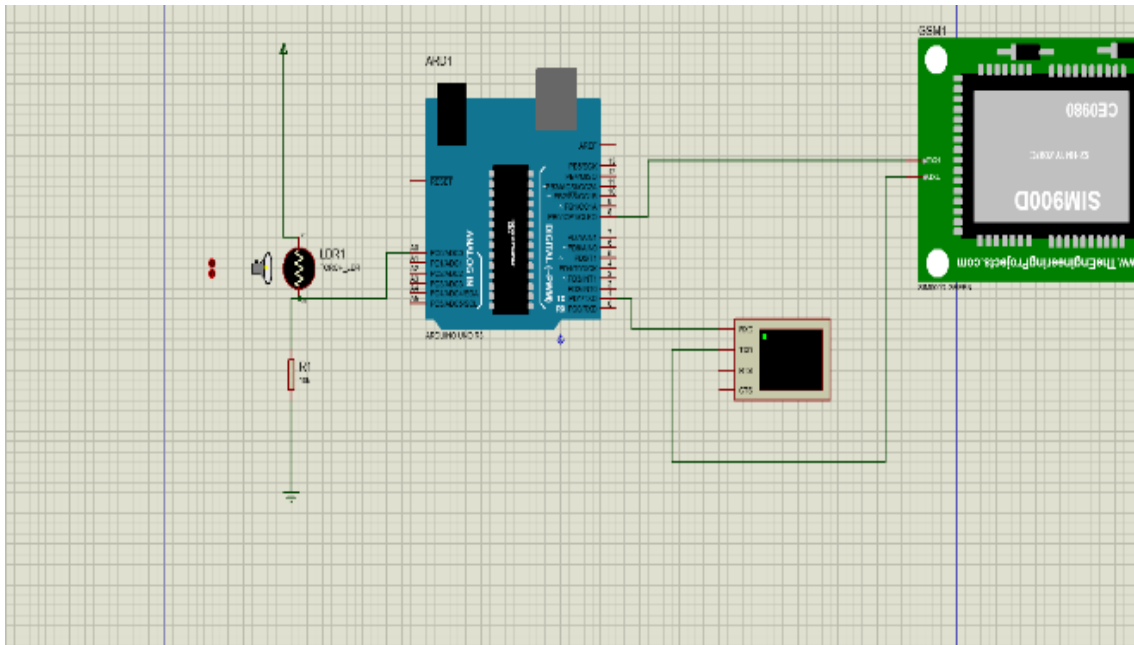
Model to Check the separation of two compartment of train



Model to detect the present of crack in railway track



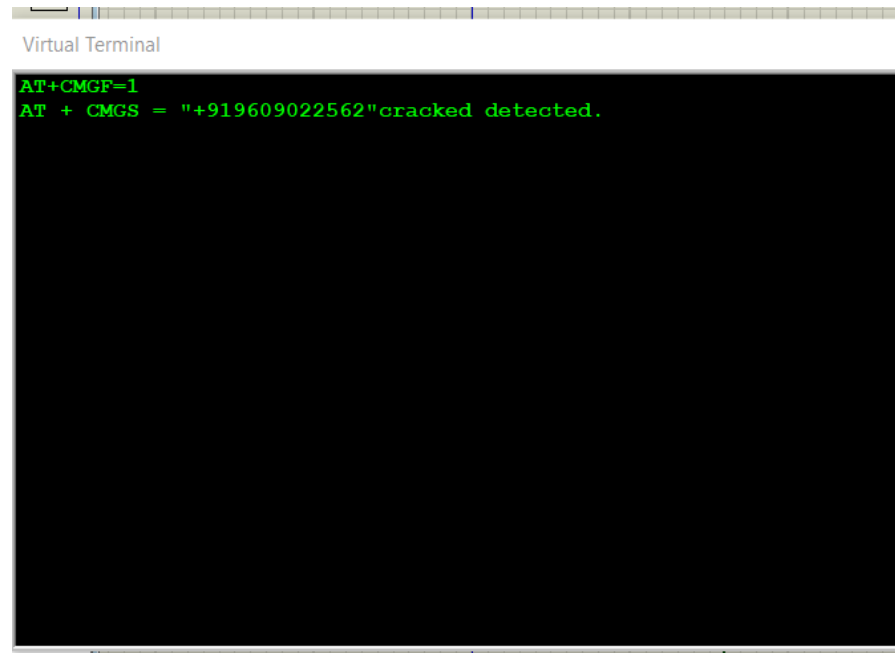
Model to check whether the two trains are on the same track



#### IV. RESULTS AND DISCUSSION

##### 1)Crack Detection

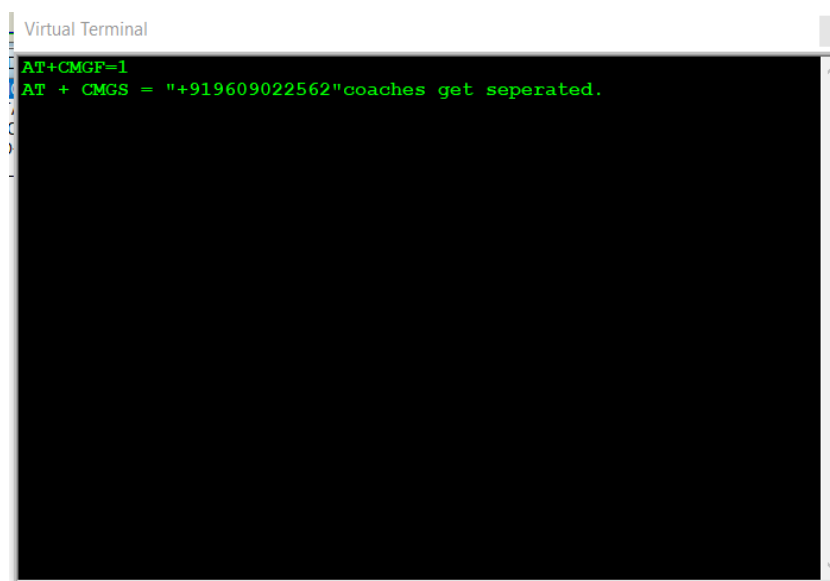
In crack detection if the crack is detected in the railway track then the robot which is checking the crack in railway track will send the message to railway authority that cracks is detected and value of longitude and latitude of that particular location is sent to the railway authority

A screenshot of a virtual terminal window titled 'Virtual Terminal'. The terminal has a black background with green text. The first line shows the command 'AT+CMGF=1'. The second line shows the command 'AT + CMGS = "+919609022562"cracked detected.' followed by a carriage return.

```
Virtual Terminal
AT+CMGF=1
AT + CMGS = "+919609022562"cracked detected.
```

##### (2)Separation of Compartment in train

In Compartment separation, if the ultrasonic sensor shows a distance greater than the distance between the coaches then GSM module will send a message to the train driver that Compartment are going to be separated

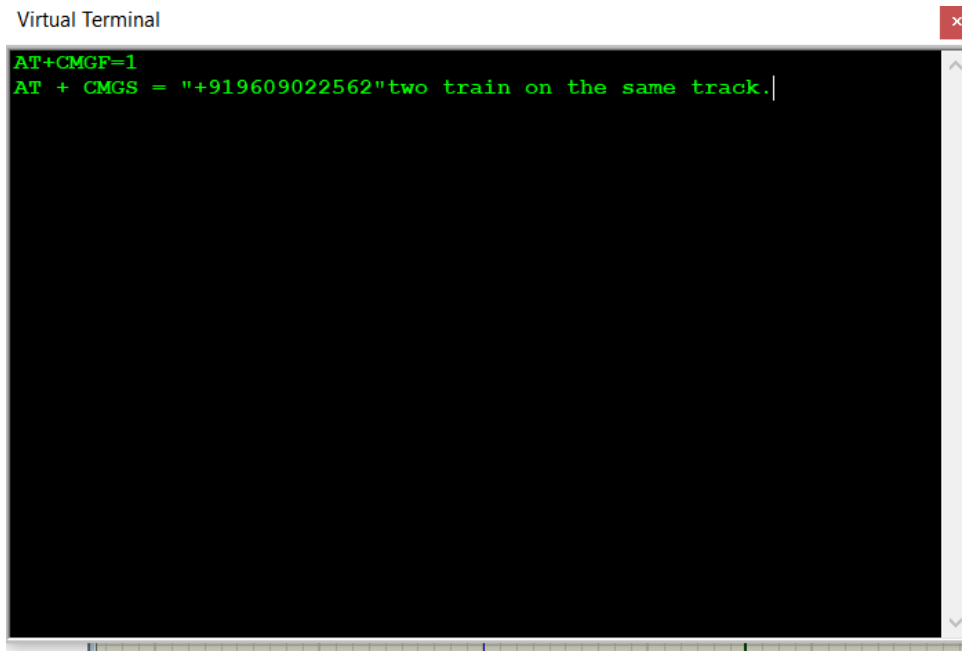
A screenshot of a virtual terminal window titled 'Virtual Terminal'. The terminal has a black background with green text. The first line shows the command 'AT+CMGF=1'. The second line shows the command 'AT + CMGS = "+919609022562"coaches get seperated.' followed by a carriage return.

```
Virtual Terminal
AT+CMGF=1
AT + CMGS = "+919609022562"coaches get seperated.
```



(3) Collision between two trains who are on the same track

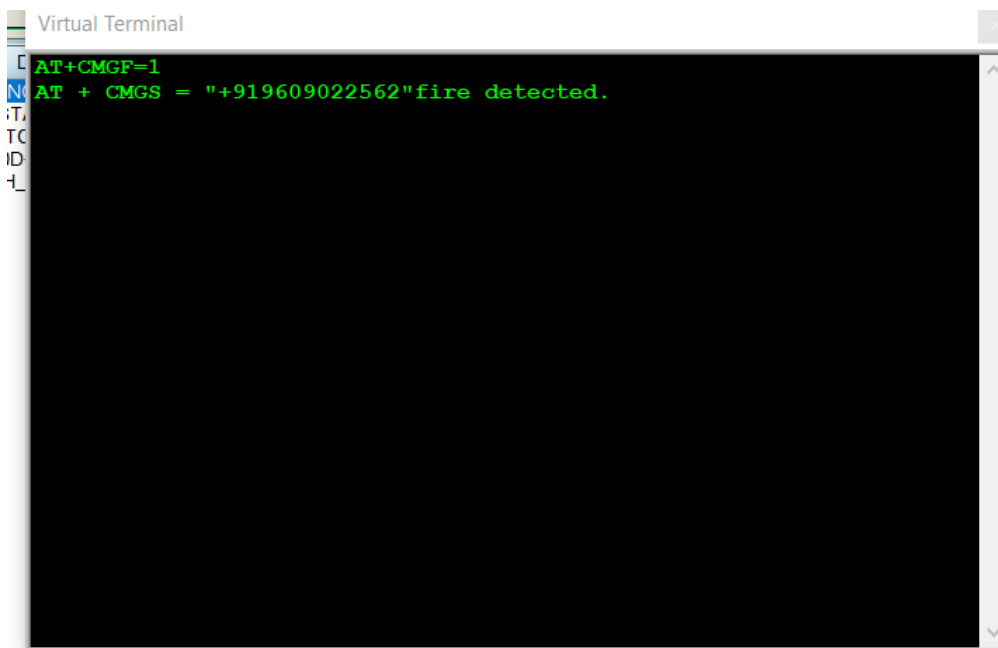
In the prevention of collision between the two trains if there are two trains on the same track then train which is ahead of the other train get message that another train is on the same track on which it is running

A screenshot of a 'Virtual Terminal' window. The window has a title bar with 'Virtual Terminal' and a red close button. The terminal area is black with green text. The first line shows the command 'AT+CMGF=1'. The second line shows the command 'AT + CMGS = "+919609022562"two train on the same track.|' with a cursor at the end of the line.

```
Virtual Terminal
AT+CMGF=1
AT + CMGS = "+919609022562"two train on the same track.|
```

(4)Fire detection

In fire detection in the pantry car if, the fire sensor will detect the fire in the pantry car then Arduino will inform the train driver that the pantry car gets fire .

A screenshot of a 'Virtual Terminal' window. The window has a title bar with 'Virtual Terminal' and a red close button. The terminal area is black with green text. The first line shows the command 'AT+CMGF=1'. The second line shows the command 'AT + CMGS = "+919609022562"fire detected.' with a cursor at the end of the line.

```
Virtual Terminal
AT+CMGF=1
AT + CMGS = "+919609022562"fire detected.
```

## V. CONCLUSION

This project presents smart monitoring of the train and its track this project is divided into four-part the first part is to find the crack or breakage in a train track by using an infrared sensor and Arduino will check the battery life of robot who detecting the crack in the railway track . The second part of the project mitigates the problem of compartment separation due to manufacturing fault this can be achieved by an ultrasonic sensor that shows a constant distance between the Compartment if the distance measured by the ultrasonic sensor is increasing then Compartment of the train going to be separated before train compartment getting separated it will send a message to a driver that train compartment is going to be separated the third part of the project mitigate the problem of train collision between the train which is on the same track and the last one is to alert the train driver that pantry car gets fire .so that train driver can take necessary action to get control over fire .

## VI. REFERENCES

- [1] Gayathiri K, Gomathi R. Monitoring System for Defects in Rail Track.
- [2] Ladola A, Parekh C, Patel D, Bhagatwala H. Solar based railway track fault detection system. International Research Journal of Engineering. 2018;5.
- [3] SINGH DN, NARESH D. RAILWAY TRACK CRACK DETECTION AND DATA ANALYSIS. International Journal of Creative Research Thoughts (IJCRT). 2017 Dec;5(4):1859-63.
- [4] Wong WQ. Railway Crack Detection System Using Ultrasonic Sensors And Arduino UNO.
- [5] Mustapha MN. Fast Train Track Quality Measurement Using Gyro Sensors. IRC.
- [6] Khan M, Islam M. *Automated railway track switching system: A smart rail station control system* (Doctoral dissertation, BRAC University).
- [7] Oo H M, San Hlaing NN, Oo TT. Four IR Sensor Based Automatic Control of Railway Gate using Microcontroller
- [8] Agrawal S, Bharane P, Khan D, Fundkar S, More S, Khande A, Ghait S, Vairale S. An Arduino based Method for Detecting Cracks and Obstacles in Railway Tracks
- [9] Krishna BS, Seshendra DV, Raja GG, Sudharshan T, Srikanth K. Railway Track Fault Detection System by Using IR Sensors and Bluetooth Technology. Asian Journal of Applied Science and Technology (AJAST). 2017 Jul;1(6):82-4.
- [10] Devan PA, Priyanga M, Manisha G, Sangeetha K, Rajarajeswari KG. FIRE SAFETY AND ALERTING SYSTEM IN RAILWAYS.
- [11] Tupe R, Yadav P, Waghmode M, Bhojne M, There P, Dhage MR. ROBOT FOR RAILWAY TRACK MONITORING WITH OBSTACLE DETECTION AND DATA SECURITY
- [12] Karthick N, Nagarajan R, Suresh S, Prabhu R. Implementation of railway track crack detection and protection. International Journal Of Engineering And Computer Science (IJECS). 2017 May;6(5):21476-81.
- [13] Imdad F, Niaz MT, Kim HS. Railway track structural health monitoring system. In 2015 15th International Conference on Control, Automation and Systems (ICCAS) 2015 Oct 13 (pp. 769-772). IEEE.
- [14] Vidhya KS, Lavanya M, Abinayapriya A, Kaaviya S, Saravanan R, Sivapragash C. AN APPROACH WITH SENSOR FOR REAL TIME RAILWAY TRACK SURVEILLANCE SYSTEM.



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[15] Jinila YB. A novel approach on obstacle detection and automatic braking system in railways. International Journal of Sciences & Applied Research (IJSAR). 2018.