

# PROJECT REPORT



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**TOPIC:** RAILWAY TRACK HEALTH MONITORING BOT

## ABSTRACT

Building a robot to monitoring faults in railway tracks with the help of Infra Red sensor and image processing. IR sensor acts as a filter as it detects crack as a non reflecting surface and image processing would confirm it. If a crack is detected the bot must wirelessly transfer data to concerned authority by sending sms to respective authority using GSM module. It will also map the location points of the crack detected using GPS module.

This is mainly a real time working prototype which will be employed to carry out research experiments in hence the project will be divided into hardware and software parts. The software parts focus on objectives such as improving image processing algorithms for crack detection along with Embedded C coding to interface sensors and modules on Arduino. The Hardware Part mainly focuses on making the prototype more efficient in real time environments which include sensor interfacing using Arduino and controlling its movement.

## CASE STUDY

### NEW DELHI/BANDA:

A crack in the tracks prima facie caused the derailment of eight coaches of mahakousha express at mahoba station in Uttar Pradesh on march 30,2017. the incident took place around 2.20am when eight bogies of the train derailed injuring some 52 people.

### KANPUR:

As many as 120 people were killed and more than 200 injured when 14 coaches of the Indore-Patna Express train flew off the rails in Kanpur Dehat district of Uttar Pradesh ,the derailment that took place at 3.10am near Pukhrayan, about 100km from Kanpur on Nov 20,2016

## PROBLEM STATEMENT

- India has the largest Railway network in the world.
- Yet **Nine (9)** out of **Ten (10)** railway accidents during **2009-10** and **2014-15** have been due to derailments and accidents at level crossings.
- The track inspection and monitoring is carried out manually

## SOLUTION

- In this project problem about a railway analysis is detection of cracks in the structure.
- In this project, the proposed broken rail detection system automatically detects the faulty rail track without any human intervention.
- There are many advantages with the proposed system when compared with the traditional detection techniques. The advantages include less cost, low power consumption and less analysis time.
- By this proposed system the exact location of the faulty rail track can easily be located which will mended immediately so that many lives can be saved.

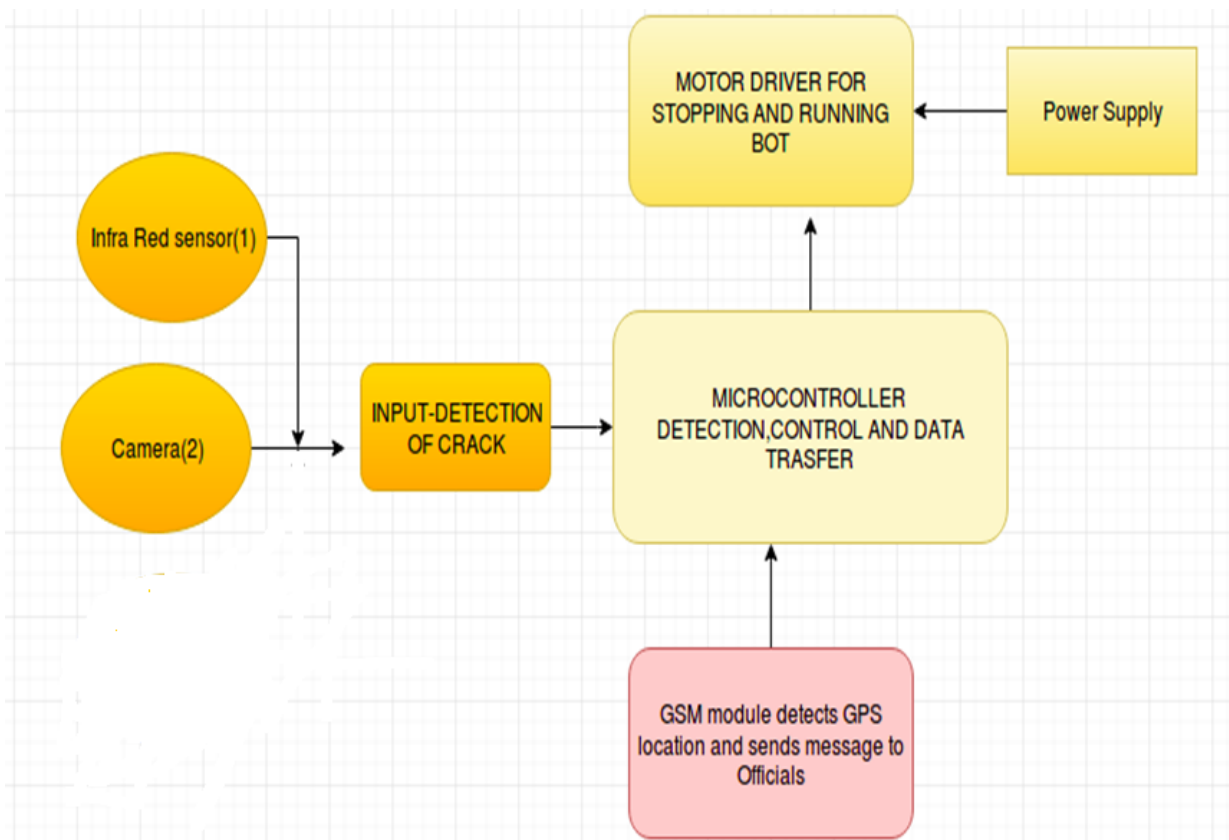
## PROJECT DESCRIPTION

- The robot consists of Arduino taking input from sensors in a preference order

(1)IR: To detect cracks acts as a filter for camera

(2)Camera: Detects if its a crack or a genuine gap in railway track.

- The image processing part is done on Matlab
- Output would be sent in the form of a message using GSM module.
- A separate GPS module is used to obtain latitude longitude based location of bot.
- Further the motors will be controlled using L293D motor driver powered by 9V DC battery which will stop in presence of crack or obstacle.



## HARDWARE DESCRIPTION

- Arduino uno: Micro controller used to interface IR sensor, GSM and GPS module.
- Breadboard

- **L293D Motor driver:** L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal which is used to drive the motors.
- **2 Servo Motors:** Servo motors are the body of the robot that helps the bot to move. These are controlled using L293D motor driver connected to Arduino and is powered by 9V battery.
- **IR Sensor:** These are the sensors we use as input to the system which helps to detect the crack. As the railway track consists of shiny surface it always reflects radiation hence giving output 1 at IR and in presence of crack there will be no light reflecting hence gives 0 output.
- **Battery:** 12V used to power GSM, 9V used to power motors.
- **GSM Module:** We use gsm module to detect gps location and to send the message to the concerned authority. GSM module was chosen because in India the telecom services are much better and efficient than internet services. Hence preferably we can use networks than IOT.
- **GPS Module:** GPS Module is a equipment which is used to measure a device's geographical location. The Arduino code calculates the latitude and longitude coordinates of the crack detected by the robot. It is interfaced with an Arduino Uno in this project to obtain the number of locked satellites, the latitude and longitude coordinates of the crack.

## SOFTWARE DESCRIPTION

- The sensor coding is performed in embedded C using Arduino Uno Ide.
- Image processing is done on matlab.
- For sms and location GSM and GPS module has to be integrated with arduino respectively.

## IMAGE PROCESSING WORKING

- Contrast sketches the original image.
- The original image is converted to grey scale image.
- Image luminous level is increased and the image is converted to binary image.(Image segmentation by Thresholding)
- Morphological operations are performed such as i) Cleaning ii) Thinning iii) Filling
- The holes are filled so that it helps reject smaller objects which are not required for crack detection.
- This helps in detecting only the cracks and removing other unwanted objects.
- Filtering is applied to remove noise from the image. Noise removal helps in accurate detection.
- The length of the crack can be determined upon calibration of image and using the imtool for the pixel length.

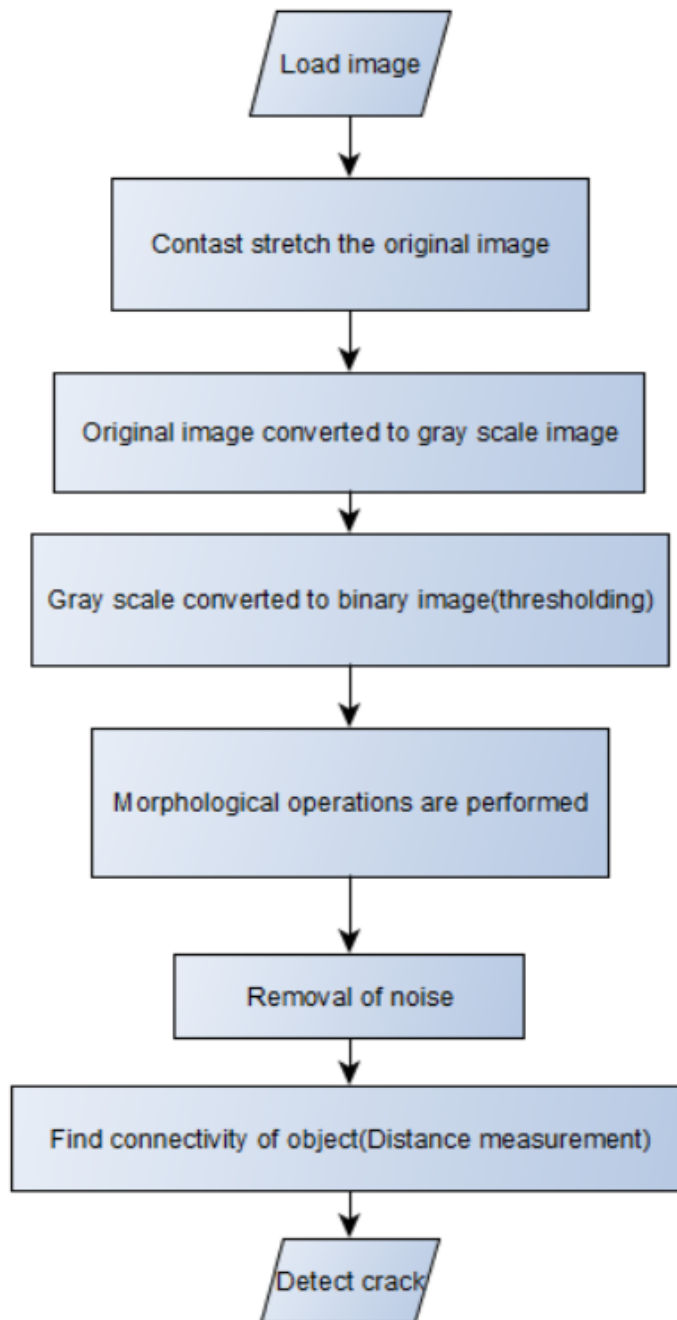


Fig. Algorithm implemented