# Railway Track Crack Detection System by GPS & GSM

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**Abstract -**India has one among the world's largest railway networks, manual examination, and detection of crack on these railways tracks may be a tedious method and consumes loads of the project aims in coming up with railway track crack detection vehicle mis-treatment Microcontroller, Infrared detector, and unhearable rays Sensors assembly system, that detects the cracks on its path; the vehicle is additionally capable of watching the placement of the crack by mis-treatment through GPS module and alerts through SMS messages mistreatment by GSM module. The vehicle moves on the trail of railway track and IR Obstacle sensors mounted on the vehicle face can examine the track on the trail. Once any crack or deformation is detected on the track the vehicle stops and therefore the location of the crack is known and therefore the location Latitude and line of longitude coordinates area unit procured mistreatment the GPS module and therefore the GSM module area unit accustomed send these Location coordinates within the sort of SMS to a predefined.

## 1. INTRODUCTION

The Indian Railways has one among the world's largest railway networks within the world, comprising over one, 115,000Km (71,000 mi) of track length over a route of 67,312 Km (41,826 mi) spreading to most the areas of the country. However, regarding responsibility and traveler safety. There are areas wherever enhancements are possible and new techniques are often utilized to scale back the likelihood of accidents. Among alternative factors, cracks developed on the rail is that the reason for accidents in a number of the cases because of the absence of timely detection and also the associated maintenance creates serious issues on the safety of operation of rail transport. A recent study disclosed that over twenty fifth of the track length wants replacement because of the event of cracks on that. Manual detection of tracks is cumbersome and its ineffective process because of abundant time consumption and demand of competent technicians.

## 2. LITERATURESURVEY

India is the vast country with an area of 3.287 million km², to move resources from one place to another within a country or to travel to another place it requires a large network. India has the fourth-largest rail network around the world and the railway tracks comprising more than 115000km. In India, more than 90% of rail accidents occur due to track crack problems.
Various measures have been taken after the railway safety act which was introduced in 1989 to improve rail safety accordingly.

There are various methods used for the detection of crack. The methods like long-range ultrasonic techniques and radiography techniques electromagnetic etc. system help to detect the crack which are more flexible.
One method is the complimentary inspection technique which is used to examine the foot of the rails and to check the corrosion. This method is known as a Long-range ultrasonic technique.
Other methods like Digital X-ray radiography has many advantages over the traditional film radiography which is based on gamma rays. In the rail network, rail wield has been a traditionally weak link. So instead of this portable digital x-ray equipment is used because it gives information regarding the current state of rail welds.
CAN also known as Control Area Network is connected to the principal node and it sends information via GSM and transmits the message to the closest railway station.

An electromagnetic system for rail cracks detection and traction enhancement comprises, in a preferred paradigm, wheel axles, wiring coils around the axles, respectively. It consists of the power source coupled to the wiring coils for supplying the power to produce electromagnetic flux.
The wiring coils give rise to opposite magnetic north and south pole pairs on the axles. When the crack pattern is detected it has a provision of monitoring the flow pattern and locating the position.
All the existing systems are complicated and time-consuming. Hence, our research paper proposes a more reliable and less time-consuming mode of crack detection in the Railways.

## 3. BLOCKDIAGRAM

This section discusses the diagram for work that has been planned by author during this paper. Fig.1 shows the diagram of railway track crack detection. This circuit uses customary power provide consisting of a transformer from (230- 12) Volts and four diodes, forming a bridge rectifier that delivers a rhythmical DC voltage that is then filtered by associate degree capacitor of concerning (470 – 100) micro-Farad. The filtered DC that is unregulated, IC LM7805 is employed to induce 5V constant at its PIN number three regardless of input DC variable from (9-14) V. The regulated 5V DC is then filtered by a little capacitor of ten micro-Farad for any noise that is generated by the circuit. One light-weight Emitting Diode (LED) is connected to the current 5V DC purpose nonparallel with the electrical device of 330 ohms to the bottom.
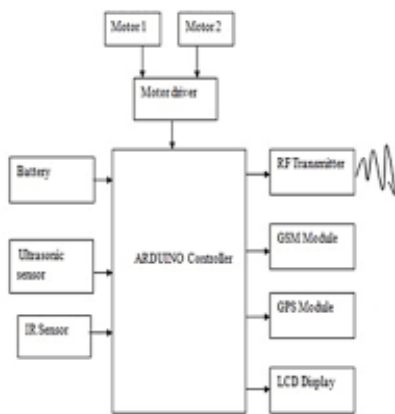


Fig.1.Block Diagram for Crack Detection on Railway Track

8051 micro-controllers could be a low value, low-power, high- performance, most compatible 8-bit microcontroller. it's a forty pin IC. it's 8K bytes of flash, 256 bytes of Random Access Memory (RAM), thirty-two I/O lines, watchdog timer, 2 data pointers, 3 16-bit timer/counters, a six-vector two- level interrupt structure, a full duplex interface, on- chip generator, and clock electronic circuit. The MAX232 is a circuit that converts signals from an RS-232 ports to signals appropriate to be used in TTL compatible digital logic circuits, so devices performing on TTL logic will share the info with devices connected through port (DB9 Connector). The DB9 (originally DE-9) connector could be a 9-pin plug primarily used for serial connections, thus allowing the asynchronous transmission of information as provided by RS-232.

A GSM modem is an specialized type of electronic device that accepts a Subscriber Identity Module (SIM) card, and operates over a subscription to the mobile operator. From the mobile operator perspective, a GSM modem looks just like a mobile device. A GSM module exposes an interface which allows applications to send and receive messages over the modem interface.

Liquid Crystal Display (LCD) is the example for parallel ports, this example does not use the bi-directional feature found on newer ports, so it must work with most, if not all the parallel ports. These liquid crystal display modules are quite common these days, as they are easy to work with, as all the logic required for running them is on board.
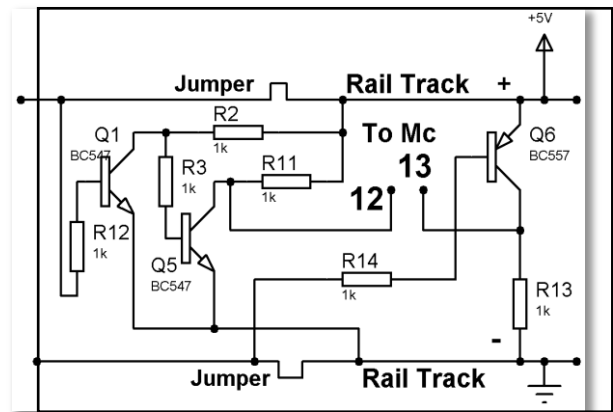


Fig.2. Crack Sensing Circuit

Fig.2 shows the crack sensing circuit. The railway track security system uses transistors Q1 & Q5 alongside a new BC557 (Q6) in conducting mode, such pin numbers twelve & thirteen are held "HIGH" in simple situation. The crack on the railway track is initiated by 2 connectors. One is fed to Q1 through R12 whereas the other is fed to Q6 through R14. One connector disconnects the positive supply whereas the other connector disconnects negative supply. whereas the shorting clip (jumper) is in place it might mean that Q1 is ON and Q5 is OFF. Also, Q6 is in ON state putting logic high at number twelve & thirteen of the microcontroller. whereas the positive shorting clip is removed Q1 doesn't conduct and Q5 starts conducting making pin twelve of microcontroller low. When the negative shorting clip is removed the transistor Q6 stops conducting and creating pin thirteen of Microcontroller logic zero, for the program whereas execution sends a warning message via GSM modem to the station master's mobile number for necessary action. The project uses a GSM modem appropriately interfaced to the microcontroller through the level shifter IC MAX232. Software needed is Kiel complier. Compilers are programs used convert a High Level Language to computer code. The language used are Assembly language or Embedded C. Compared to assembly language, C code is a lot more reliable, scalable, easy to debug and easily transferable completely between different platforms. This makes it convenient for a user to develop programs that may run on most of the systems.

## 3. FLOW CHART



Fig.3. Flow Chart

## 4. RESULTS ANDDISCUSSIONS

We have implemented an autonomous vehicle for the railway track cracks detection. But we can see that the sensing speed of our sensors is less accurate, which can some time fail to detect the crack. Overall speed of our vehicle is also quite less. In rainy and other specific atmospheric conditions, it does not work properly and fail to detect the cracks. The design is all in all robust and very cost effective and can also function efficiently. This method can be very helpful in order for the regular track analyzing as it is more convenient than the other checking systems. Also, possibility of error are less as Global Positioning Satellites are used to determine the exact location of the crack on the tracks. The robot consists of two arms like structure on which we are connecting IR sensors either side for detection of railway track cracks to increase the efficiency of our vehicle.

## 5. CONCLUSION

As per our project aim the main purpose of this autonomous vehicle is to find the railway track cracks, which can also be very useful for railway maintenance department for inspection of long railway tracks. By using this robot, we can also reduce the number of accidents to greatest extend. We can also find exact location by using this robot and location information can be send to the predefined phone number. This will help in maintenance and monitoring of railway lines time to time. The power consumption of this vehicle is also less.

## 6. REFERENCES

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