

RAILWAY TRACK CRACK DETECTION MECHANISM

Rohit Gavali¹

¹S.Y. Student, Department of Mechanical Engineering, Vishwakarama Institute of Technology, Bibwewadi, Pune

Abstract - There are many faults and cracks observed in various objects which lead to a high amount of accidents and loss of lives too. The cracks and faults can't be observed by the naked eyes and thus can lead to dangerous situations. The only solution to the problem is the high built quality of the product and time to time maintenance of the product. Most of the cracks can be caused due to the high wear and tear of the parts or the lack of disciplined usage. The railway tracks undergo various stresses and strains due to the high pressure exerted by the trains and continuous wear and tear results in the early damage to the tracks. This can result in dangerous accidents. The various mechanisms are used but they lack smartness and ready alert.

Key Words: Faults, Cracks, Railway track, Ultrasonic Waves, Barricades, Solidworks

1. INTRODUCTION

The major advantage of the project is for detecting the faults and the cracks of the tracks which needs to be checked. The cracks can result in dangerous accidents resulting in loss of lives and loss of money. The barricades with red colour indicating danger are also used for extra safety reasons.

The tracks are highly exposed to the environment resulting in early damage. The damage results from the high cracks and faults on which the railways with massive loads travel. This can prove fatal in terms of life and money. Hence protection and safety are necessary.

Even though proper maintenance is claimed still many tracks which are present in the outskirts lack maintenance and hence result in the cracks

The improvement scope is always high with the improvement with the upgrading of the machine. This will lead to more generations of more advanced crack detection mechanisms that will be more advanced and more accurate.

This is the most advanced feature and since being small and easy to handle the rate of feasibility is higher. The hydraulics and other electronics can be easily maintained resulting in the high shelf life of the product.

2. LITERATURE REVIEW

The paper is focused on the prototype of the crack detection in the railway tracks with the Arduino and LCD to show if there is any crack. The main focus is based on the ultrasonic sensor interface with the Arduino and the detection of the cracks.

The motor starts and the checker checks if the motor starts if yes then it proceeds if not then it goes back and informs to start it. Then the starts running and the timer show CT time. There are two possibilities here if yes it goes ahead and if no then it resets. If yes then it checks whether there is a crack or not. The crack number is then counted with the help of the counter mechanism and incremented each time it detects the crack. Then again there are two possibilities here yes or no if no then it resets and if yes then it goes to motor and stops it if there is a crack. The L293D is also used to synchronies the motors with the Arduino UNO. The LCDs are all kinds of alerts and counts present on the chassis of the car or train. [1]. Many accidents occurred in India due to a lack in the maintenance of the tracks and systems associated with them. The systems lack in informing the authorities about the faults in the tracks resulting in the high accidents rates in India and various other developing countries.

The paper focuses on the GSM module which sends the notifications to the driver. The description of the GSM module is majorly focused here. The same algorithm is used here as well that the motor stops if there is a crack detected and the antenna sends the signals to the driver. [2].The paper focuses on the

EMAT sensor technology with the proper application of the technology in this field. The EMAT sensors detect if there are any kinds of cracks on the tracks and the PIR sensors detect if there are kinds of humans or animals on the track which results in the double safety of the individual or animal.

The GSM module sends the notifications to the nearest control centre which is registered in the microcontroller. The sensors work in coordination to detect the cracks and alert the authorities.

Another safety feature of the PIR sensor makes it more comfortable and easy to detect the living object on the track. Hence the lives of that object can be saved beforehand. [3].

3. METHODOLOGY/EXPERIMENTAL

3.1 Materials/Components

The project is designed on Solidworks. The project finds if there are any kinds of faults or cracks in the system which is to be checked and the barricades come out to alert the driver and the authorities. The high alert system is also present in it and thus it can give an alert if there is a high amount of deflection observed and thus it can be used by anyone and anywhere. The structure is designed in such a way that the product is easy to handle with maximum accuracy keeping in mind. The GSM module results in an easy alert to the driver and control room. The maximum use of this project can be done on the construction sites, areas where a high amount of structural things are manufactured, automobile sector.

The EMAT sensors transmit the Ultrasonic sound waves to the tracks and they get deflected back if there is any kind of crack or fault in the track. The unusual deflection can be easily detected with the help of this model. The unusual deflection will be diagnosed and analyzed by the microcontroller. The analyzed result will be given out and declared if there is any kind of crack in the track. This process will be done every time before a train passes through the track further. The sensors will be placed at a

fixed distance of 4 kilometers which is more than the average train length. Hence enough time is present for applying breaks and stops the train. The range of the sensors can be increased as per the development in the sensors or multiple sensors between the barricades.

After the crack detection, the alert is sent to the train driver and the control room the barricades will be opened to indicate the danger. The control room then can send the maintenance people to rebuild and correct the cracks. This might be a bit lengthy process but this mechanism can save the lives of millions of passengers.

The barricades will be controlled by the hydraulics and all the electronic components are powered by cells with additional solar chargers to charge the cells when discharged.

The monthly maintenance of the components can ensure the proper working of the mechanism for a longer lifespan.

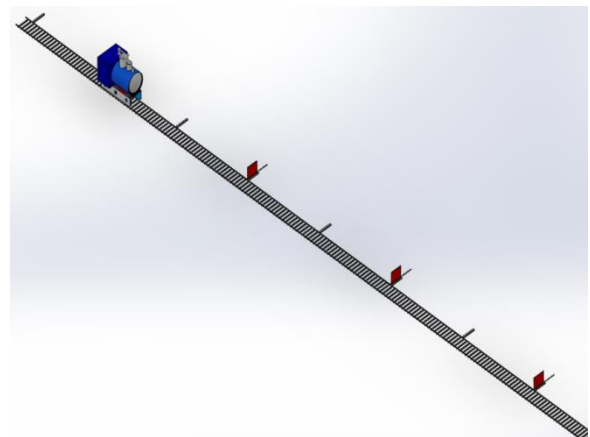


Fig -1: Assembly

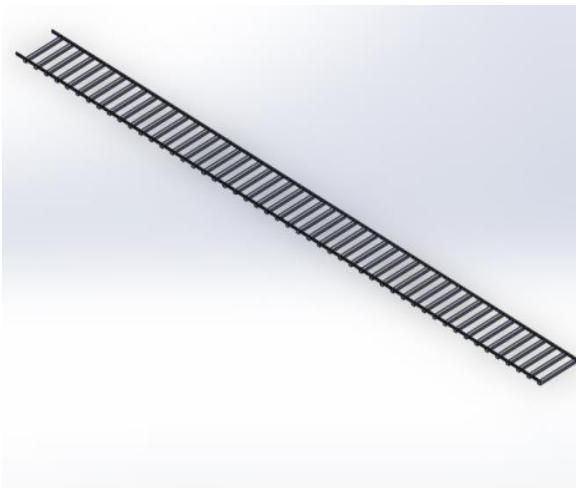


Fig -2: Good Track

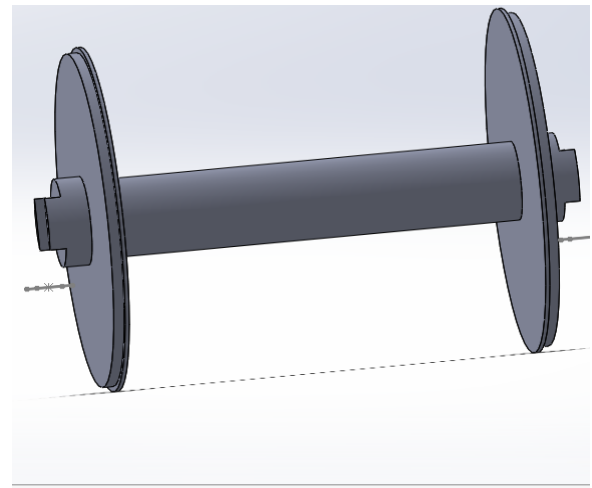


Fig -5: Wheels for the Railway Engine

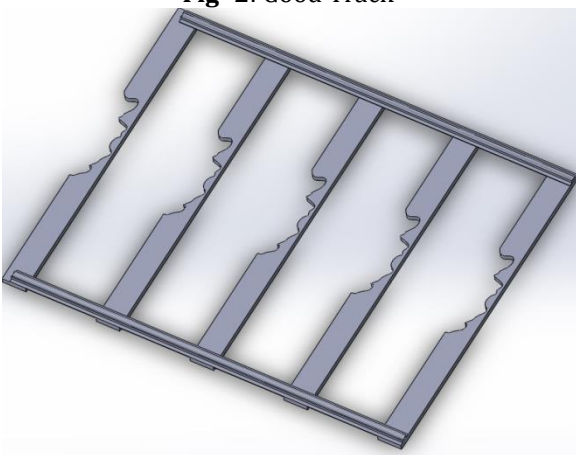


Fig -3: Track with Crack

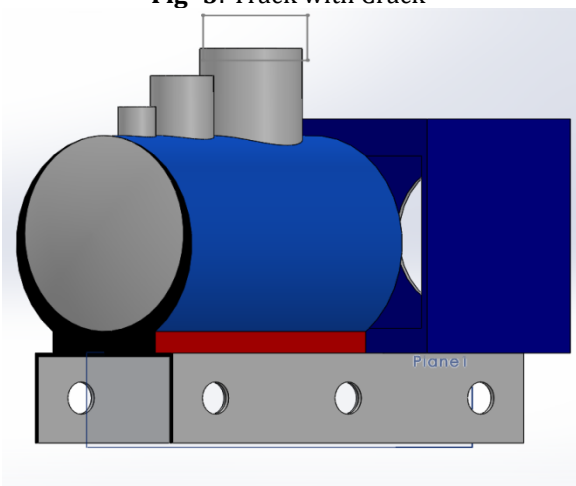


Fig -4: Train Engine Model

4. RESULTS AND DISCUSSION

The present project can be implemented and will prove an important change in the railway systems and can help to save a lot of lives with cost effective method. The sensors are calibrated according to the user conditions and will prove good change in the railway industry.

5. LIMITATIONS

The mechanism designed in this project might get affected because of the extreme weather conditions which can lead to a bit of the issue for the working of the project

Even though the mechanism will be protected using a box and lock but there are little chances of theft and the mechanism might get stolen.

Failure or the poor calibration of the sensors can also lead to failure of the system.

6. FUTURE SCOPE

Highly automated sensors can be also used in future generation models hence it will result to high accuracy of the project.

Self calibrating sensors can be used to make sure that there is no need to calibrate the sensors after a certain period.

The design modifications can prove useful during the future models.

7. CONCLUSIONS

The product is highly recommended for cracks or the fault detection of any object and thus the lives of millions can be saved through it.

The accurate designs make it more comfortable while using it and also give an upper hand when compared with the existing ones.

The high functionality at less cost is one of the most appreciated functions of this mechanism. The high alert system makes it one of the most reliable mechanisms to detect railway tracks cracks.

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