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Railway Security Management System (Bridge Vibration) Based on GSM

Jithin P Sajeevan*, Mohammed Zeeshan A**, Bhoomika H K**,Nagesh B M**
**(Research Scientist, LRDC,Lithoera Technologies, Bengaluru-56*
*** (Student,Master of Computer Applications, REVA University, Bengaluru*

ABSTRACT
The investigations on the railway bridges have become a major part as there is an increased response towards structural health monitoring (SHM). The bridge experiences increasing traffic volume and weight, deteriorating components, and a large number of stress cycles. Therefore, monitoring the present condition of railway bridges is important. The most common approach for structural health monitoring is inspecting it visually. Currently, researchers have observed that the vibration measurement-based structural health monitoring methods provide more realistic predictions, and also they are economical. Railways are large ground transportation and are the primary mode of transport in most of the countries. They have become the primary mode of transport due to their capacity, speed, and reliability. Even a minor enhancement in the performance of the railways benefit economically the rail industry. Thus, there is a requirement for a good strategy to monitor the optimization of frequency inspection. The breakage or weakness of the bridges should be identified in real-time before any accidents occur due to the impact. In this paper, we have different rail defects inspection, detecting cracks, and maintenance methods that will avoid accidents from happening.

Keywords **-** Crack detection, Railway Security, Rail Sensor,Structural health monitoring (SHM), Track Survey

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I. INTRODUCTION

Railways consist of very large infrastructure and they are an important mode of transport in most of the countries. The railways are closely associated with passenger and goods transportation due to their capacity, speed, and reliability; they have high risk associated with them in terms of human lives and cost of assets[1]. The maintenance of the railways needs to be good to avoid accidents. Accidents occur even though safety measures are taken into considerations and new technologies are being found. Therefore, there should be rational planning to maintain and inspect the tracks and bridges. Most of the railway bridges across the world are near the end of their design lives and many of them exceed 100 years of age [2,3]. Replacing these at a time will be very costly and thereby it is practically impossible as there are many old bridges. Since, for the past few decades, researches have been directed towards the development of structural health monitoring and non-destructive assessment methods to maintain these bridges more efficiently[4].

The structural appraisal is being received more attention from bridge engineers due to recent failures in bridges in both the countries i.e., developed and developing countries such as the collapse of the Inter-state 35 W bridge in Minneapolis, Minnesota on July 2—7; the Hoan bridge failure in Milwaukee, Wisconsin in 2000; the partial collapse of Cosen bridge in Latchford, Canada in 2003, etc. There was a detailed inspection on the bridges that revealed damages such as cracks and fractures, severe deterioration due to corrosion of members, some of which already reached a complete loss of the cross-section of the member[4].

II. INSPECTION OF CRACKS :VISION BASED

A technique for inspecting rial track using automated video analysis is proposed [6]. The system aims at replacing the manual visual inspection performed by the railway engineers for the track. To get high performance automated rail track inspection, a combination of analysis methods and image processing is used in the paper. This paper is based on finding out the clips which are missing and finding blue clips that have been replaced recently in place of damaged clips.

The algorithm aims to find clips automatically in video sequences and then identify whether the clips are broken and if the clips are new or old as they are indicated by their color. Some of the clips on the track may be missing or damaged because of the strain on them as the train moves on

the track which lead to the tracking failure, these clips which are missing are identified. These clips can be identified with their color depending on whether it is new (blue color) or old (grey color). Therefore a video analysis is made on the clips based on their colors and the outcome is given to the track maintenance engineers.

The driving accidents are caused due to the irregularities in the Railway track gauge which reduces the service life of rail as well as the vehicle which in turn results in vehicles falling off rail or wheel trapping. The inspection method of track gauge dynamically based on computer vision is developed in [7]. The construction of the inspection system is done by using four CCD (Charge-coupled Device) cameras and two red laser sector lights.

III. SENSOR BASED SURVEYING

For Track looking over with sensors, the creators have proposed a design that has sensor hubs conveyed along a railroad track as appeared in Fig 1. The organization comprises of various control communities (sink hubs) that are associated through a wire lined association, and the sensor hubs are sent along the railroad lines [13]. The sensor hubs gather the fundamental information and forward the information back to the sink. An inventive railroad track reviewing method is portrayed that utilizes sensors and basic parts like a GPS module, GSM Modem, and MEMS based track finder gathering [14]. The studying framework proposed in this paper can be utilized for both stabilizers and piece tracks. The railroad mathematical boundaries which are Track pivot organizes are gotten with coordinated Global Positioning System (GPS) and Global Framework for Mobile correspondence (GSM) collectors. The creators have proposed a modest, and straightforward plan with adequate roughness which is appropriate in the Indian situation that utilizes an LVDT plan to overview track math by utilizing multi-sensor, which has end up being financially savvy as contrasted with the current techniques. This sensor precise discovery and it will send data promptly by utilizing GSM. The framework can be worked in burrows without interference.

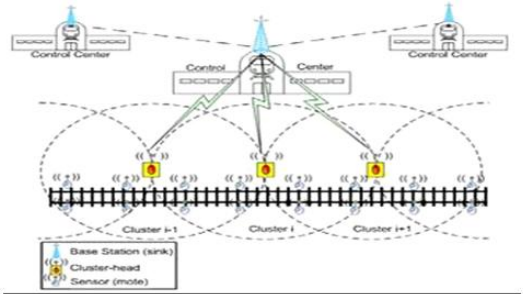

Fig.1. Architecture of Track Surveying with Sensors

Bridge damage status is checked by the sensor and remote modules, when the sensor not getting a signal, right away close by remote framework tells an alarm or advises to the current train on the track. The above undertaking can accomplish through micro-controllers, GSM, LVDT.

IV. RAIL DEFECT DETECTION PROCEDURE

Rail defect identification is a cycle for which various identification strategies have been considered and actualized. In general, for an imperfection identification framework, the accompanying need to be made accessible: an arrangement of sensors that navigates the rail tracks, and information securing framework, a calculation to measure the information and group the signs as those emerging from a break or no break lastly a method for telling the GPS position of the break to specialists with the goal that vital move might be made. This methodology is formulated to find clips automatically in video sequences and identify whether they are broken and if they are old. There are metal clips that hold the rail track to the sleepers on the ground. There is no assurance that all clips on the track are perfectly aligned, some may be broken or missing due to excessive strain on them as the number of trains move on the track that may cause track failure these missing clips are identified. Figure talks about the progression of the cycle of flaw recognition and remediation in the event of rail break occasions. An outline of the talked about strategy is given in Fig 2[15].

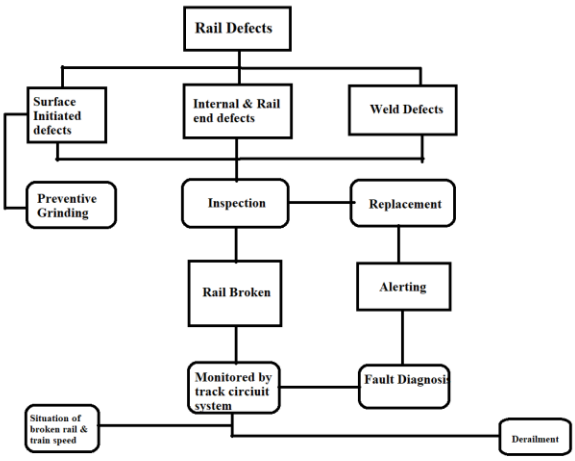

Fig 2 Break Detection procedure

V. CONCLUSION

Accidents taking place in railway transportation systems impact a large number of lives and as well as the economy of the system. There will be a huge loss in terms of life and others

get physically and mentally injured. We need or there is a need for some advanced techniques which will prevent these accidents and also remove all the possibilities of their occurrence. The data that we collect from the above model should be transferred to the relevant persons through the GPS module who would take action on the damages that occurred, which will prevent the accidents from happening. The above sensors are capable of sending the geographic location. The geographical positioning sensors are placed on the trains. Once you get the location and the conditions of the track a message will be to the relevant person through the GPS module, so that the decision-making can be done and the decision is forwarded to the train without any delay.

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