

Collision Avoidance by Crack Detection in Railway Transportation System

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ABSTRACT

In today's world the Indian railways are the enormous rail passenger transport and it is the hardihood of the country transport infrastructure. One of the most widely used and comfortable mode of transportation system is train, but sporadically, accidents are occurring due to collision as well as some other cause. The major worry about a railway analysis is detection of cracks in the structure. If these deficiencies are not controlled at early stages they might lead to a number of derailments resulting in a heavy loss of life. This paper proposes a cost effective solution to the problem of railway track crack detection using MEMS, ARM 7 and GPS module which tracks the location of track damage. Track damage status is monitored by the sensor and wireless modules, when the sensor not getting signal, immediately notifies and alert or informs to the current train or authority people on the track.

Keywords - MEMS, railway track, crack, GPS.

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I. INTRODUCTION

Depending on recent developments in railway systems, high-speed trains are being extensively used and rail transportation is being increased. Reasons for this increase are high speed, economical, environment friendly, safety, and modern characteristics of railway systems. In railway tracks, anytime the track is damaged due to weather conditions, floods, earthquakes, cyclones etc. The existing track surveying systems have some limitations. It takes more time and it is less accurate. In this project, the proposed system immediately notifies the cracks in the track and informs to the current train or authority people on the track, hence can reduce the rain accidents due to cracks in the tracks.

In the proposed system, it consists of multiple sensors such as ultrasonic sensor which finds the cracks on the track and MEMS (Micro Electro Mechanical switch) sensor which detects the shakes. This section mainly consists of GPS module which is used to find the exact position of the crack transmits the information to railway authority. This paper proposes a cheap, novel yet simple scheme with sufficient ruggedness suitable to the Indian scenario to track geometry survey by using multi sensor, which proves to be cost effective as compared to the existing methods.

II. EXISTING SYSTEM

In the railways there exist some works in crack detection. The majority of the work done in the field of crack detection uses infrared sensing technique but later it was found that it was affected by external disturbances and hence came to be considered inaccurate. Automatic broken track detection using LED-LDR assembly system automatically detects the faulty rail track without any human intervention [1].

In this system GPS module was used so that we can get the exact location of the broken rail track but it cannot operate in slabs. This disadvantage can be overcome by using the proposed system.

On the basis of the numerical method In Rotating Electromagnetic Field for Crack Detection in Railway Tracks system [2] they developed a finite element procedure for the analysis of the rotating magnetic field for the detection of railway tracks. Rotating Magnetic Field provides a good overall accuracy in discriminating defect presence but it was time consuming. At the same time, the procedure should be validating for other kind of defects, with different geometries or orientations. The introduced surveying system in this paper is operational on both ballast and slab tracks.

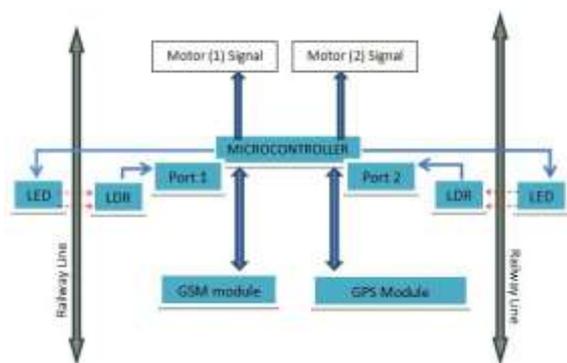


Figure.1. Existing system

Track axis coordinates, which are railway geometrical parameters, are obtained with integrated Global Positioning System (GPS). This project proposes a cheap, novel yet simple scheme with sufficient ruggedness suitable to the Indian scenario. The introduced surveying system in this paper will detect objects, cracks and vibrations of the track. The use of multiple sensors makes the proposed system highly accurate. It is simple and the cost is low and suitable to the Indian scenario.

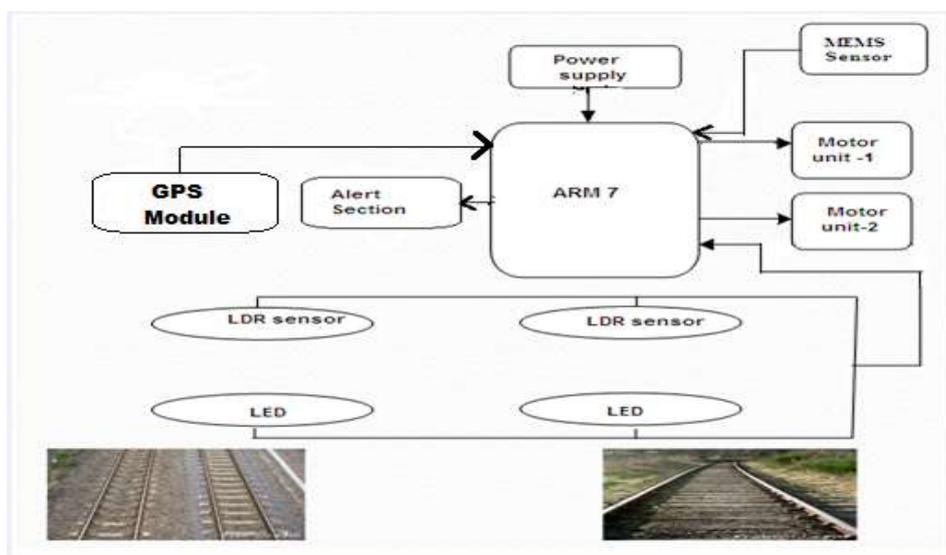


Figure.2. Block diagram of Collision Avoidance and Crack Detection System

III. PROPOSED SYSTEM

The detection of crack can be done using LED-LDR sensors, where LED will be attached to one side of the rails and the LDR to the opposite side. During normal operation when the LED light falls on the LDR, the resistance of the LDR gets reduced and the amount of reduction will be approximately proportional to the intensity of the incident light. Micro Electro Mechanical Switch (MEMS) is the integration of mechanical elements, actuators, sensors and electronics on a common silicon substrate through micro fabrication technology.

The MEMS sensor output (analog form) are fed to filters for the filtering purpose and after signal processing this outputs are given to the CPU and it continuously compares the output value with a predefined range(normal vibration).If there is a fault in railway track, the vibration increases more than the normal range. MEMS output voltage increases from the normal range of voltage When a high vibration is detected train stops and sends alert message (latitude and longitude) is send to the current train or control station immediately. The GPS module calculates the geographical position of

the crack. And message is sent to the mobile of the authority people of the track. The proposed system will find the cracks on the track, identify the objects on the track and identify vibrations of the track.

Whenever MEMS output value is increased than the predefined range(normal vibration) then the train stops and position of the crack is calculated and sends the message to the authority people on the track.



Figure.3. Hardware implementation

IV. CONCLUSION

In railway transportation system derailments resulting in a heavy loss of life. A cost effective solution to the problem of railway track crack detection using MEMS, ARM 7 and GPS module is designed. Track damage status is monitored by the sensor and wireless modules, when the sensor not getting signal, immediately notifies and alert or informs to the current train or authority people on the track.

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