International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue-17
December 2017

Vibration Detections On Railway Tracks And Testing Of Train Wheels Condition Using Iot

Shaik Eliyaz & S S Naga Pavan Kumar T
M.Tech Scholar, Vignan's Lara Institute Of Technology & Science, Vadlamudi, Guntur District, A.P
Assistant Professor, Vignan's Lara Institute Of Technology & Science, Vadlamudi, Guntur District, A.P

ABSTRACT: *Today's most of the railroad investigation is manually conducted by tracks examiners. Practically, it is not easy to investigate the thousands of railway track and wheels by trained human examiners. Hence it takes too much time to inspect the defected railway tracks and wheels, then inform to the railway authority people. In order to avoid delay and improve the accuracy, the proposed structure that will automatically investigate. The system is described, detailing the process of capturing consistent high resolution and quality images of the wheel tread and flange suitable for processing to detect defects. Some with defects created artificially on the test wheel to test the image capturing capability of the system and its ability to automatically detect the defects. Here Vibration sensor is used for detect the vibration of tracks. The system was also shown to be successful at automatically analyzing the captured images to detect wheel surface defects. For easy surveying and with less delay the information can be send to the authority by using IoT. These detection and controlling methods can be used to prevent the railway accidents and to safeguard the people.*

Keywords: VibrationSensor ,logi-tech camera raspberry pi-3 processor.

I. INTRODUCTION

Micro-Electro mechanical systems are being used in vibration sensing, acceleration measurement, gas sensing and biological detection. They are integral aspects of accelerometers and gyroscopes in vehicles. Their use has also been explored in static magnetic field sensing along with sensing of radio-frequency magnetic fields. In recent years, an increased development in the field of Micro-Electro-Mechanical Systems
(MEMS) technology has been the key driver of smart sensors. which can monitor a particular environment and transmit relevant information to the user. Smart sensors are a set of MEMS sensors having a control unit and a transmitter deployed for specific application. They can be deployed for structural health monitoring of civil infrastructure. Such a system has been practically tested in a bridge.

MEMS sensors can also be used to monitor Railway tracks which are vital parts of transport infrastructure. Railway track monitoring holds special significance for remote and hilly areas where changes associated with the physical conditions of railway track arising out of events like rock or timber fall go undetected resulting in accidents which cause immense loss of life and property.

To address this problem, optical obstacle detection system using video camera mounted on a locomotive has been tested. Microsystem based sensors integrated with the railway track offers some advantage over other techniques as they can detect the acoustic wave generated by events like rock or timber fall or landslide and can offer real time monitoring. The sensors can be placed at precise distances along the track and they can have a transmitter which would send the signal associated with change in physical conditions of the track to a central station through the optical fiber link which is usually present along the track length.

II.EXISTED SYSTEM

A MEMS based vibration sensor or accelerometer has a fixed part and a moving part which facilitates transformation of mechanical waves generated in the railway track into an electrical signal. It may have piezoelectric or piezoresistive elements to enhance the response of the electrical signal. Fig. 1 shows an accelerometer for contact based vibration measurements of the vibrations of a railway track. The device has a fixed element with an electrode projecting between the capacitor plates linked to a movable element connected to the fixed structure through which vibration is transferred. The accelerometer is connected to a computer through data acquisition card which collects data.

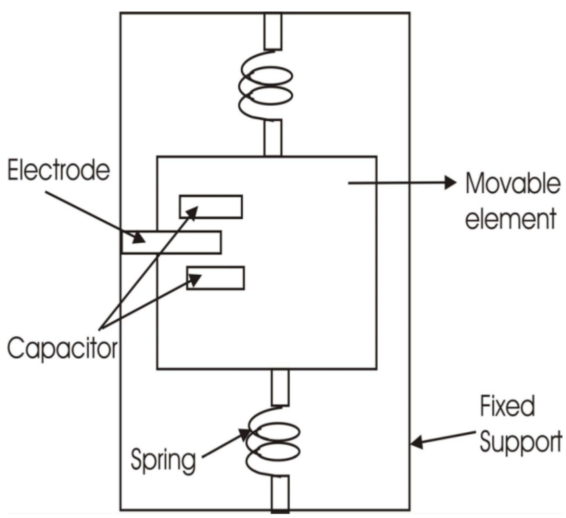

FIG. 1. A VIBRATION SENSOR HAVING A FIXED SUPPORT WITH AN ELECTRODE WHICH IS PROJECTED INTO THE SPACE OF PARALLEL PLATES CAPACITOR THROUGH A SPRING ELEMENT.

The experiments were completed at the Tuxford end of the High MARNHAM Rail Innovation and Development Centre, UK and comprised of dropping selected objects at a specific point (Drop Zone) on the railway track in a periodic order, whilst accelerometer at some distance away referred to as the Test Site was used to record the mechanical vibrations generated in the track (Fig. 2). Subsequently, the accelerometer was connected at precise distances away from the Drop Zone and the experiments were repeated. Prior to the actual trial, the site was surveyed for possible locations to set up the accelerometer for measuring the objects dropping on the rail at the Drop Zone.

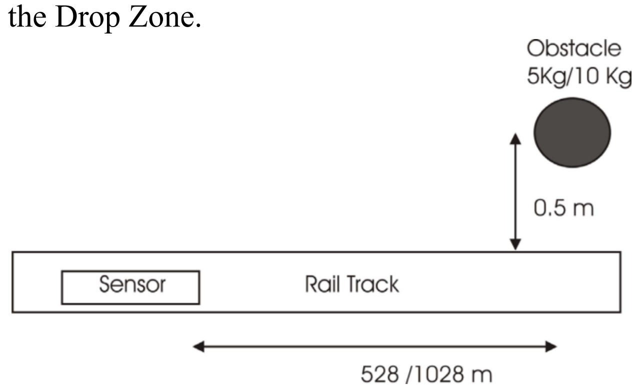

FIG. 2. SCHEMATIC DIAGRAM OF MEASUREMENT SET UP.

The locations which were selected for the accelerometer are Test Site one which was at 528metres from Drop Zone and Test Site two which was located 1028 metres from the Drop Zone. Besides these, the vibration measurements using accelerometer were also conducted at 1.5 km, 2 km and 100m from the Drop Zone. The accelerometer (301A10, Piezotronics, www.pcb.com) used for vibration monitoring is a high performance, wide

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue-17
December 2017

bandwidth vibration sensor. This device is ideal for monitoring vibration, detection shock where wide bandwidth, small size, low power, and robust performance are essential. This was used to detect objects dropped at the Drop Zone. The device was connected along the side of the railway using its magnetic element. Data acquisition module from National Instruments was used to acquire data from the accelerometer and transfer it to a laptop. The data acquisition system acquires the numerical values related to vibration in units of acceleration due to gravity g (9.88 m/s2) along with its dependence on time expressed in seconds.

III.PROPOSED SYSTEM

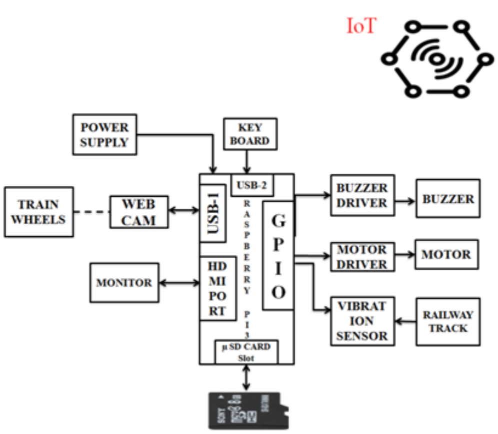

FIG3. CIRCUIT DIAGRAM OF PROPOSED SYSTEM

The proposed system consists of Raspberry pi-3 as a processor. GPIO pin of 31 is connected to the vibration sensor,pin-32 is connected to the buzzer, and the both 35&37 pins are connected to the motor respectively. When vibration is occurred then the vibrator sensor will be activated and hence the information will be shown in IOT. USB port-1 is connected to the logi-tech web camera which is used for capturing the damaged wheels and provides the information to IOT. The information of vibration of tracks and damage of wheels are monitored through the pc. Then monitor will be connected to the HDM1 port. Micro SD card is used for the storage of captured data. Another USB port-2 is utilized for connecting the keyboard to give commands.

IV.RESULTS

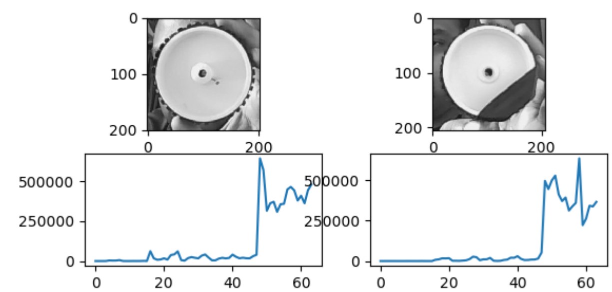

FIG.4 RESULT ANALYISIS

The combined results of the test programme show that the Wheel Checker system could be installed in an operational railway site; furthermore, it could be operated effectively to capture high-quality images of the wheel treads and flanges of passing rail vehicles, enabling thus the image analysis to detect wheel surface defects. the system was successfully developed to automatically identify a specific type of wheel defect in these tests flange defects and that its capability has been verified. These results are promising, indicating that the system is capable of being developed to automatically detect, quantify the severity of and report wheel defects. Further work is required to fully verify the capability of the system; this would include testing with a range of wheels exhibiting different types of defects, and a long-term monitoring campaign of operational vehicles to assess the trends in vehicle condition which could be identified. Further development would be required to improve the equipment beyond the prototype stage and to integrate automatic maintenance requirement reporting and operational alert functionalities into the system.

V.CONCLUSION

In this work, the crack on the track, face to face collision and de-railment, all these occurrences are sensed automatically and accidents are prevented, here testing has been carried out by established models and program has been done by python language. The both face to face collision and crack on track are detected 4-5km before by the continuous monitoring of vibration detecting sensors which are fixed at the railway tracks, and once detected the vibrations automatically send the information to railway authority,if the any wheel damaged,the damaged wheel captured and send to railway authority using Iot.Then an alert is given to driver and automatic emergency brake control is applied. If this system is brought in railways, the accidents could be controlled and the place of damage could be sent automatically.

VI.REFERENCES

[1] J. Bernstein, R. Miller, W. Kelley, and P. Ward, “Low-noise MEMS vibration sensor for geophysical applications,” *J. Microelectromech. Syst.*, vol. 8, no. 4, pp. 433–438, Dec. 1999.

[2] S. X. P. Su, H. S. Yang, and A. M. Agogino, “A resonant accelerometer with two-stage microleverage mechanisms fabricated by SOI-MEMS technology,” *IEEE Sensors J.*, vol. 5, no. 6, pp. 1214–1223, Dec. 2005.

[3] M. Afridi *et al.*, “MEMS-based embedded sensor virtual components for system-on-a-chip (SoC),” *Solid-State Electron.*, vol. 48, nos. 10–11, pp. 1777–1781, Oct./Nov. 2004.

[4] C.-J. Lu *et al.*, “First-generation hybrid MEMS gas chromatograph,” *Lab Chip*, vol. 5, no. 10, pp. 1123–1131, 2004.

[5] G. Müller, A. Friedberger, P. Kreisl, S. Ahlers, O. Schulz, and T. Becker, “A MEMS toolkit for metal-oxide-based gas sensing systems,” *Thin Solid Films*, vol. 436, no. 1, pp. 34–45, Jul. 2003.

[6] P. S. Waggoner and H. G. Craighead, “Micro- and nanomechanical sensors for environmental, chemical, and biological detection,” *Lab Chip*, vol. 7, no. 10, pp. 1238–1255, Jun. 2007.

[7] J.-J. Gau, Jr., E. H. Lan, B. Dunn, C.-M. Ho, and J. C. S. Woo, “A MEMS based amperometric detector for *E. Coli* bacteria using selfassembled monolayers,” *Biosensors Bioelectron.*, vol. 16, nos. 9–12, pp. 745–755, Dec. 2001.

[8] W. Pang, H. Zhao, E. S. Kim, H. Zhang, H.Yu, and X.Hu, “Piezoelectric microelectromechanical resonant sensors for chemical and biological detection,” *Lab Chip*, vol. 12, no. 1, pp. 29–44, 2012.

[9] N. Barbour and G. Schmidt, “Inertial sensor technology trends,” *IEEE Sensors J.*, vol. 1, no. 4, pp. 332–339, Dec. 2001.