Scientific Journal of Impact Factor (SJIF): 4.14
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development
Volume 3, Issue 11, November -2016

Real Time Rail Road Surveillance System

Anil kumar[1], Ashok K N[2], Chethana kumara S[3]

[1,2,3]*Assistant Professor ECE, Amruta Institute of Engineering and Management Sciences, Bidadi, Bengaluru*

Abstract-*The railway being most convenient low cost mode of transportation when compared to other mode of transportation, the railway accidents can have worse impact in comparison to any other mode of transport accidents. In this paper we propose the system which is accurate, reliable and effective means for detection of rail road cracks without human efforts. This system incorporates microcontroller which acts as processing and control unit, GPS module which extracts location information where the rail road crack is detected and GSM used to transmit location information to concerned authority.*

Keywords:*Arduino, IR Transmitter, Photo detector, GPS, GSM, RF transmitter and Receiver*

I. INTRODUCTION

The railways plays prominent role in blooming the economy of the nation. In the field of transportation railway plays an important role, it carries both goods and passengers. The major issue is that 60% of total railway accidents occur due to derailments, out of which 90% of them happened due to crack. One major cause of the railway accidents is track failure. Railroad cracks have been found out to be significant sources of derailments and can introduce a major vandalism to the economy. Railroad safety is of paramount concern and hence the crack detection process is required for its safety. In order to have an effective means of transport, proper surveillance system is necessary for railroad crack analysis. The most challenging problem in railroad maintenance is the shortage of cost effective and efficient technology to detect track flaws. An effective track surveying system is the need for monitoring the predefined issue. Analysis using existing systems is not up to the mark, since there is an inaccuracy in fault detection system [1]. This paper proposes a system which is an effective means for analysis of the cracks present on a railway track without human efforts. The system consists of an automatic robot with arrangement of infrared transmitter and photo detector for crack detection in a precise way. The processing and control unit consist of an Arduino which captures and processes sensor output and GPS module collects latitude and longitude values of the location, GSM transmits information to the concerned authority. For the entire process to occur robot should have to been granted with a certain delay after which robot starts its movement.

II. LITERATURE REVIEW

The Ultrasonic based approach [2] used to detect gauge corner and longitudinal cracking in the rail head. It fails to detect surface or near surface cracks which are responsible for major damages. Microwave horn antenna for detection of cracks [3] utilizes the microwave sensors to inspect rail surface, this system requires spectrum analyzer. An alternative track surveillance method is proposed that is eddy current method technique [4], it utilizes AC bridge techniques which are used for impedance measurements have been adopted to develop eddy current sensor for rail crack detection. Before testing, track it should be cleaned and rust on track is removed. Visual inspection system [5], images from digital line scan cameras this type of monitoring is unacceptable for slowness and lack of objectivity, because the results are related

to the ability of the observer to recognize critical situations. Railway Tracks Detection Using Satellite Imagery [6] uses Google maps for analysis of rail tracks, the problems occur when map services provide obscure image for some counties.

III. SYSTEM ARCHITECTURE

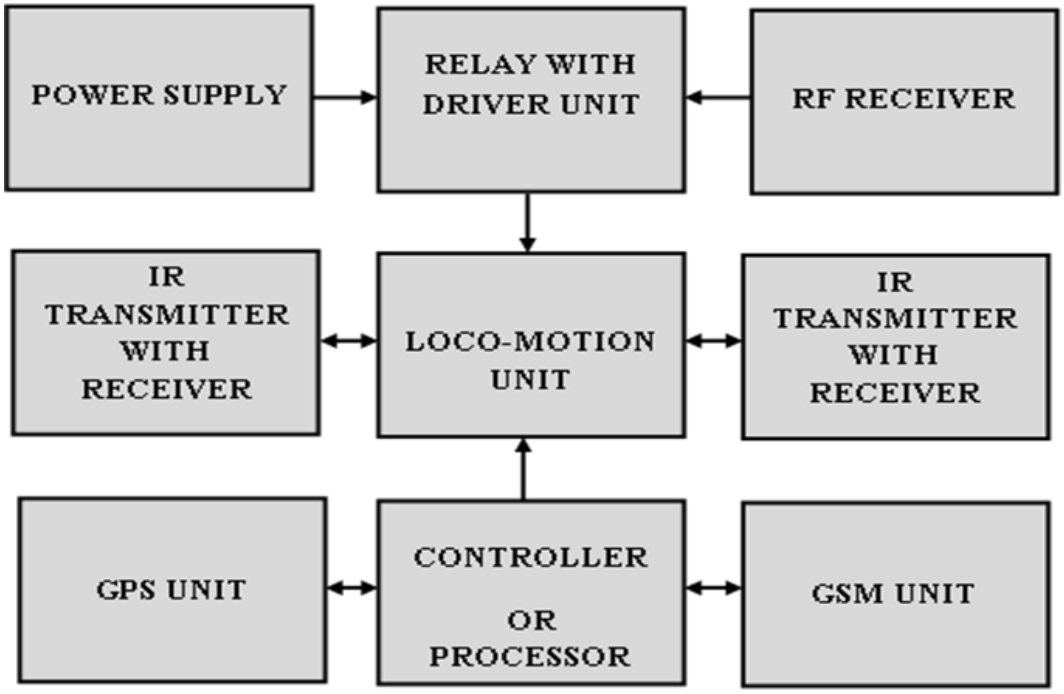

Figure 1. System Architecture

The locomotion unit's movement is controlled by RF transmitter, receiver module; it switches the relay to drive the power supply to locomotion unit. The system inherits IR transmitter at one side of track and optical sensor at another side of the track. The system uses the concept of sensor network with GSM and GPS module to determine the cracks on railroad. When the robot starts its motion the infrared transmitter gets activated, the output value of the optical sensor remains low until no cracks are detected. Whenever there is crack, infrared rays directly fall on the optical sensor. The output value of the optical sensor is directly proportional to the intensity of light incident on it. Hence the soul concept lies on the fact that when the received value is greater than the threshold value determines whether a crack is there or not. When a crack is detected robot stops at that point and GPS collects location information and sends to nearby authority via GSM module. After completion of the task robot resumes its motion on rail road.

V. ALGORITHM

1. Initiate the system movement on track and start GPS module.
2. Turn ON the Infrared Transmitter and Receiver.
3. Convert output of Infrared Receiver into digital value.
4. Compare digital value with predefined threshold value, if digital value is greater than threshold stop the system movement and collected the latitude and longitude data (i.e., location information of detected crack).
5. Transmit the information to concerned authority via GSM.
6. Go Back to Step 1.

VI. RESULTS

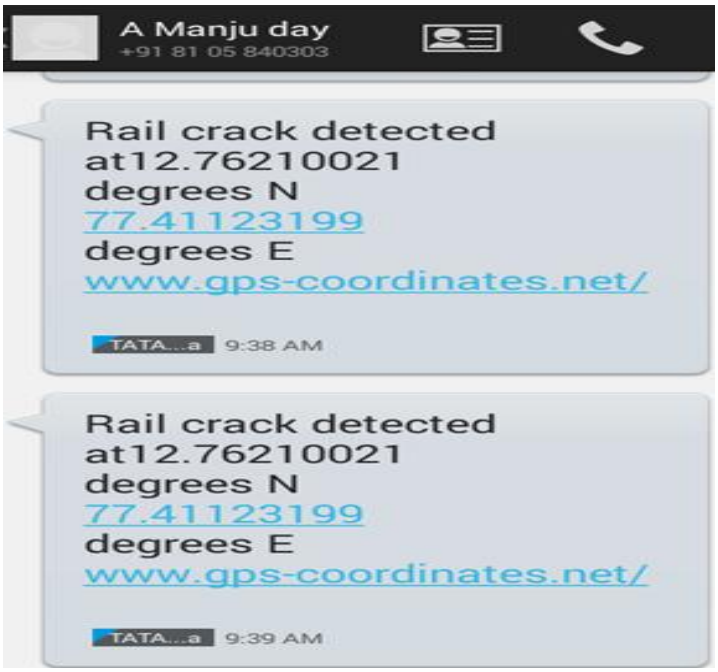

Figure 2.Receivedmessage by concerned authority contains Latitude and Longitude of the rail crack detected area

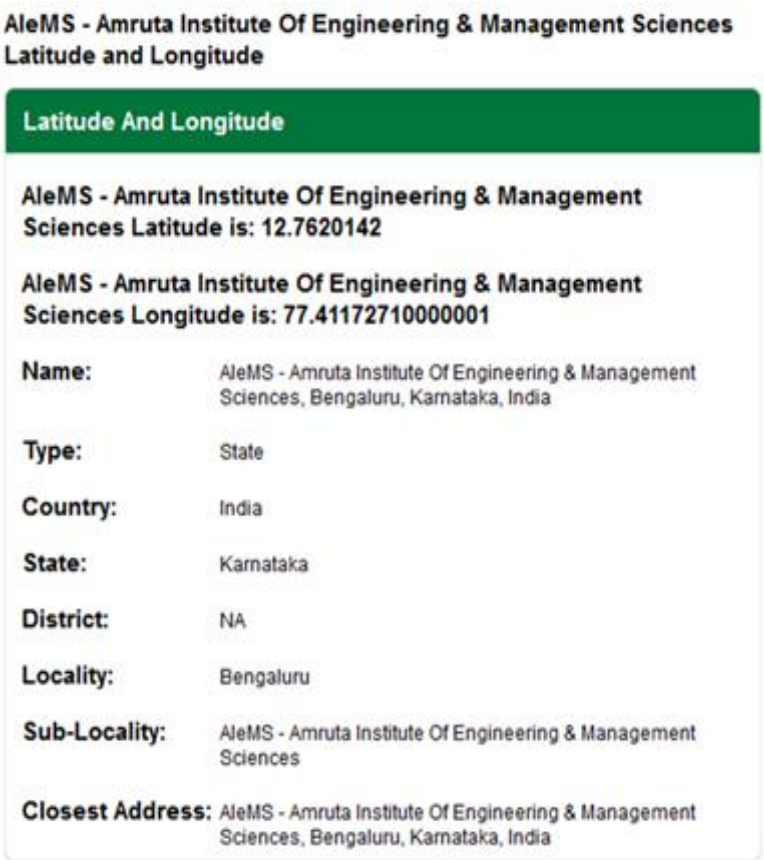

Figure 3. Information about Latitude and Longitude of the rail crack detected area

VII. ADVANTAGES AND DISADVANTAGES

A. Advantages

1. The system is accurate, intellectual, reliable and effective.
2. The system is automatic hence no human intervention is required.
3. It can survey large rail paths with less time.

B. Disadvantages

1. Problem in remote areas where GSM communication is not possible.
2. GPS may not extract location information when the system moves into tunnels.

VIII. CONCLUSION

The proposed system possesses an intellectual approach which is capable of surveying cracks on rail tracks quite efficiently. It is evident that the system can detect minor cracks as well as major cracks in the best suitable way. This detection system automatically detects the faulty rail track without any human intervention. There are many advantages with the proposed system when compared with the traditional detection techniques. The advantages include less cost and less analysis time. By this system the exact location of the faulty rail track can easily be located, which will be mended immediately, so that many lives can be saved by avoiding train accidents. In future satellite communication or node to node communication can be used in remote areas for effective transmission of data.

REFERENCES

[1] Indian Railways Facts and Figures (2011-2012) by Ministry of Railways, Government of India, 2012.

[2] Stuart B Palmer, Steve Dixon, Rachel S Edwards and XiaomingJian,"Transverse and longitudinal crack detection in the head of rail tracksusing Rayleigh wave-like wideband guided ultrasonic waves," Nondestructive Evaluation and Health Monitoring of Aerospace Materials, Composites, and Civil Infrastructure IV, edited by Shull,Gyekenyesi, Mufti, Proc. of SPIE Vol. 5767 (SPIE, Bellingham, WA,2005) · 0277-786X/05/$15 · doi: 10.1117/12.598142.

[3] K. Vijayakumar, S.R. Wylie, J. D. Cullen, C.C. Wright, A.I. AIShamma'a**,** "Noninvasive rail track detection system using Microwave sensor," Sensors & their Applications XV, *Journal of Physics:*Conference Series 178 (2009) 012033, doi:10.1088/1742- 6596/178/1/012033, 2009.

[4] Ze Liu, Andrew D. Koffman, Bryan C. Waltrip, and Yicheng Wang, "Eddy Current Rail Inspection Using AC Bridge Techniques," Journalof Research of the National Institute of Standards and Technology, Volume 118, 2013.

[5] P. De Ruvo, G. De Ruvo, A. Distante, M. Nitti, E. Stella and F. Marino**,** "A Visual Inspection System for Rail Detection & Tracking in Real Time Railway Maintenance," The Open Cybernetics and SystemicsJournal, 2008, 2, 57-67.

[6] Ali Javed, KhuramAshfaqQazi, MuazzamMaqsood and Khurram Ali Shah, "Efficient Algorithm for Railway Tracks Detection Using Satellite Imagery," International Journal of Image, Graphics andSignal Processing (IJIGSP), ISSN: 2074-9074/11, 34-40, 2012.

