



e-ISSN: 2278-8875

p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 7, July 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.282

9940 572 462

6381 907 438

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Accident Prevention & Crack Detection System for Railway Tracks

Mukul Pande¹, Mini Magdline², Snehal Paliwal³

Assistant Professor, Dept. of ECE, TGPCET, Nagpur, Maharashtra, India¹

PG Scholar [ECE], Dept. of ECE, TGPCET, Nagpur, Maharashtra, India²

Assistant Professor, Dept. of ECE, TGPCET, Nagpur, Maharashtra, India³

ABSTRACT: The cheapest and most convenient mode of transport both for long distance and suburban traffic provided by the railways. In Indian railways, accidents are the major concern in terms of unidentified crack in rail tracks. About 60% accidents are occurring at railway track due to fault in rail tracks resulting in loss of precious life and loss of economy. Therefore, there is need to think about new technology which is robust, efficient and stable for rail track monitoring and detect a fault in railway tracks. This paper proposes faulty rail track detection system. This project discusses a Railway track crack detection system using image processing technique and is a dynamic approach which combines the use of raspberrypi4 system and the Wheel encoder module which give the information about geographical coordinate of location. A Raspberry Pi 4 is used to control and coordinate the activities of these devices.

KEYWORDS: Raspberry Pi 4, crack detection, image processing.

I.INTRODUCTION

Rail track is one of the most important infrastructures for the rail transport, it plays major role for the comfort and safe journey of the passengers. Inspection of railway tracks is essential in ensuring the safety of railway system. Poor track management leads to degradation in the quality of ride, flange contact, flange climb, finally to the derailment. There are old methods for inspecting the condition of the track. There is one is portable devices in which engineers to operate along the track line during the midnight. It's a time-consuming work and the quality can't be guaranteed since it depends on the ability of the workers. Inspection by manually and detection of crack in railway track is very time consuming and human resources and it is also a very tedious process. Second method is the Track Recording Vehicle (TRV) is used for carefully examine the geometry condition of the track, which uses many acceleration sensors, optical sensors, and gyro sensors for measuring the different improper railway track, such as vertical unevenness, gauge, lateral alignment, cross level, and twist. therefore, this system is expensive and the optical sensors are very much sensitive to the harsh environment. Hence it can be concluded that the current regulatory framework does not provide a full set of tools to effectively deal with railway accidents and main-track derailments. Rail track monitoring is an emerging system, which is being adopted and supported by many countries across the world. Inservice rail track monitoring and fault reporting refers to the inspection of the track routinely and intimates the fault immediately to provide service at the right time. This project proposes to design a railway track crack detection system using Raspberry Pi 4, Image Processing and wheel encoder sensors. The central component of the whole system is a Raspberry Pi 4. If any crack or fault is detected on the track the location of the crack is identified and the location latitude and longitude coordinates are procured.



II.BLOCK DIAGRAM OF PROPOSED SYSTEM

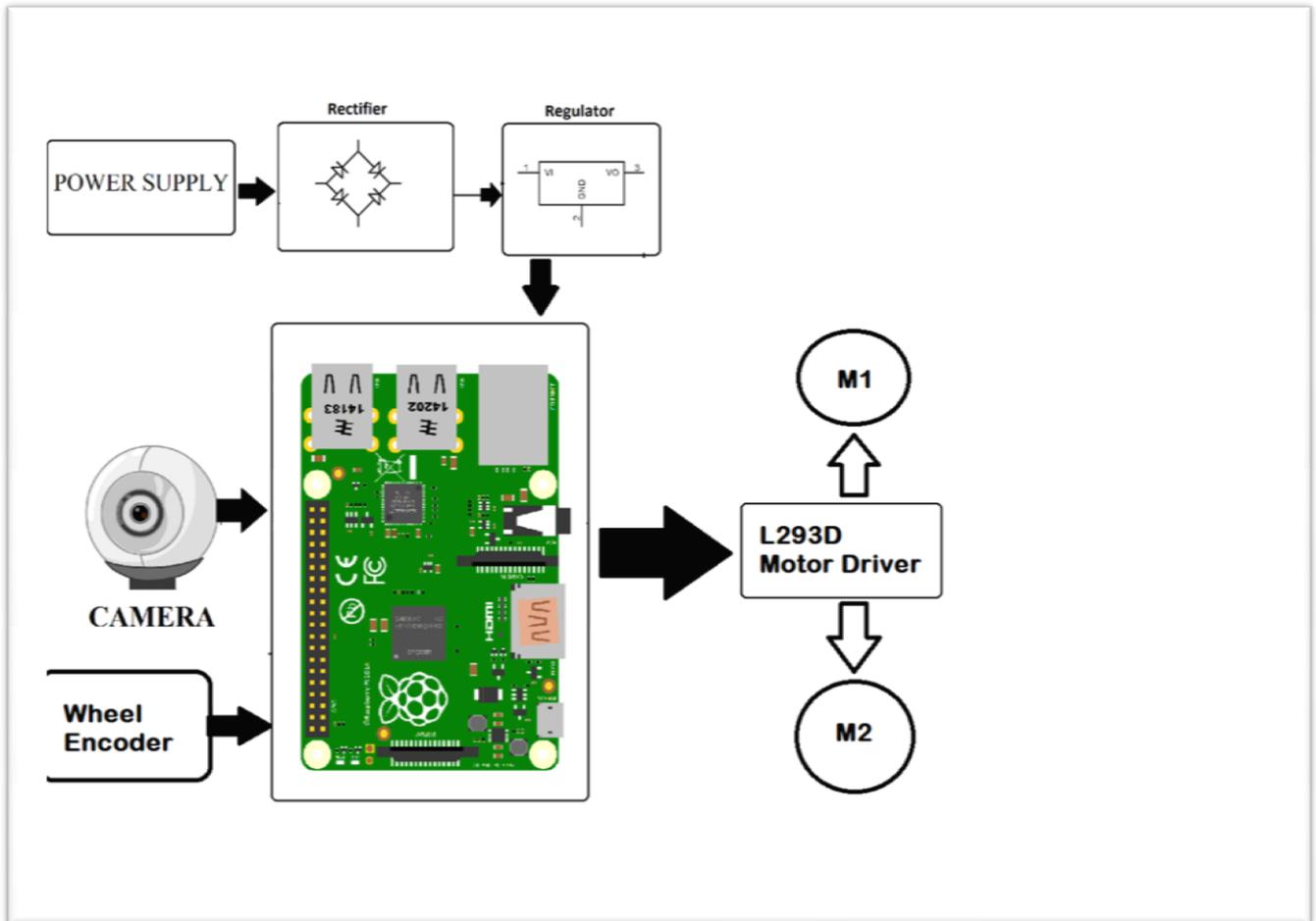


Fig 1: Block Diagram of Proposed System

III.METHODOLOGY

The proposed method uses the raspberry pi board as the main controller. The latest version of raspbian is used on the board. After installing the OS to the board connect all the necessary hardware components and switch on the power supply. It starts booting up the Board and login the raspberry pi by username and password. It operates on the Linux Debian arch operating system. It mainly works on the python software and checks the network settings to update the python software by commands in the terminal window.

Enable the camera settings on the board to capture the image and save it on the folder. Run the python code to check the enhancement algorithms and remove the noise present in an image. The proposed method implementation as shown in the flow chart in fig. below

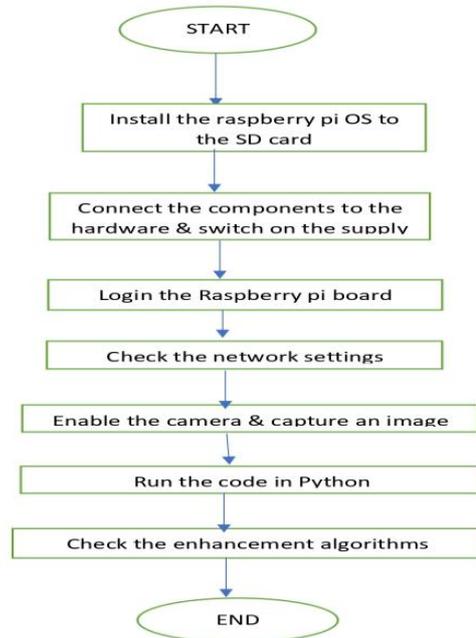


Fig 2: Flowchart of Methodology



Fig 3: Prototype railway engine with railway track

As shown in the above fig., our prototype railway train is moving on the railway track. The pi camera which is attached to the railway train is ready to click the images of the fault



IV. RESULTS & DISCUSSIONS

As per the above mentioned methodology our prototype engine has detected the crack and image has been processed and stored automatically. The algorithm has been applied to the complete image. Once the camera captures the fault image and specifies the location through wheel encoder whole process is automatic. The output images are shown below:



Fig 4: Original Image of track with crack



Fig 5: Gray Image of track with crack



Fig. 6

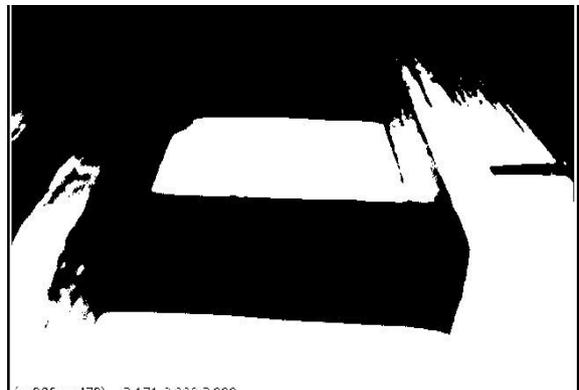


Fig. 7

The above figures Fig.6 & Fig.7 shows, the Greyscale image is converted in binary matrix to identify the number of zeroes on the track using open CV.

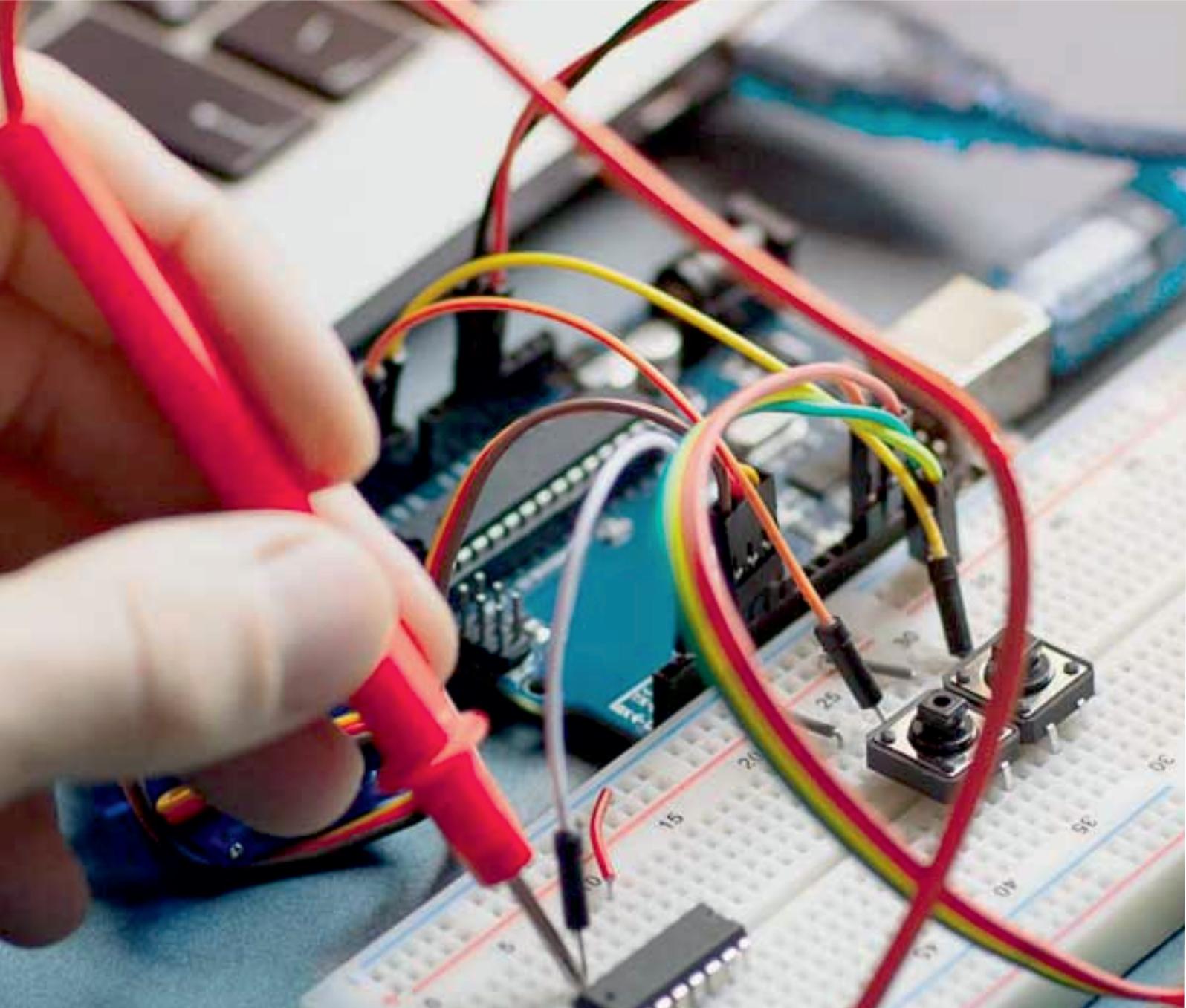
V. CONCLUSION

- The prototype used in this project is capable of detecting the cracks in the railway track.
- Our project model successfully traces the crack with exact location where it is placed.
- Our projects successfully use the techniques of image processing in crack detection.
- The method replaces manual inspection of the track section, by automatic inspection
- The idea can be implemented in large scale to facilitate better safety standards for railway tracks in future.
- This project model will help in preventing train accidents.
- This project model can be implemented efficiently for maintenance of tracks.



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INNO SPACE
SJIF Scientific Journal Impact Factor
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