Rail Track Broken Detection System using IR Sensors

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Abstract: **Railways provide the cheapest and the most convenient mode of transportation both for long distance and sub-urban traffic. Also, most of the transport in India is being carried out by the railway network. Still accidents are the major concern in terms of railway track crossing and unidentified crack in rail tracks in railway. About 60% accidents are occurring at the railway track and the cracks in the railway tracks results in loss of precious life and loss of economy. Therefore, there need to think about new technology which is robust, efficient and stable for both automatic gate closure system and crack detection in railway track. This project proposes a gate crossing and faulty railway track detection. IR sensors base system and crack detection is a dynamic approach which combines the use of GPS (Global Positioning System) tracking system. The controller system prevents accident which are caused due to railway track crossing and railway crack detection system prevents the train derailment by detecting crack in railway track using SMTP (Simple Mail Transfer Protocol) technology.**

Keywords: **Raspberry pi3, IR Sensors, Web Cam, Robot, GPS module, DC Motor.**

1. Introduction

Railway is the biggest transport infrastructures in any country and our Indian railway has the fourth largest railway network in the world. Even though with large technological infrastructure still accident occurs. The 80% of the accident are occurred due to the worn out of rails and cracks. This is due to the poor maintenance and internal defect. So we need to make a automated monitoring system which is used to detect the defects. Our project proposes with low cost efficient for large scale infrastructure. In this the track is being scanned by the robot and calibrates. The IR transmitter robot waits for a predetermined period of time so that the GPS module starts reading the correct geographic coordinates. The principle involved in this crack detection is, the light reaching the IR receiver is proportional to the intensity of the crack. Both IR transmitter and the receiver will be placed straight line to each other on the track.

2. Existing system

In the existing system, no mailing service was included. They used only the basic controllers, which required man power. In order to identify the cracks. They used only ultrasonic sensors. This became a drawback as it was not efficient and convenient to use. They were not able to produce perfect output.

A. Drawbacks

- No emailing service
- GSM used for message service
- Not using raspberry pi

B. Proposed system

In the proposed system we have included webcam to capture the cracks in the railway track. We have also used raspberry pi version 3 as it was convenient and efficient. Man power is not needed as the robot will automatically identify the cracks. Easily affordable IR sensors are used for economical efficiency. We use mailing service by using SMTP which more safe and secure.
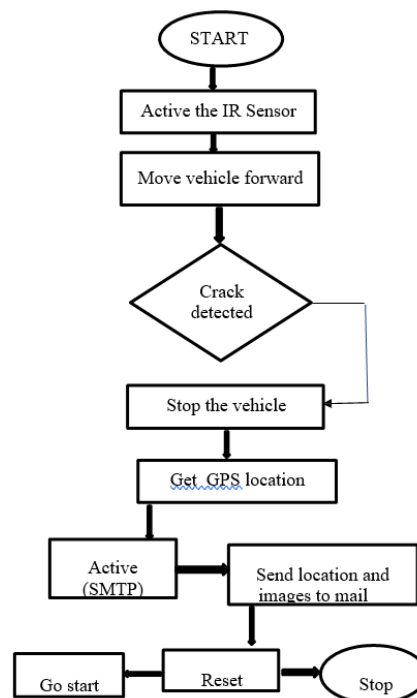
C. Module architecture

Fig .1. Module architecture

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D. Module explanation raspberry PI

Raspberry pi is a small board computer used for teaching the basic computer science in developing countries. The Raspberry Pi 3's four built-in USB ports provide enough connectivity for a mouse, keyboard, or anything else that you feel the Raspberry Pi

needs, but if you want to add even more Hub performance. The performance of the Pi 3 is roughly 50-60% faster than the Pi 2 which means it is ten times faster than the original Pi .Boots from Micro SD card, running the version of the operating system (LINUX). It has Dimensions length of 85 x 56 x 17mm. It has Power Micro USB socket of 5V1, 2.5A.

Fig .2. Module PI

E. IR sensor

An infrared sensor is an electronic device it detects the motion and measure the heat of the object. In this project, the transmitter section includes an IR sensor, which absorb IR receiver module sent the continuous IR raysThus the output of the comparator goes low, but the LED does not glow. When it receives signal from the IR receiver module to the potential it goes low at the inverting input. Infrared Technology is found not just in industry, but also in every-day life.
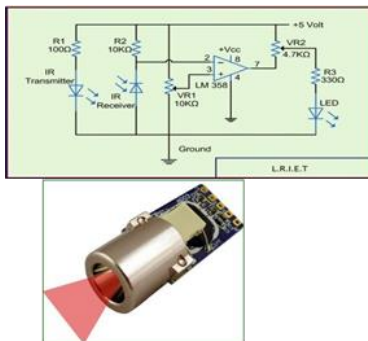

Fig. 3. IR sensor

F. GPS (Global Positioning System)

The Global Positioning System (GPS) is a global navigation satellite system. It provides reliable position and Services the time to worldwide users on a continuous basis in all the processes anywhere on or near the Earth. GPS satellites enforces on circle the earth two days for one time in a very precise orbit and transmit signal information to earth GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares with the time the satellite transmits the signal it was received. A GPS receiver must be locked on to the signal of at least three satellites to calculate 2D position (latitude and longitude) and track movement of the locations. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude) respectively.

G. DC motors

It is used to run on DC electric power. Two examples of Direct current designs:

- Michael Faraday's homopolar motor
- Ball bearing motor

Direct current motor according to relay operation:
When relay 1 is in the OFF state and relay 2 is in the ON state the motor is running in the reverse directions. When relay 2 is in the OFF state and relay 1 is in the ON state, the motor is running in the forward directions. So far the most common DC motor types are two types which is brushed and brushless and it use external and internal commutation respectively to create an DC source oscillating AC current from the so they are not purely DC machines in a strict sense accordingly in the motor. In our project, we using brushed DC Motor, which will operate in the ratings of 12v DC 0.6A which will drive the flywheels in order to make the robot move.

Fig .4. DC motors

H. Webcam

A webcam is a video camera and it is a digital camera that feeds or streams its image in real time to or through a computer to a network. When "captured" by the computer using our webcam, the video stream may be saved, viewed or sent on to other networks via systems such as the internet and emailed as an attachment. When sent to a remote location, the video stream may be saved, viewed or a sent there. It is useful in many ways for us like sending the live pictures from any place we sited the camera.

I. Working

The proposed crack detection system has been tested by placing the robot an actual rail track. The longitude, latitude and the nearest railway station will be sent as a message.

Fig. 5. Webcam

3. Conclusion

Proposed algorithm is an attempt to prove the initial findings in the area of railway security through IR sensor sensors placed on the railway track. The simulation for the proposed network architecture has been done by capture the crack using web cam from the help of IR sensor detection technique and sent an email with a location successfully. The results are satisfactory for the real time requirement and the output is overhead in comparison to the previous approaches. The module are such used that they have minimum processing overhead for decision making. The time taken for decision making is independent and very quick of the train speed Most important advantage of the proposed system is that it is compatible with any other sensor also. The simple idea can be implemented in large scale in order to have long run to facilitate better safety and provide effective testing infrastructure for achieving better results in the future.

References

[1] Conf. on Networking process, Sensing and Control process, vol. 13, no. 4, pp. 961-970, April 2007.
[2] Ravi Shankar Shekhar, Purushottam Shekhar, Ganesan P, "Automatic Detection of in Railway Track", IEEE Sponsored 3rd International Conference on Innovations in Information technology and Communication System process. vol. 3, no. 6, pg. 413-413, December 2013.
[3] Emad Aboelela, William Edberg,Christos Papa konstantinou, Vinod Vokkarane "Wireless Sensor Network Based Model for Secure Railway Operations"Performance, 2013. IPCCC 2006. 25th IEEE International, pp. 628, April 2006
[4] M. Kalamani, P. Ilaikya "Atomtic Railway Track Surveying with Sensor control and Controlled by Wireless Communication sensor" International Journal Engineering, (IJAEEE) pp 22788948, Volume-3, Issue-3, 2015
[5] ZeinabSam Daliril, Shahaboddin Shamshirband, Mohsen AmiriBesheli "Railway Security Through the Use of Detection Wireless Sensor Networks Based on GSM," International Journal of the Physical Sciences Vol. 6(3), pp. 448-458, 4 February, 2013.
[6] S. Ramesh, S. Gobinathan "Railway detection tolerance Techniques using global system communications". IJECT, Vol. 3, Issue 1, Jan.-April 2015
[7] Ayuubzinvandlorestani, Seyed Ali Mousavi Raja Ebadaty, "Railway Traffic Monitoring Using Embedded Wireless Sensor Network (WSN") IJCSET, Vol 2, Issue 7, pp. 1280-1282, March 2012.
[8] P. Mudge, V. Kappatos, "The Railway track application of Long Range Ultrasonic Testing (LRUT) On Railway Tracks", IEEE Railway Condition Monitoring and Non-Destructive Testing (RCM 2013), Nov. 2013.
[9] Selvamraju Somal Raju, Vigneshwar Murali, Gourav Saha, V. Vaidehi, "Railway Crack Fault Detection Scheme (RCFDS) Using GSM (Global System Communication) service.
[10] R. T. Lemmon, "Unmanned level crossing controller of RTK GPS positions," in Australian Surv., vol. 44, no. 1, pp. 64–70, 2013.