ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

RAIL ROBOT: AUTONOMOUS ROBOT CAN CLEAN AND MONITOR YOUR RAILWAY TRACKS DATA BASE TO SMART PHONE

G.Kasthuri[1], E.Rosevangelin[2], J.Kiruba Golda[3] Guided by Mrs.A.Mabel Rajakumari[4]
kasthurisana@gmail.com[1],jeba3011@gmail.com[2],kirubagolda1995@gmail.com[3],mabelrajakumari@gmail.com[4]
Dr.G.U.Pope College of Engineering, Sawyerpuram.

Abstract : **India has one of the world's largest railwaynetworks, manual Inspection and detecting a crack onthese railways tracks is very tedious process andconsumes lot of time and human resource. The projectaims in designing railway track crack detectionautonomous vehicle using Microcontroller, IR obstacleSensors assembly system, which detects the cracksalong its path; the vehicle is also capable of monitoringthe location of the crack by using the GPS module andalerts through SMS messages using GSM module. Thecentral component of the whole system is a PICMicrocontroller. The vehicle is powered with the helpof Solar panel and Lead Acid battery assembly. Thevehicle moves along the path of railway track and IRObstacle sensors mounted on the vehicle front end willinspect the track along the path. When any crack ordeformation is detected on the track the vehicle stopsand the location of the crack is identified and the location Latitude and Longitude coordinates areprocured using the GPS module and the GSM module isused to send these Location coordinates in the form ofShort Message Service (SMS) to the Pre-defied number.Keywords: Micro controller (PIC16F877A), IRobstacle Sensor, Railway Cracks, GSM/GPRS, GPSModule, DC Motor (Engine)**

I. INTRODUCTION

The Indian railway network today has a track length of113,617 kilometers (70,598 mi).over a route of 63,974kilometers (39,752 mi) and 7,083 stations. It is thefourth largest railway network in the world. Indian railnetwork is still on the growth trajectory trying to fuelthe economic needs of our nation. Though rail transportin India growing at a rapid pace, the associated safetyinfrastructure facilities have not kept up with theaforementioned Proliferation. Our facilities areinadequate compared to the international standards andas a result, there have been frequent derailments thathave resulted in severe loss of valuable human lives andproperty as well. On further analysis of the factors thatcause these rail accidents, recent statistics reveal thatapproximately 60% of all the rail accidents havederailments as their cause, of which about 90% are dueto cracks on the rails either due to natural causes(likeexcessive expansion due to heat) or due to antisocialelements. Hence these cracks in railway lines have beena perennial problem which has to be addressed withutmost attention due to the frequency of rail usage in India. These cracks and other problems with the railsgenerally go unnoticed due to improper maintenanceand the currently irregular and manual track linemonitoring that is being carried out. The high frequencyof trains and the unreliability of manual labor have putforth a need for an automated system to monitor the presence of crack on the railway linesOwing to thecrucial repercussions of this problem; this paperpresents an implementation of an efficient and costeffective solution suitable for large scale application.In previously existing system, the same concept is usedusing LED and LDR sensor assembly. The maindrawback of the system is that LED and LDR needs tobe exactly aligned opposite to each other to detect the crack, also the environment needs to be controlled todetect the true values from LDR. For this reason, wehave used IR Obstacle sensor, which has only onemodule that has both transmitter and receiver and alignment will not be an issue. The main objective of the project is to identify anycrack or deformation on the railway track using this setup, which can be implemented in live by Railwayauthorities. The proposed setup would make theinspection and maintenance of railways tracks easierand help them to monitor efficiently by

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

replacing thehuman inspection which is currently followed. Thedesign of the vehicle and software related to it are verysimple and can be easily adopted by the present system

.

II. THE HARDWARE SYSTEM

A) Micro controller: This section forms the control unitof the whole project. This section basically consists of aMicrocontroller with its associated circuitry like Crystalwith capacitors, Reset circuitry, Pull up resistors (ifneeded) and so on. The Microcontroller forms the heartof the project because it controls the devices beinginterfaced and communicates with the devicesaccording to the program being written.

B) PIC16F877A: PIC is a family of modified Harvardarchitecture microcontrollers made by MicrochipTechnology, derived from the PIC1650originallydeveloped by General Instrument's MicroelectronicsDivision. The name PIC initially referred to PeripheralInterface Controller. This feature a 14-bit wide codememory and an improved 8 level deep call stack. Theinstruction set differs very little from the baselinedevices, but the 2 additional op code bits allow 128registers and 2048 words of code to be directlyaddressed.

C) Liquid-crystal display (LCD) is a flat panel display,electronic visual display that uses the light modulationproperties of liquid crystals. Liquid crystals do not emitlight directly. LCDs are available to display arbitraryimages or fixed images which can be displayed orhidden, such as preset words, digits, and 7-segmentdisplays as in a digital clock. They use the same basictechnology, except that arbitrary images are made up ofa large number of small pixels, while other displayshave larger elements.

2.1) Board Hardware Resources Features

(1) IR Obstacle sensor:

This sensor is a short range obstacle detector with no dead zone. It has a reasonably narrow detection area which can be increased using the dual version. Range can also be increased by increasing the power to the IRLEDs or adding more IR LEDsThe photo below shows my test setup with some IRLED's (dark blue) as a light source and two phototransistors in parallel for the receiver

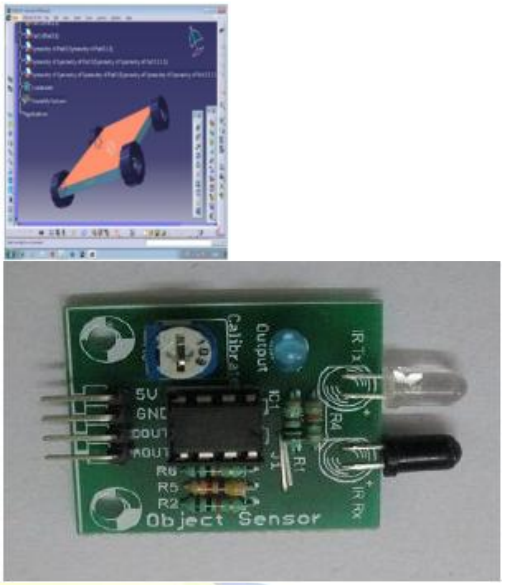

Figure 1:IR Obstacle sensor used in project

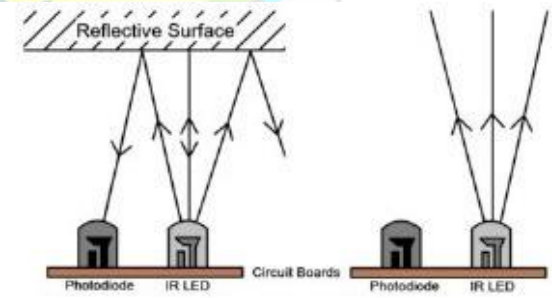

Figure 2:IR Obstacle sensor

2) Photodiode: Photodiode is alight sensitive semi-Conductor diode which converts the light energy into Voltage or current based on the mode of operation. In General Photodiodes are operated in reverse biasCondition. The clear Photodiode can detect visible andIR rays to limit the Photodiode to detect only IR rays ablack cutting is applied to the glass of the Photodiode.The photodiode allows the current to pass through it ifthe photodiode is exposed to IR rays and it doesn'tallow current to pass through it if no IR rays falls on it.The amount of current passed through the photodiode isdirectly proportional to amount of IR rays falls on it.

(3) GPS: Global Positioning System tracking is amethod of working out exactly where something is. A

GPS tracking system, for example, may be placed in

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

avehicle, on a cell phone, or on special GPS devices,

which can either be a fixed or portable unit. GPS worksby providing information on exact location. It can alsotrack the movement of a vehicle or person. So, forexample, a GPS tracking system can be used by acompany to monitor the route and progress of adelivery truck, and by parents to check on the locationof their child, or even to monitor high-valued assets intransit.

(4) GSM: An embedded system is a special-purposesystem in which the computer is completelyencapsulated by or dedicated to the device or system i

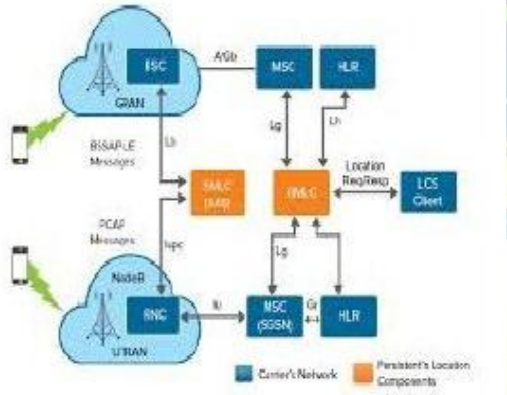

Figure 3:GSM Architecture

(5) Motor Drive: L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current controlsignal and provide a higher-current signal. This highercurrent signal is used to drive the motors

Figure 4: DC Motor

In its common mode of operation, two DC motors canbe driven simultaneously, both in forward and reversedirection. The motor operations of two motors can becontrolled by input logic at pins 2 & 7 and 10 & 15.Input logic 00 or 11 will stop the corresponding motor.Logic 01 and 10 will rotate it in clockwise andanticlockwisedirections, respectively.

Enable pins 1 and 9 (corresponding to the two motors)must be high for motors to start operating. When anenable input is high, the associated driver gets enabled.As a result, the outputs become active and work inphase with their inputs. Similarly, when the enableinput is low, that driver is disabled, and their outputsare off and in the high-impedance state.

III. DESIGN OF PROPOSED HARDWARE SYSTEM

In this project, I have used the two tracks; each trackwill be monitored by one IR obstacle sensor. Wheneverthere is a crack on the track, the IR obstacle sensorsenses the crack and activates GPS. The location Latitude and Longitude coordinates of the crack is sentto the pre-defined number with the help of SIM insertedinto GMS module. Once the crack has beensuccessfully identified and message is sent, the vehiclemoves further on the model path till next crack is detected. The complete setup is powered by 5W Solarpanel

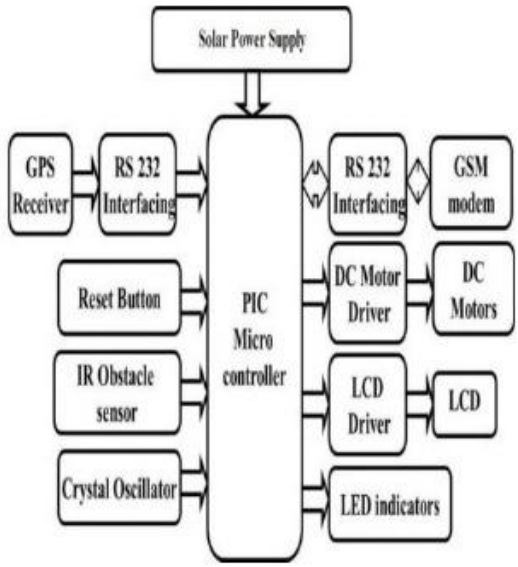

Figure 5: Block diagram

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

The designed Railways Track Crack DetectionAutonomous Vehicle has been successfully tested on the model track and the detected location has been sentto the phone number which is 4km away from the prototype.This vehicle can be used to detect the track and send GPS coordinates in SMS form to even longer distanceprovided the GSM signals are intact

IV. WORKING OF THE VEHICLE

1) When the vehicle is Powered On, it moves along themodel track. The IR Obstacle sensors monitors thecondition of the tracks
2) When a crack is detected by the IR sensor the vehiclestops at once, and the GPS receiver triangulates theposition of the vehicle to receive the Latitude andLongitude coordinates of the vehicle position, fromsatellites.
3) The Latitude and Longitude coordinates received byGPS are converted into a text message which is done byPIC microcontroller
4) The GSM module sends the text message to the pre-defined number with the help of SIM card that is Inserted into the module.
5) Once the message has been successfully sent to the number, the vehicle resumes its movement forward depending on the type of crack.

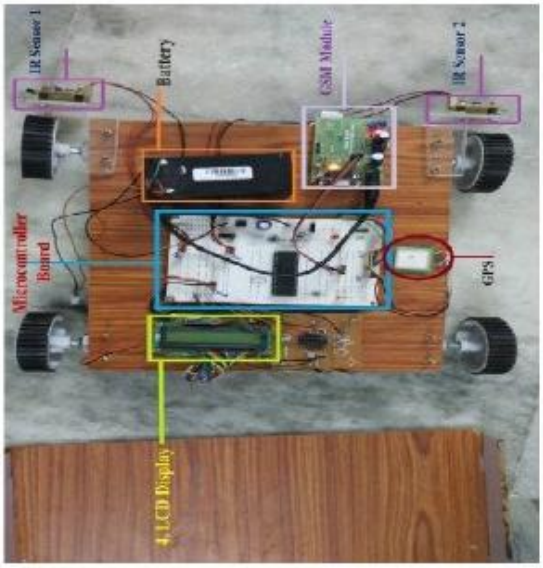

Figure 6:Prototype and components

VI. CONCLUSION

By using this Autonomous vehicle for purpose ofrailway track inspection and crack detection, it willhave a great impact in the maintenance of the trackswhich will help in preventing train accidents to a verylarge extent. The regions where manual inspection isregionsand dense thick forest regions can be easily done usingthis vehicleBy using this vehicle for the purpose of Railway trackinspection and crack detection and automated SMS willbe sent to pre-defined phone number whenever thevehicle sensors detect any crack or deformation Thiswill help in maintenance and monitoring theconditionof railway tracks without any errors and therebymaintaining the tracks in good condition, preventingtrain accidents to very large extentRailway track crack detection autonomous vehicle isdesigned in such a way that it detects the cracks ordeformities on the track which when rectified in timewill reduce train accidents. The addition of solar panelis an added advantage, which also helps conserving thepower resource.

REFERENCES

1)PaperJ. Trehag, P. Handel, and M. Ögren, _Onboard estimation and classification of a railroad curvature,IEEE Trans. Instrum. Meas., vol. 59, no. 3,pp. 653-660, Mar.2010.
2)G.Rajakumar, Dr.D.Manimegalai, "Design and VLSI Implementation of DIP Based Rod Quality Inspection", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 2, Issue 3, Page No.198-204, March 2013, ISSN: 2278 – 1323.
3) International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue17- July 2013 Automatic Broken Track Detection Using LED-LDR Assembly, Avinash.Vanimireddy, D.ArunaKumari
4) Paper I. Milev and L. Gruendig, _Rail track data base of German rail The future automated maintenance,_ in Proc. INGEO FIG Regional Central Eastern Eur. Conf. Eng.Surv., Bratislava, Slovakia, Nov. 11-13, 2004,pp. 1-8.
5) Apr-May, 2014, ISSN: 2320 – 8791, Innovative Railway Track Surveying With Sensors and ControlledBy Wireless Communication by Athira Ajith1, AswathyK S2, Binoy Kumar H3, Dantis Davis4,Lakshmi S Pai5,Janahanlal P Stephen.
6) RamavathSwetha,P. V.Prasad Reddy Global Journal of Advanced Engineering TechnologiesISSN (Online): 2277-6370 & ISSN (Print):2394-0921