

ROBUST RAILWAY TRACK CRACK DETECTION USING GSM AND GPS SYSTEM

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ABSTRACT: Railways are the most preferable transport system because of its reliability, passenger safety and easy to travel. If any misalignment and crack occur it creates loss to the lives. To overcome this problem we will develop a system that is railway track crack detection. Here we are using simple components like GSM, GPS, BUZZER, IR SENSOR, ULTRASONIC SENSOR and ARDUINO. The cracks are detected through sensor rays falls on the crack and it slowly stop the train. By using GPS we can send the explicit area of the ace and send the messages to the railways by using GSM. At any time, the ace is exposed the alarm immediately energized to give a message to the passengers and all the connections are done by using ARDUINO. Here in the place of train we are using wheel robot with the help of the dc motor. This simple concept will gives high accuracy and no problems occurs during detection and saves so many lives. It is not only used for railway stations but also used in metro trains, gaming systems and any crack detection system.

KEYWORDS: GSM, GPS, BUZZER, IR SENSOR, ULTRASONIC SENSOR, FOUR WHEEL ROBOT, CRACK DETECTION, RAILWAY TRACK.DC MOTOR.

INTRODUCTION:

Now a days transport is the most important to move from one place to another place and also most of the financial transport is carried by using the track transportation. Transport is the biggest source to develop our nation and its safety and sustainability are also issues of paramount importance. India is one of the largest railway associate in the world. Indian railways is an Indian purchased enterprises, it is managed and owned by Indian community. In Bharath every year 4.6

millions of the vehicles introduced and only 10% of the people uses their own vehicles and remaining people depends on the public transport. They always prefer railway network due to safety and easy to travel. That's why people always prefer to journey longer distance mainly to rely on either railways or airways only.

Throughout the history in 1853 the primary railway in India "peninsula railway" which is travel from Mumbai to thane.16000 trains run on barrier per day. Nearly exact 300 railway accidents are takes place every year. Out of that 15% of accidents occurred in India and 90% of accidents are happened due to natural causes like heat, antisocial elements and improper maintenance. These improper maintenance cracks are cannot be identified due to the currently irregular and manual track line check and other problems with the rails. Railway transport is the only way to grow India rapidly compared to other nations our facilities are very less that's why the resultant severe loss of lives and economy. This problem is occurred due to cost in incurred is high. To reduce this problem we will develop a system that is railway track crack detection. In this system the train is running if any crack is find out the IR sensor and ultrasonic sensor detects is used to find out the outstrip from the train to the crack and will send exact location of the crack through GPS and GSM will receives the message. If any crack is detected the buzzer is immediately activated. If any crack is not found the buzzer will not activated.

SYSTEM MODEL:

ARDUINO UNO:

Arduino Uno is an open source platform used for building electronics projects. It is the

combination of hardware and software. It is used to write and upload the code on the system and dump on the visible board. Arduino become quite develop along with people just starting and for good reason. In order to load new cryptograph we don't need to divide piece of hardware you can simply use a USB wire .It is a 40 pin IC and it is having 6 analog pins. It have 14 digital input and output pins(i.e;0 to 13 pins, out of these 14 pins 6 pins acts as a pulse width modulation), 6 power pins and frequency range of 16 MHZ. Pin 0 and pin1 acts as a transmitter and receiver pins. Arduino IDE is also a simplified version of C++, making it easier to dump code. It can be divided into so many types ARDUINO UNO, ARDUINO MEGA, ARDUINO PROMINI, ARDUINO LILLIPAT and so many types. Out of this Arduino Uno is one of the more popular board in the Arduino family and a great choice for learners and it is also a low cost scientific instrument so we are using ARDUINO UNO.

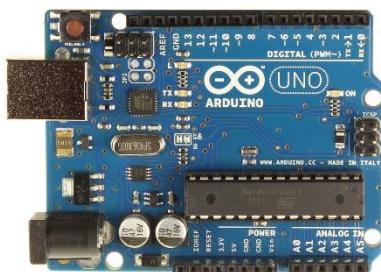


FIG1:ARDUINO UNO

IR SENSOR:

IR sensor is an auto electronic device. This sensor is used to detect the objects through IR rays. If any sensor having three or four pins and two pins are common to any sensor one is VCC(5V) and another one is GND remaining pins decides either it is analog or digital pins. An IR sensor is used to calculate the heat of an object as well as detects the motion. Infrared sensor ,different types of IR sensors are present in IR TRANSMITTER and IR RECEIVER. The basic concept of IR sensor is used as obstruction detector is to send an IR signal, this IR signal go from the surface of an object and the signal received from the infrared receiver .The frequency range of IR sensor is more than the microwave and lesser than the visible light.

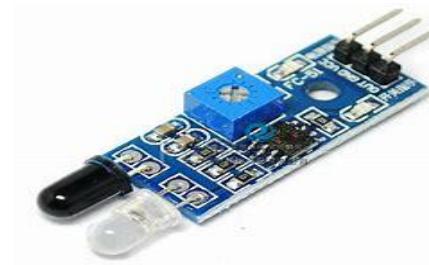


FIG2:IR SENSOR

ULTRASONIC SENSOR:

Ultrasonic sensor is worn to measure the gap from the object. It is also called as transceiver why because it will be act as both sender and receiver . It is having four pins VCC, GND, TRIGGER and ECHO. Trigger is used to transmit the information (output) and echo signal will receive the information(input). It generates peak frequency sound signals and evaluates the echo signal which is collected backbite the sensor. We can measure the time gap between the sending wave and receiving echo by using this sensor. System typically use a transducer used to generate sound waves above 18000hzs, by converting electrical energy into alternative sound and then receiving echo change the sound waves into its actual electrical energy. It's detecting range is 3cm to 4cm and best in 30degree angle and it is also act as a bread board friendly.



FIG3: ULTRASONIC SENSOR

POWER SUPPLY:

A power supply is one of the electronic device that produce electric energy to an electric board. The preliminary function of the power supply is used to proselyte electric current from an object to the appropriate voltage, current and frequency to power circuit. Some power sources are connected externally for the device, during the time others are inbuilt in the load appliance that

the power. All power sources has input connection, in the time collects energy in the form of electric current from the source. The source power is obtained from the electric power grid board. The power supplies with 5V is enough for micro controller But ,for the running of D.C motor it requires 12V of power that's why we are using external power supply.

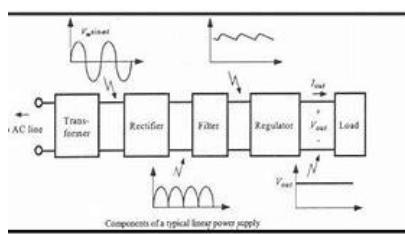


FIG 4: POWER SUPPLY

BUZZER:

Buzzer is also called as beeper. It is an audio signaling device in the form of either mechanical or electromechanical. It can be recycled in alarm devices, timers and confirmation of user input such as mouse click or key stroke. Buzzer or alarm is act as an output for the device with two pins to attach it to the power and ground. The word buzzer appears from the grating noise the electromechanical buzzer built. Whenever the obstacle occurred then the buzzer immediately activated otherwise the buzzer doesn't activate.



FIG 5: BUZZER

GLOBAL POSITION SYSTEM:

GPS is also called as global positioning system. By using GPS, we can share the current location. It works on satellite radio navigation system purchased by the united states and managed by the united states air force. It gives the actual location and timing information for the GPS receiver. It will

be act as a navigation system .The GPS does not need any user to transmit the data, and it is handled independently by any telephonic or internet reception .The GPS provides critical positioning capabilities to military, civil, and commercial operators around the world and it will give always correct location whenever there in the world. It will place a key role in navigation system. GPS system uses 31 satellites in orbit. GPS uses more complex technology, although the concept is easy to understand.



FIG6:GLOBAL POSITION SYSTEM

GLOBAL SYSTEM FOR MOBILE(GSM):

GSM is defined as a digital mobile network can be extensively used by mobile phone operators in Europe and other areas of the world. GSM consist of transmitter and receiver. GSM benefits a variation of time division multiple access and use the grater far used of the digital wireless telephone technology. GSM digitizes and also compress information, that sense it down a channel with two other creeks of user data , each in its own time slots ,it operates in the range of 900mhz or1800mhz of frequency band .It supports voice calls and data transport closely with the transfer of SMS. In a GSM network the user terminal is called mobile station. The mobile station manufactured by the SIM card accepting the user to be entirely identify each SIM card also has a unique identification number and the communication occurs between the mobile station and base station.



FIG 7: GLOBAL SYSTEM FOR MOBILE

D.C MOTOR:

Motor is a mechanical equipment that novitiate direct current into mechanical energy that creates motion, it is not an engine it will be operated as neither an electric motor nor an internal combustion engine. DC motor is an electric motor that bound on direct current electricity. Each motor consisting of two terminals namely as M1 and M2 whenever we are giving input as M1=1 and M2=0 the motor rotates on clockwise direction. If M1=0 and M2=1 the motor rotates on anti-clockwise direction and if we are giving M1=0 or 1 and M2=0 or 1 then the motor will stop. Motor is an alternative decision in bulk of variable speed and torque control application.



FIG 8:D. C MOTOR

PROPOSED SYSTEM:

The proposed railway crack detection consisting of IR sensor, Ultrasonic sensor, Buzzer, Power supply, GPS , GSM, four wheel robot, D.C motor. Whenever we are giving power supply to the system in the place of train we are using the wheel robot it starts if any crack is detected then the sensors activate if any crack is not found it will not detected. If the crack detected then the train slowly stops and the IR sensor will disclose the crack and also the Ultrasonic sensor will measure the distance from the crack will gives the information to the railway authority of the current location of the crack using GPS receiver of functionality to collect the latitude and longitude information and will transfer the data of any crack found through GSM in the form of message to mobile. The buzzer will immediately activated if any crack is found otherwise it is in OFF condition.

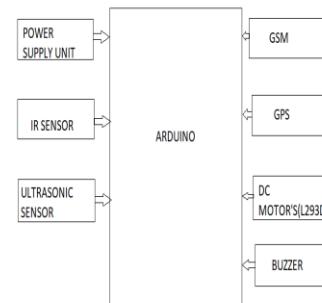


FIG9: BLOCK DIAGRAM FOR ROBUST RAILWAY TRACK CRACK DETECTION

EXPERIMENTAL RESULTS:

By observing the below figures namely as fig-10 and fig-11 is the experimental result of the project. By observing the figures fig-9 is the prototype result of the project and the fig-10 is the output of the project whenever the crack is found then the message will displayed on the android mobile as “TRACK or PERSON DETECTED” the message will be clearly observed in the fig-11.

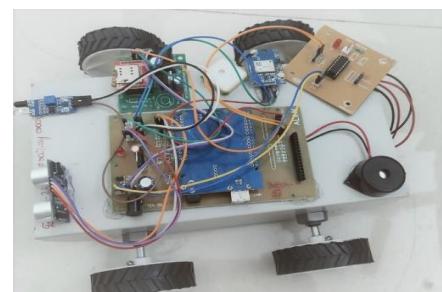


FIG10: PROTOTYPE



FIG14: OUTPUT OF THE PROJECT

CONCLUSION:

In order to provide the safety transportation we develop a system as Robust railway track crack detection system. By using this system we will detect any faults are detected in the track it will detect and the information will pass towards the railway authority before any accident is occur. It is not only used for trains it is used for metro trains, gaming systems and any other crack detections. It will give accurate result when compared to the previous projects. By using GPS will give the current location of the crack and the GSM will send the message, and the buzzer is activated whenever the crack is detected as result we can avoid major accidents occur due to cracks in tracks.

FUTURE SCOPE:

In this project we made this by using GSM and GPS but in further we can also made this by using IOT(internet of things).And here we use external power supply to run the system to decrease the power we can use solar vehicles where we can add the sensors to that vehicles ,that vehicle will runs through the rails it exposes the splits as a result man power will reduce and efficiency will increase and the power also eco-friendly.

REFERENCES:

- [1]. QiaoJian – hua; Li Lin-sheng; Zhang Jing-gang; “Design of rail surface crack detecting system based on linear CCD sensor”, IEEE conf. on networking sensing and control, vol.14,no.4,pp.961-970,2008.
- [2].K.Vijaykumar,S.R.Wylie,J.D.Cullen,C.C.Wright,A.I.Shamma,”non-invasive rail track detection system using microwave sensor”, Journal of applied physics.,2011.
- [3].Selvamraju Somalraju, Vigneshwar mrunali, Gourav saha , D. Vaidehi, “Robust Railway crack detection scheme (RRCDS)Using LED-LDR assembly”, IEEE International conference .on networking sensing and control,vol.6,Issue.3,pp.453-460,2012.
- [4].J. Trehag, P. Handel, and M. Ogren,-onboard estimation and classification of a railroad curvature ,IEEE Trans. Instrum. Meas., vol. 59, no. 3, pp. 653-660, Mar.2010.
- [5].M.Cacciola, G.Megali, D.Pellicanuo,S. Calcagno, M.Versaci, and F.C.Morabito, “Rotating Electromagnetic Field for crack detection in railway tracks”, PIERS ONLINE,vol.6,no. 3,2013.
- [6].V. Saravanmoorthy, G.N. Muruganantham, “Automatic Identification of obstacles and crack sensing scheme in rail tracking system”, IJARECE, Volume 4, Issue 1, January 2015.
- [7].Dr.R.Nagarajan, S.Sathishkumar, K. Balasubramani, C.Boobalan , S.Naveen and N.Sridhar. “chopper Fed speed control of DC motor using PI controller,” IOSR-Journal of Electrical and Electronics Engineering (IOSR-JEEE), volume 11, issue 3, ver.1, pp.65-69, may-june 2016.
- [8]. R. Prabhu, R. Nagarajan, N. Karthick and S. Suresh, “Implementation of direct sequence spread spectrum communication system using FPGA,” International journal of advanced engineering, management and science (IJAEMS), vol-3.Issue-5,pp.488-496,May. 2017.
- [9] G. Jagga Rao " ECG de-noising jag-wavelet filter for Heartbeat noise signals" in Volume 4 Issue 4, pp. 220-225, April 2018.
- [10] G. Jagga Rao " JAGSRC: Joint Analysis Gain for short-range communication in Wireless Sensor Networks of 5G Wireless Communications" in Volume 3 Issue 4, pp. 1-7, July - Aug 2018.
- [11] G. Jagga Rao, Y. Chalapathi Rao " Robust Analysis of Minimizing PAPR Reduction by Using Low Density Symbol Check "in Volume 3 Issue 5, pp. 1104-1109, June 2018.
- [12] G. Jagga Rao, Y. Chalapathi Rao " Robust Bit Error Rate Optimization for MASSIVE MIMOCEM System using Channel Coding Method "in Volume 8-Issue 4S2, pp. 180-184, March 2019.
- [13] G. Jagga Rao, Y. Chalapathi Rao " Artificial Intelligence & Machine Learning Based Wireless MIMO-OFDM Communication system in JAG6G Analysis "in Volume 8-Issue 4, pp. 3740-3755, May2019.
- [14] G. Jagga Rao, Y. Chalapathi Rao, Dr. Anupama Desh Pande "A Novel Approach for High Secured Image Transmission in 6G via MIMO-OFDMA process in NCHAOS Encryption Algorithm" in Volume 9-Issue 10, pp. 1481-1492, Oct 2019.