To Prevent the Animals Accident and Trackcrack Detection System for Railways

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ABSTRACT: In India , the Naxalites will manoeuvre to our protest in railway accident by releasing track and also Indian railway may suffer in collision of animal – rail in forest area. Today, the India has fourth largest railway network management in the world comes from United states, Russia and China. Considering an India as an example , in the past five years numerous laws has been passed by the government of India for the protection of wildlife sanctuaries and jungle animals nearby railway track. To overcome this problem. We analyzing the detection of crack and collision of animal – rail in the proximity area. If these deficiencies may result in increasing an Indian railway budget and loss life and property. In this paper proposing a cost effectiveness solution to managing this problem of railway track crack detecting system and also preventing the collision of rail – animal accidents , by utilizing the LDR ,Sharp sensor and ultrasonic sensor to receive the accurate location of faulty area in the track and also utilize the Ultrasonic sensor to collectively address conservation of animals and living beings by preventing their death being overrun by trains and also monitoring the integrity of the railway track If it is fault which will set right immediately they resulting lead to number of lives can be safe.

KEYWORDS: PIC Microcontroller,ultrasonic sensor,LDR sensor,sharp sensor GSM,GPS,motor&LCD Display

I.INTRODUCTION

Railways have been the biggest infrastructures of any country and are the most used mode of transportation. The railways have become a new means of transportation owing to their capacity, speed, and reliability.The railways indirectly affect the political, economic and social development in the nineteenth century. Countries like the United States, India and Canada The poor maintenance of the railways can lead to accidents. The unavoidable risk Associated with derailments and collisions can be reduced by eliminating the root causes. Some of the defects include worn out rails, weld problems, internal defects, corrugations and rolling contact fatigue initiated problems such as surface cracks, head checks, squats, spilling and shelling.

Figure1.0Railway Bridge

These cracks and other problems with the rails generally go unnoticed due to improper maintenance and the Currently irregular and manual track line monitoring that is being carried out. LDR sensor is used to detect the crack as well as distance. This project pertains to a process for monitoring the condition of rail on train tracks and more specifically has the object of the identification of defects detected by monitoring equipment on the tracks to be checked to allow maintenance crews to subsequently find these defects. When we give the supply to the device, the DC motor gets start through relay driver circuit. LDR and sharp sensors are fixed in front of the train is used to find out the crack on the rail. Each sensor will produce the signal related position with the rail. If the track is normal on its position both the sensor gives the constant sensed output. If anyone misses their output condition to fail then there is defect on that side. Ultrasonic sensor is used to measure the object from the distance of track.

II. RELATED METHOD

Mostof the researchers have researched to concern the saving of human being or animals while releasing the track or animal-train collision. Many research organization and personal researchers are working in that area the major reason for reject this type of system are cost, complexity, reliability and many more reason. Most researchers have done their work on alerting system via GSM and detecting via GPS. Some researches utilize ultrasonic sensor to communicate animals ,..i.e. elephant by sound waves to avoid stepping on the track . Some of the animals vocalization,..i.e, elephant, rumbles within the range of infrasonic i.e.., less than 20Hz the minimum human audible range. The audible range of elephants is 16Hz -12KHz. Animals injurious and moralities in track are detected and alerted automatically.one of the system help to detect the flaws in the rail track using ultrasonic testing method it is detect minor cracks and growth rate of the crack using TDOA.
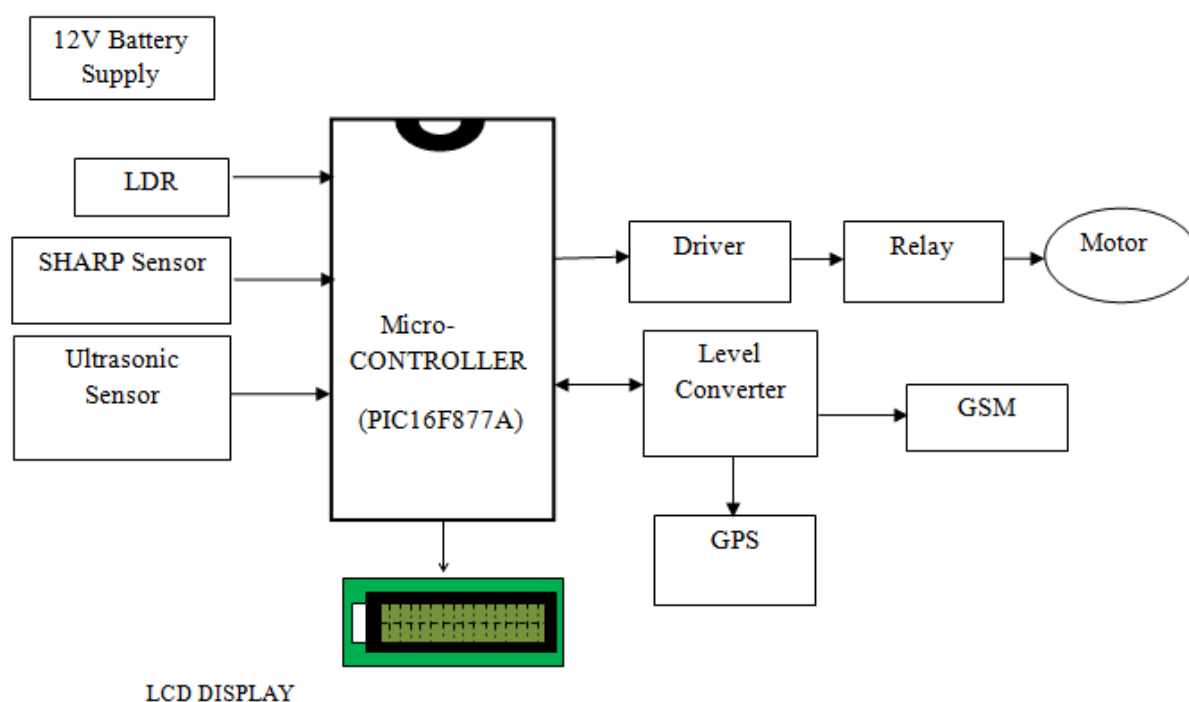
III.PROPOSED METHOD

The proposed method for the track crack detection and preventing animals accident by utilizing of the Ultrasonic sensor, LDR sensor, Motor Drive, GPS Module & GSM Modem. The heart of the system is PIC16F877A microcontroller. As soon as any Object detected through Ultrasonic sensor microcontroller shall immediately slow down train speed and come to rest till object is in the path. Once the sensor detects nothing is in path controller shall bypass control on breaks. The instantaneous crack information is shown on the display immediately and also send information to the specified person through the GSM Module. And also locate the accurate location of the crack area and obstacles via GPS Modem.

Figure 1.1 The proposed method for preventing animals accident and track crack detection system.

To detect obstacle in vehicle path the sensor is placed in a train that each cover the maximum area in front of the train chassis and to detect a Human or animal and obstacle either obstacle is small or big. When vehicle follows the wrong path, then, LDR sensors, transmitter & receiver pairs which are placed at the bottom of the sense that track and automatically move the towards the correct path.

Figure 1.2 Animal Crossing the Railway Track

III A. PIC Microcontroller Unit

The Microcontroller   PIC16F877A is interfaced with a track sensor that continuously detect, track, the vehicle is in motion if track sensor output detects off train path, then the Microcontroller immediately slow down vehicle speed and try to stop on the path depending on track sensor output. Also Microcontroller interfaced with Ultrasonic sensors to detect any object is present in train path, is in movement. In addition, to improve overall system, PIC controller featured with GSM and GPS interface. The PIC16F877A is a Low power, High performance, 16 bit Microcontroller with 1024 Bytes Data EEPROM &Nano watt XLP Technology.

III B.LDR Sensor

In the fast developing country, people are facing many accidents; it would be undesirable for any nation to losing their life for unwanted cause. Railways are one of the important transports in India. There is a need for manual checking to detect the crack on railway personnel takes and always railway personnel takes care of this issue, even though the inspection is made regularly. Sometimes the crack may unnoticed because of this train accident or derailment may occur in order to avoid this situation and automate the railways the railway crack detection has been proposed here LDR sensor is used to detect the crack in the railway track by measuring distance from track to sensor if the distance is greater than the assigned value.

III C.ULTRASONIC SENSOR

Ultrasonic detector module has transmitter and receiver section. This sensor interface with PIC controller with one output named as the trigger and one input named as echo. PIC controllers trigger this sensor at every one second interval and detect for the echo signal on its input pin. If echo signal high width is detected is in predefined range, then obstacle detection is considered and same time motor and signals to stop running as soon as obstacle removed again motor will start as per sensor inputs. When any obstacles are in range of ultrasonic sensors, the firmware will glow LED3.The Ultrasonic Detector circuit is a circuit which gives a low output in the absence of Ultrasonic signal when some obstacle come in path Ultrasonic signal reflected back and fall onto the Ultrasonic detector. In such a way that obstacle is detected. Ultrasonic ranging module provides 344 metre non-contact. The measurement function, the ranging accuracy can reach to 3mm. The modules include ultrasonic transmitters, receiver and control circuit.

Figure 1.3 Bending of Railway Track

Detecting Obstacle actual setup Using IO trigger for at least 10us high level signal, The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
Test distance = (high level time * velocity of sound (340M/S) / 2

III D.GSM Modem

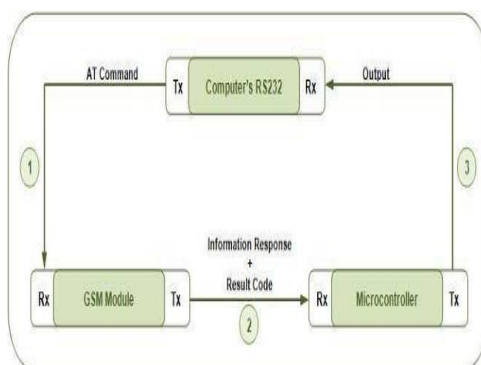**Figure 1.4 Interfacing GSM and Microcontroller.**

By concerning an AT commandsthe Modem can be controlling aPIC microcontroller . We used GSM in our system with Dual band 900/1800 MHz Compact. The "Plug And Play" -Dual band GSM modems which is connected directly to the serial port of a Controller via serial interface. The dual band frequency GSM with UART port is used to AT command reception. Microcontroller UART1 is connected to the GSM UART on our hardware system. Firmware logic is written whenever a Microcontroller detecting the signal from ultrasonic sensor as an obstacle detection or sudden change in speed observed from GPS data then the controller will send AT command on its UART1. That AT command sending SMS to predefined SIM number.

E.g. AT+CMGS=”98xxxxxxxx” Enter <GPS data>.

 The GSM after receiving the command it will send SMS to SIM number written back in command .GSM has SIM card signals of SIM socket connections when we put SIM card via GSM module will be register on GSM network.
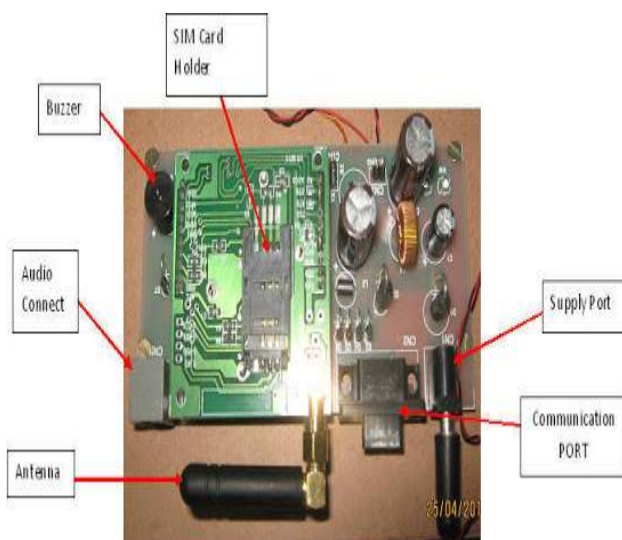

Figure 1.5 GSM Module.

E.GPS Module

In real time, GPS module can receive the data by connecting to Microcontroller Universal asynchronous receiver/transmitter (UART1) via serial fashion. GPS module is connected to microcontroller UART2 via GPS UART port. GPS module is a combo device, with inbuilt antenna. The location string is a universal format called NEMA protocol.

E.g.GPRMC,122825.000,A,1828.9146,N,07353.8977,E,0.04,339.41,110211,,A*60.

    That string contains latitude, longitude, Date, time and speed. The controller receiving this data at every one second. On the basis of speed Read only memory (ROM) based GPS used in this system has fast tracked & acquisition features. The output of GPS has Recommended Minimum Specification, Global positioning system, Global Navigation Satellite System, Dilution of Precision (GNSS DOP) and Active satellite & GNSS Satellite by viewing Messages body format. In addition the GPS Module is designed with typical 1.8v power supply, power consumption in Acquisition, Tracking, Hibernate modes are 45Ma@-130dbm, 35Ma@-130dbm and 20µA respectively. Receiver type L1, 1575.42 MHz C/A Code.

F. Emergency Alert

        In case harsh braking is detect the microcontroller runs set of AT commands to send GPS location over SMS to predefined numbers.

Microcontroller continuously receiving the current valid location i.e. Latitude and Longitude from GPS and monitoring the variation in speed in case of sudden variation it will announce as accident porn situation and text message sent to end user.
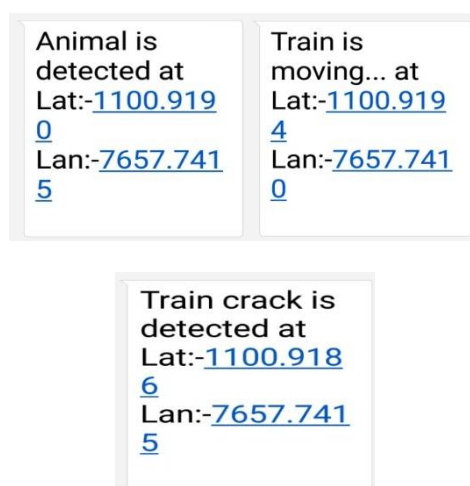
Animal is detected at Lat:-1100.9190 Lan:-7657.7415

Train is moving... at Lat:-1100.9194 Lan:-7657.7410

Train crack is detected at Lat:-1100.9186 Lan:-7657.7415

Figure 1.6.Messages from GSM with latitude and longitude.

G. Motor Driver

Motor driver will drive two separate DC motor independently. M1_IN1 and M1_IN2 are DC motor1 input and M2_IN1 and M2_IN2 are DC motor2 input all are connected to Microcontroller digital output. Firmware logic will make this output low or high to drive the respective DC motor. When left side IR sensor sense black and right IR sensor sense white, then firmware drive only right side DC motor2, if left side IR sensor sense white and right IR sensor sense black then firmware drive only left side DC motor1. When both left and right LDR sensor detects black both motor will drive simultaneously, while both left and right Ultrasonic sensor detects white initially only motor2 will drive for 3 seconds, so it will scan for black area if no detection found firmware drives both motor simultaneously and poll for if any black portion is detected.

IV.RESULT

In the advanced system it is designed for finding crack in the railway track. Here we use PIC controller is interfaced with sensors ,…i.e, sharp and LDR which sense the crack by varying the light resistance it detecting them and ultrasonic sensor which used to detecting the obstacles,… i.e, living or non-living and GSM&GPS. The PIC controller checks the variations in the voltage ofthe measured value with the threshold
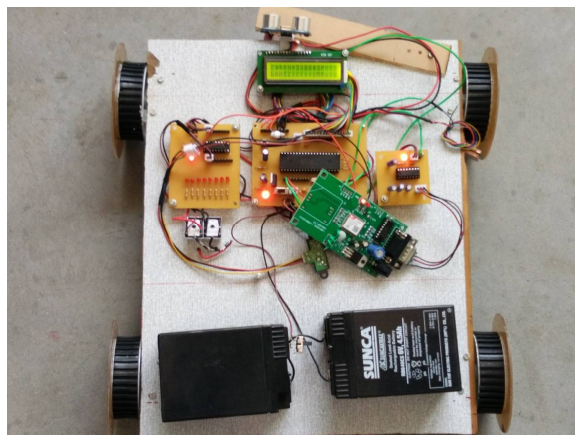
Figure 1.7 Photography of track crack detection system and preventing animals accident.

value the controller detect the crack in the track it immediately gets the accurate location by using Global Positioning System and sends that accurate location, crack information and distance of the obstacle to the control section it displays the accurate location that is latitude and longitude value.

V. CONCLUSIONS

In this paper we have proposing an approach that address conservation of animals by preventing them from being run by trains. Crack in the track have identified to be the main cause of derailments.so, owing to the critical solution of this problem we have done on implementing an cost effective solution and effectiveness to suite this application. In this system we automatically detect the faulty area and send message to specified person without any intervention of human. There are many advantages in this system comparing with achieved techniques it include costless and power consumption.In this system we locate the accurate location of the faulty area and measuring the accurate distance between train and obstacles the train will be automatically slow and stop.

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