Track Monitoring System & Prevention of Train Accidents

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ABSTRACT: The principle goal of this work is to plan a computerized framework for Crack recognition and additionally crash shirking on the railroad tracks. This project presents an ultrasonic automatic braking system for impact prevention of vehicles and an infra-red sensor for crack detection on tracks. Micro-controller is used to control the wheels based on received pulse information. The location of the error is sent to the control room using GSM and GPS technology. RF module is used in order to control the vehicle movement from the station.

KEYWORDS: Track monitoring, Train accident prevention, IR sensor, Ultrasonic sensor, GSM module, GPS modem.

I INTRODUCTION

Indian Railways is the 4th largest railroad with 1,00,550 km of total track and 92,000 km of working track over a route of 66,650 km with 7,200 halts at the end of 2014-15. Indian railroads conveyed 8 billion itinerants yearly or more than 22 million travellers a day and 1 billion tons of goods every year. There have been many accidents occurring in railways which results huge damage in terms of money and people. Most of the accidents are due to the impact between trains and faults in tracks. The projected framework is used to predict that kind of setbacks and keeps them from happening. By which more number of lives can be spared. Railroad accidents are the most scared disasters, which are extremely hard to prevent, as speed of the train cannot be reduced rapidly. The accidents may occur in two ways either by collision of trains or track failures. The collisions are happening due to the manual signalling process, by which synthetic oversights in flagging the mischances are more in our nation. And the other case is track failures which is generally caused by cracks in track, the existing methods cannot be implemented for longer distances Also, these strategies ought to be executed with most extreme prediction and efficiency of the system. In order to diminish the human and conditional mistakes we should develop advanced prevention methods using the latest technology. The fault should be pre-determined to the railroad authorities using a computerized automated system so that the required response is quick [1]. Because of the delicate infrastructure in Indian railroads the effect of the mishap is more Contrasted with the other developed countries. Certain amendments include Both heavy and light rail vehicles regulates the safety of the people. Besides there were a total of 803 accidents in last five years in Indian railways, executing 700 individuals and harming 1800 people. 47% Of these mishaps were because of crash of trains

II EXISTING SYSTEM

In the existing system, the track sensing circuitry applies a voltage source at each end of a block of rails and senses the current flowing through the circuitry [2].This work is relevant in station yards only, it can't be executed for longer distance and actualizing this framework is a great deal and costly. Avoiding the Impact of the trains is done by using the radio frequency transmitter and the receiver [3]. This context cannot be used in the real time operation as the frequency range of the radio signals are less. Currently Indian railways are using the manual maintenance of tracks performed by gangs [4] and there is no solution for the Train mischances involving human errors. In present day hone a recording instruments are being appended to the tracks keeping in mind the end goal to check the alignment and height of the tracks [4]. Accidents Can happen all the time because of safety infringement due to human mistakes or impediments in the operation of the current framework and furthermore because of equipment disappointments. As the work is completely centred on staying away from prepare mishaps and ensuring the travellers safety our control system is inbuilt in the train. Crisis alarm can be sent through traditional telecommunication systems such as Walkie-Talkies or other communication devices. However, Railway division is as yet confronting some problems due to the consideration of some factors such as cost effectiveness, despite of its increasing amount spent on usage of the gadgets. These existing procedure [5] [6] is done independently as the sum spent on each work increments quickly. By our proposed framework both impact shirking and track disappointment location should be possible utilizing single hardware. Our work will be acknowledged worldwide on account of its viability and its vigorous correspondence highlights

III PROPOSED SYSTEM

The framework has an inbuilt ultrasonic programmed automatic braking system for impact shirking of trains [5] and IR (INFRARED) sensors for split location [7]. Once the fault is distinguished the crisis caution is sent to the train traffic control station utilizing GSM (GLOBAL SYSTEM FOR

-MOBILE COMMUNICATION) module and the exact location of the fault is sent utilizing GPS (GLOBAL POSITIONING SYSTEM) modem. Once the emergency alert received by the prepare movement control station they direct the loco pilot to make fundamental move for maintaining a strategic distance from prepared mishap and loss of lives. The ultra-sonic sensor measures the separation between the running train and the inverse train on the similar track ceaselessly and if the distance is beneath the edge it informs the loco pilot and the station. The Infrared sensors are utilized to recognize the split on the track these sensors consistently transmits the infrared beams and receives the Reflected beam. In this event if there is any change in the beam frequency it initiates the stopping mechanism of the train, at this point the GPS modem gets initialised and the location of the fault is obtained. This information is sent through GSM which is associated with the line driver used for serial communication.

IV DESIGN STRATEGY

The fundamental segment utilized for the working of the module is the micro controller from the family of 8051. It gathers all the data from the sensors and the radio frequency receiver as source of information and controls the vehicle based upon the programmed data. The deliberate separation from the ultra-sonic sensor and the present controls and faults are shown on the LCD (LIQUID CRYSTAL DISPLAY). A Radio frequency receiver is placed on the vehicle so as to control it through a remote. . We utilize two customized vehicles so as to demonstrate the impact between the trains, one vehicle has every one of the segments, for example, GPS, ultrasonic sensor, GSM, RF receiver alongside the IR sensors for recognizing the track disappointment and the other vehicle is quite recently settled with ultrasonic sensor along with dc engines controlled by micro controller.

BLOCK DIAGRAM:

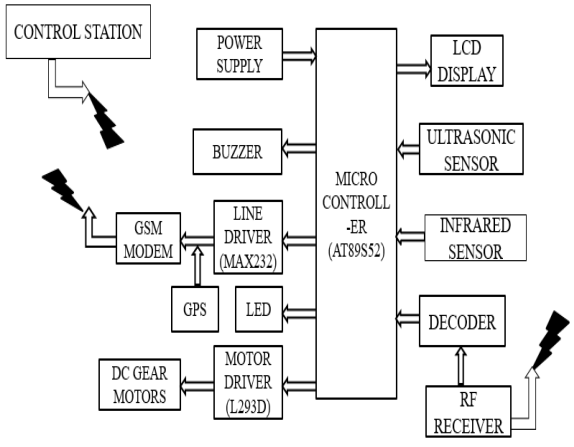

Fig.1 BLOCK DIAGRAM OF THE SYSTEM

The decoder which is connected to the radio frequency recipient translates the control flag which is sent from the control station. This controls can be utilized either to stop the train or to move the train in reverse. This decoded flag is given to the micro controller, the micro controller operates the motor driver which gives high energy to the dc engines to pivot.

COMPONENTS DESCRIPTION:

From the fig.1 it is realized that the micro controller assumes a noteworthy part for the working of the framework. The AT89S52 expends less power, with all around characterized execution it is made of CMOS technology and the function of the controller is restricted to 8-bits.it has 8k bytes of flash memory which is in-system programmable. This micro controller is contrived with high-density, non-volatile memory technology and it can be utilized with the 80C51 guideline set and pin out. The on-chip flash memory allows the user to reprogram in the system itself. Therefore it is feasible to use. This 8-bit CPU programmable flash is combined with the monolithic chip. The AT89S52 is in-built with 256 byte of RAM and has 32 I/O lines. The timers and the counters are 16-bit which is three in number.it contains on chip oscillator along with the clock circuitry [8].

Ultra-sonic sensor (HC-SR04) is utilized to gauge the separation from 2cm to 40 cm. The sensor comprise of a transmitter and a recipient alongside the control hardware. High level signals are sent for 10 micro seconds using a trigger. The module sends the signal at 40 kHz through the transmitter and checks the received pulse through the collector. The separation between the obstruction and the transmitting source is figured by

Distance= (Time taken by the wave to reach the Impediment and reflecting back to source x Speed)/2.

Speed= speed of sound in air i.e.340 m/s

The component works on the occurrence of echo.it drives 8 cycles of 40 kHz ultra-sonic signals and receives its echo. The product is divided by 2 as the time taken by the signal to reach the obstacle and receive it is considered [9]**.**

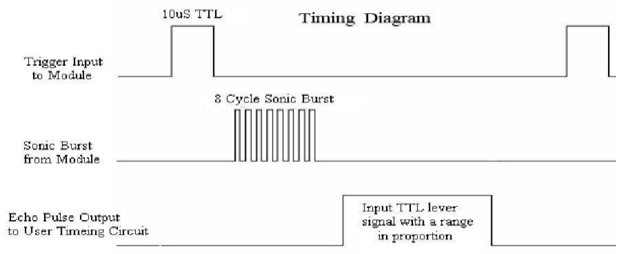

Fig.2 Timing diagram for ultra-sonic

From fig.2 we can see that after 10 micro seconds the trigger is applied which initialised the cycles of frequency. The echo pulse Yield is appeared in the fig.2 which is fed into the timing circuit. The timing

Circuit measures the distance continuously forwarding the data to the controller to perform specific operation. The ultrasonic sensors has the recurrence extend over the human perceptible range. The infrared sensor emanates and distinguishes the infrared wave to detect its environment as shown in fig.3. Infrared LED's of specific wavelength can be used as infrared source. The radiated flag is transmitted through a medium and received by the detectors. Line of sight should be maintained.

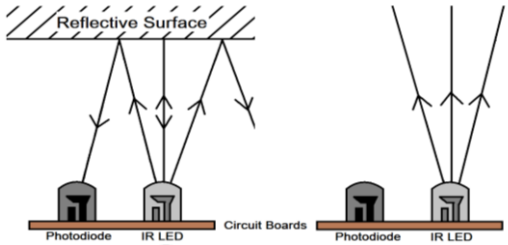

Fig.3 Illustration of Direct and Indirect Incidence of IR radiation

GSM Module (SIM 800l) is a quad-band GSM/GPRS module that works on frequencies GSM-850 MHz, SIM800L is a GPRS multiple port class 12 / class 10 (optional) furthermore, underpins the GPRS coding plans CS-1, CS-2, CS-3 and CS-4. The yield pins are outlined beneath in fig.4.

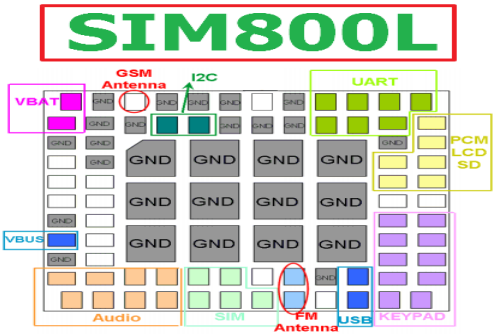

Fig.4 pin out diagram of SIM800L

A line driver (MAX-232) is associated with the GSM module which is utilized as a dual transmitter and recipient performs the change of transmitted and received signals to voltage outputs.it can perform serial communication.

GLOBAL POSITIONING SYSTEM is a space bound navigation system used to locate and track the location precisely. The obtained data can be stored in the tacking unit or it can be sent to central database through GSM or GPRS It transmit this data to a focal computer either by means of GPRS or a text message in type of IP packets.

MOTOR DRIVER (L293D) is an IC which allows DC engine to rotate the motor in both directions. The IC consist of 16 pins which Operates both the motors concurrently in any direction. The IC has an h-bridge circuitry which permit the motor to rotate independently the maximum voltage for a motor driver ranges from 5V-36V.

ALGORITHM:

The basic procedure of this system is illustrated by a flowchart shown below In fig.5. It explains the working of the whole module by a flow diagram.

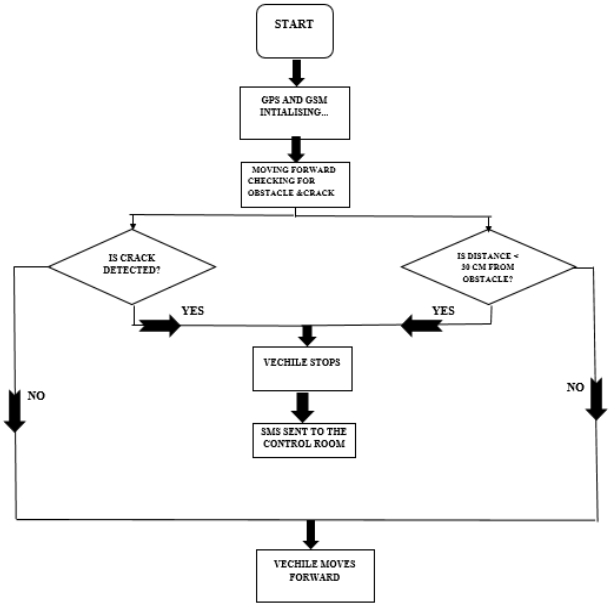

Fig.5 flowchart representing the working of the module

At the point when the power is provided to the vehicle both the GSM and GPS modules gets initialised and the ultrasonic and infrared sensors begins detecting its environment. In the event that the separation is beneath the limit of 30cm the micro controller operates the dc engines to stop. On the off chance if there is any change or break on the track the IR detects it and the controller does likewise work. This fault area is sent to the control station through SMS and a particular control is offered back to the vehicle through RF module from the station. Once the control is received and played out the procedure of initialisation begins once more.

As the micro controller is a programmable device we use Keil software in order to code and compile the program. Here we can write the code in c language and can convert the code into the assembly language [10]. It is also known as cross compiler as program to the microcontroller (target) is written on the other processor (host). After programming and compiling the code we can generate the schematic file used for the design of the PCB board.

In system programming (ISP) is also used which has the ability to the program while the logic device is completely installed in the system. Rather than programming the chip prior to the installation.it helps in integrating and testing the program in single phase.

V RESULTS AND DISCUSSION

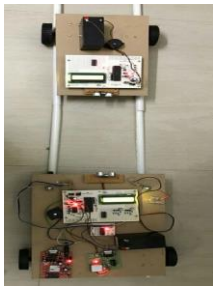

fig.6

fig.7

fig.8

Fig.9

fig.10

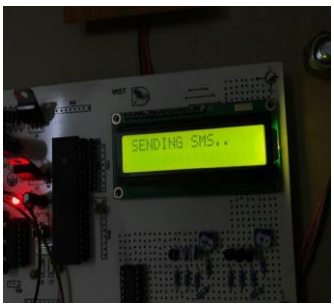

fig.11

fig.12

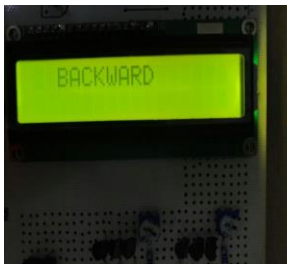

fig.13

The aggregate model of the project is appeared in the fig.6 where two vehicles are been utilized alongside the track portrayal. In Fig.7 we can see the separation data and the control to be done by the vehicle. As the separation is below the threshold the vehicle actuates the robotizing stopping mechanism and show STOP on the lcd screen as appeared in the fig.8. At a point when there is a fault along the track line a similar move is made by the Controller and shows TRACK FAULT DETECTED on the screen as on Fig.9. When the fault is identified the GPS gets instated as appeared in fig.10 and procure the Geo area information. This information with the fault data is sent to the enrolled versatile number fed into the micro controller. This can be seen in fig.11 and fig.12. The control activity sent from the control room to the vehicle is on fig.13. The IR sensor which is used should be maintained line of sight. GPS module ought to be given a voltage of 5V and the whole circuit work with a voltage of 12V. A voltage regulator (7805) is utilized for consistent supply to the GPS modem.

VI CONCLUSION:

In this paper we have talked about the mischance counteractive action of trains utilizing both ultra-sonic and infra-red sensors .it is evaluated that if this idea is executed high secure travel affirmation can be given to the voyagers. This can be financially savvy and can be utilized at a wide range network.

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