
Object Detection and Collision Avoidance with Train Using GSM

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Abstract

Railway is the most common and popular eco-friendly transportation system. It is widely used for comfortable and safe journey. Due to low fare and high volume capacity almost everyone can afford it. But in recent years rail accidents occurred continuously. Rail accidents occur when trains travelling on the same tracks collide with other train or object. Usually, these types of accidents cannot be avoided as the train driver or security personnel do not have enough time to react, unless they are travelling under special protection because of an exceptional situation. Such accidents cause direct and indirect damage to people and the environment, especially when they involve trains carrying freight, people or dangerous or polluting substances. This project is based on avoiding train collisions through android system integrated with ultrasonic and MEMS sensor inbuilt in the train. Emergency alerts can be sent through phones or other communication devices. Konkan Railways has developed Anti-collision devices inbuilt with ZigBee and Infrared based sensor concepts. The ACD system is based on GPS based positioning and track detection. This has inherent problems as with GPS service and course acquisition, the best possible accuracy is 10 m. This is inadequate for detection of rail tracks separated by a distance of 10–15 feet. ACD does not even have DGPS, differential GPS that gives an accuracy up to 2.5m. It has limited range of signal covered Hence these drawbacks can be overcome in our project by using android based control system with latest technology to avoid collision and it is operated through the GPS /GSM concepts.

Keyword: *Ultrasonic Sensor, MEMS Sensor, Global System for Mobile, GPS Module Microcontroller(AT89S52), Infrared Sensor, LCD.*

1. Introduction

Railway is the most common and popular eco-friendly transportation system. It is widely used for comfortable and safe journey. It is cheap and convenient. Today the railway in India provide the principal mode of transport for freight and passengers. Indian railways have been a great integrating force during the last hundred years by bringing people and their goods together. Indian railway is the backbone of India. It has bound the economic life of the country and helped in accelerating the development of industry and agricultur[1-4].

Rail accidents are very common in India. Collision of train with an object or other train is a very common type of accident. To minimize this accidents Konkan Railways has put afford toward

this. Konkan Railways has developed Anti-collision device Based on ‘Radio communication’, ‘Microprocessors’ and ‘Global Positioning System (GPS)’ technology which, when mounted on two approaching trains, would enable them to access accurately each other’s course and initiate an ‘automatic’ braking action, in case they were perceived to be on ‘collision risk[4-8]’.

receive signal from train section interface with microcontroller. GSM is used to send SMS to authorized persons as guard, control station and driver[8-9].

2. Existing System

The existing system uses traditional telecommunication systems like Walkie-Talkies and other communication devices. Due to railway

personel carelessness it fails sometimes. The Anti-Collision Device (ACD) is also another method introduced by Kankan railways. The ACD uses radio modems for communication and receive inputs from GPS through satellites.

Drawbacks of ACD: - (i) Ineffective: - It is ineffective because it does not receive inputs from railway control system.

(ii) Communication problem:-The Anti collision device does not provide proper communication between the trains and stations because it uses radio modems. To overcome this problems Kankan railways also introduce a Zigbee and infrared sensors based concept. But it has also failed due to limited range of signal coverage. Instead of this they used geographical sensors through satellites for communication. But it is very costly and complicated to implement. And also it fails to work on curved tracks.

3. Proposed Approach

In proposed approach we provide collision avoidance system with GSM technology and sensor. The GSM is connected to the processor. We have to register in this paper by sending our number. Eight IR sensors are connecting to processor to check tracks and Ultrasonic sensors also connect to this to check objects in the track. If any sensor get activated SMS will send to the registered number and display on the LCD display. The train will stop automatically. In case of curve or tilted path IR sensor not more efficient, so we also use MEMS Sensor to remove this problem.

Our proposed block diagram is given below

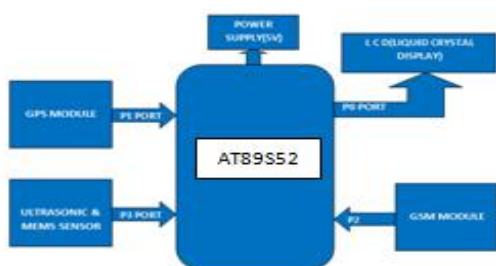


Fig.1 The above block diagram is the collection of various entities.

(i) AT89C52 Microcontroller

The AT89C52 Microcontroller is low power high performance microcontroller. It is 8 bit

microcontroller belongs to atmel's family Microcontroller which contain 40 pins in which 4 port contain 32 pins for I/O purposes. some pin have more than one function.

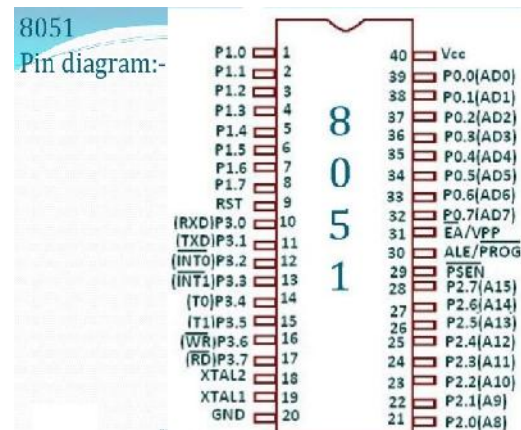


Fig. 2 Architecture of AT89S52 Microcontroller

(ii) LCD(Liquid Crystal Display)

It is very important in embedded system designs. We can show information easily by using this. It requires low power. It always requires +5v power supply. It consists of 16 pins. All are bidirectional. It provide interface for 4-bit or 8-bit data bus.

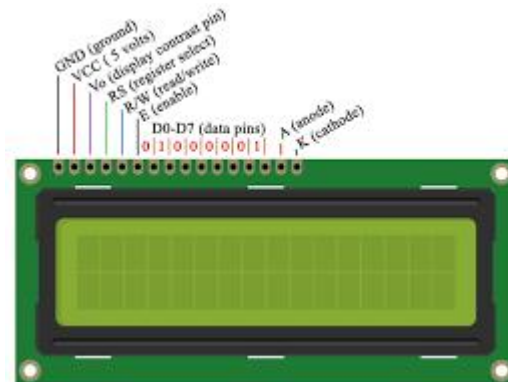


Fig. 3 Block diagram of LCD 16x2

(iii) Ultrasonic Sensor Module

Ultrasonic sensor is a high frequency sound sensor. It produces frequency higher than 20 kHz, Which is non hearable for human being. Usually ultrasonic transducer devices convert the sound into ultra sound. Ultra sonic sensor transmit and receive signal with transducer device where the speed of ultra sound signals depends on the environment . It will enable to find an object into selected range. Its count an object as an obstacle if the object like as humans, vehicles, big trees or more than bigger object. In air, sound speed 345 m/s approximately, in water, the speed of ultra sound is 1500 m/s

approximately and in metal, the speed of ultra sound is 5000 m/s approximately.

(iv) GSM Module

Global System for Mobile are basically used When the collision is detected then , the GSM module sends the message to the driver or nearest controlling station in order to prevent the collisions .

5. Graphical Representation

Below are the details of train accident happen in recent year which is mention in table1.

Table 1, Number of train accident

Year	Col- l- isio ns	Track probl em	Cross ing accid ent	Other probl ems	Total accident s
2016-17	4	70	16	1	91
2015-16	3	65	35	4	107
2014-15	5	63	56	11	135
2013-14	4	53	59	10	126

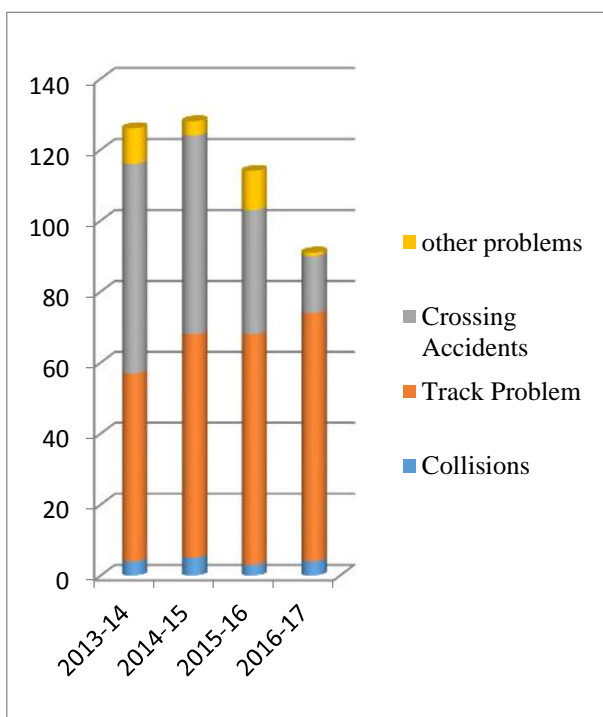


Fig.4 Represent bar graph of table -1

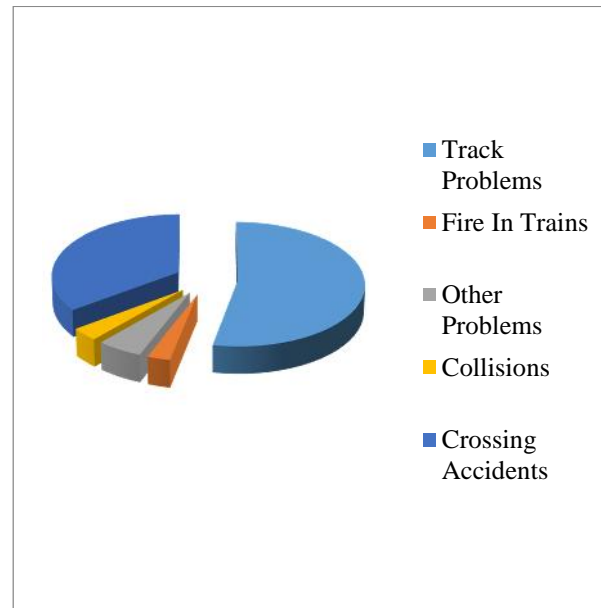


Fig.5 Represent pie chart by percentage which is mention in table-1

4. Operational Result

When two consecutive IR sensor get activated means collision detected then it transmit signal to microcontroller. To communicate train and processor we used RF module which consist Transmitter and Receiver. Transmitter transmit signal in the form of encoder which is mounted with microcontroller . Receiver receives that signal in form of decoded signal which is mounted with train . a transistor is also mounted with receiver to control motor. Emitter pin is connected with ground, collector pin is connected with motor and supply high signal at base pin of transistor and second port of motor is connected with vcc. Through base collector get high and through vcc it also get high .finally train stop Automatically.Via GSM module we send information to destination point.

The code of sending sms are such as follows.

AT

AT+CMGF="1"

AT+CSCS="GSM"

AT+CMGS="9717811137"

AT+CMSS="9717811137"

COLLISON DETECTED

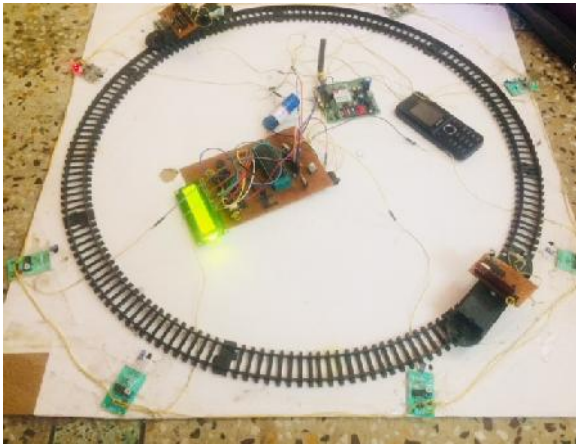


Fig.6 Snapshot of working model

CONCLUSION

In This “OBJECT DETECTION AND COLLISION AVOIDANCE WITH TRAIN USING GSM”, which is paved the way to detect both the static and dynamic objects and also ensures passengers safety. This system is having the dynamic nature to detect the objects in the track. It offers a robust, secure and efficient mode of communication to prevent the collision. This paper ensures the recent technology with cost effective.

By this project train collision is stopped. Many human lives and many properties can be saved if this system is implemented. The scenario of accident in Trains due to collision will be controlled with the help of this project.

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