

Collision Avoidance of Trains Using ARM7

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Abstract: Railways are the popular mode of Transport in almost all major cities of the World. Railways are the most widely used and comfortable modes of transportation system. The major cause for railway accidents is collision of trains on the same track. The main aim of this anti collision system is to identify collision points and to report these error cases to main control room nearer to the station as well as grid control station. Majority of accidents occurred due to improper communication among the network between drivers and control room, due to wrong signaling, worst atmospheric condition, immediate change of route. The train driver doesn't get proper information in time leading to hazardous situations. So this system by using zigbee protocol provides communication in between trains, which provide information or track id of one train to another train to avoid collision.

Key words: ARM7LPC2148 • Sensor • Track switches • Fire alert • Zigbee technology

INTRODUCTION

Today Railways is one of the efficient and largest transports in world. But railway system is also facing some problems. In this paper we are providing some electronic element to provide some safety measure for collision of trains by using zigbee protocol. It may helps to save the human life from accidents by implement this paper in railway transport. By implementing this automatic system one could avoid human error. In this implementation, every train sends its track id to nearby trains, if the one train goes in a first track, the signal is given to the other train, if any another train comes in same track and it also sends first track to other, then two trains receives same track id alerting two train drivers so that they can stop train at a distance to avoid train collisions. This system uses buzzers, switches, ARM7LPC2148, LCD display, MAX232, DC motor, Zigbee receiver and transmitter.

Collisions: Collisions are most dreaded accidents. In case of fault signaling it is very difficult to stop both the trains on the same track because generally there would be travelling very fast. Collisions are made by human errors or by equipment fault but by the collision there would be a lot of loss to property and the death toll in such accidents would be very high.

Existing Methods at Present System

Detection of Train Paths: This system continuously tracks the path of train. The proposed Solution is based on IR Rays and Sensors [1].

Anti-Collision Device (ACD): The Anti-Collision Device (ACD) is a automatic train invented by RAJARAM BOJJI director of Konkan railways. The system consists of Loco ACD (locomotive of train) with a console (message display) for the driver (in each Loco Engine), Guard ACD with remote (fitted in Guard Van), Station ACD with console (fitted in Station Masters' Cabin), Manned(manually operated level crossing gate) and Unmanned Gates ACD with hooters and flashers (in each location) and Repeater ACDs (ensuring communication in the defined zone of 3km) which work in concert to prevent the following kinds of collisions and accidents like [2].

- Head on collisions.
- Rear end collisions.
- Collisions due to derailment.
- Accidents at the level crossing gates.

Head on collision occurs when one front end of the train/vehicle hits another front end of train or any vehicle. Rear end collision occurs when the front of train or any vehicle hits the back end of train or any vehicle.

ACDs have knowledge embedded intelligence. Receive inputs from GPS satellite system for position updates and network among themselves and communication can be done through radio modems to take decisions for timely auto-application of brakes to prevent dangerous collisions. But drawback of ACD is as it is made from IR system (works only on LOS) fails on curved tracks and here we are using radio modem for communication which may get obstacles in places like hill stations [3]

Related Methods: Railway Collision Avoidance System (RCAS) is the system which identifies the train position and also the movement of direction, but they are not trust worthy. Train Collision Avoidance System (TCAS) which has signal aspect in cab and also display prevention of SPAD (signal passing at danger) with emergency break application[4]

Proposed Embedded System Design View: The proposed system is used to protect the accidents between the trains automatically which helps for safety purpose by using buzzers, switches, ARM7LPCs2148, LCD,MAX 232 serial communication, Temperature Sensor, DC Motor, Motor drive, Zigbee transmitter and receiver.

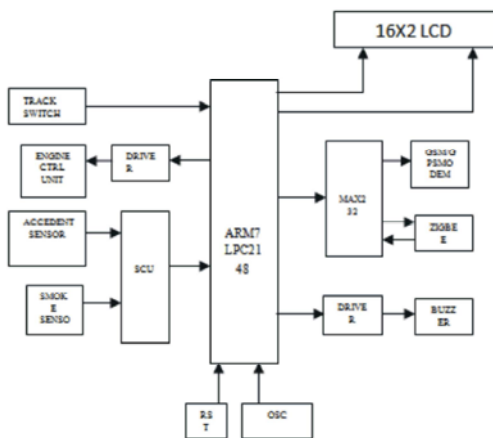


Fig. 1: Train module I

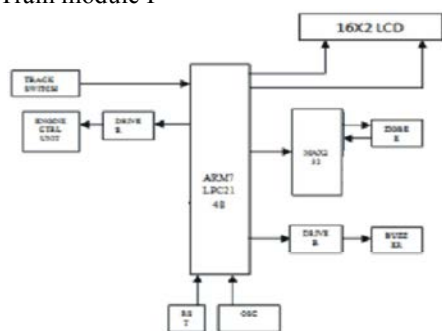


Fig. 2: Train module II

ARM7-Based Embedded System: The ARM7-based embedded system is heart of entire System. It is designed based on low power 32-bit ARM7 (LPC2148). It is RISC architecture and can use oscillators, thus it is ideal to be used as an embedded system. The LPC2148 is an 32k instructions program buffers, 512kb of RAM, three timers and 32 bit A/D converter microcontroller. It is highly performance and low cost solution for embedded applications [5].

Zigbee Technology: Zigbee is the latest technology and also provides an efficient way to convey the information to the authorized official at low cost as compare to that of the GSM Modem and also utilizes a cell-phone to send the message to the officials having a long battery life. The other wireless techniques such as Bluetooth, infrared etc are having the limitations of range and also of the efficiency. The wireless system based on GSM/GPRS is well known. But the fee is needed of using GSM/GPRS network and also the cost of hardware system is very high. The following are the some of the features of the zigbee technology [6].

Features:

- Good sensitivity
- Excellent stability
- Good pinpointing ability
- Loudspeaker output
- Low cost.

Temperature Sensor: As there are many types of temperature sensors but we are using LM35 temperature sensor. LM35 is an IC which measures temperature with an electrical output proportional to Celsius. Compared to the thermistor LM35 measures temperature more accurately. It has three pins which are positive power supply, analog output, ground or negative power supply. This LM35 is less cost effective and it is suitable for remote applications such as power supplies, battery management. It is a Waterproof temperature sensor.

MAX232 Serial Communication: The output of the TTL logic is always 5V and 0V. So these values are needed to be amplified before being transmitted to the GSM Module for this purpose MAX232 is used. It has incorporated switched capacitor charge pump circuits to generate required voltage levels. It has in-built voltage doubler and inverter circuits. MAX 232 has two pairs of such transceivers.

RESULTS

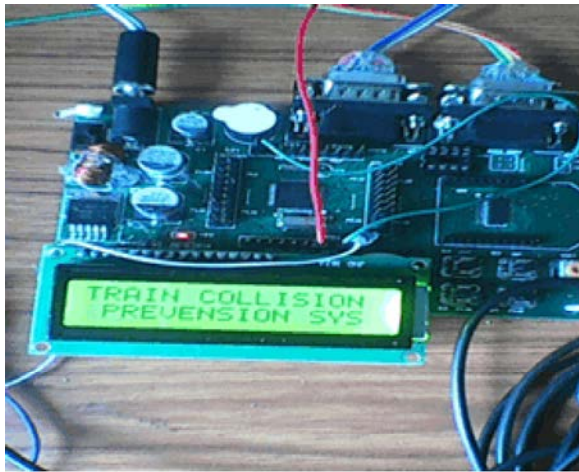


Fig. 4: Hard Ware of Train Collision Avoidance System

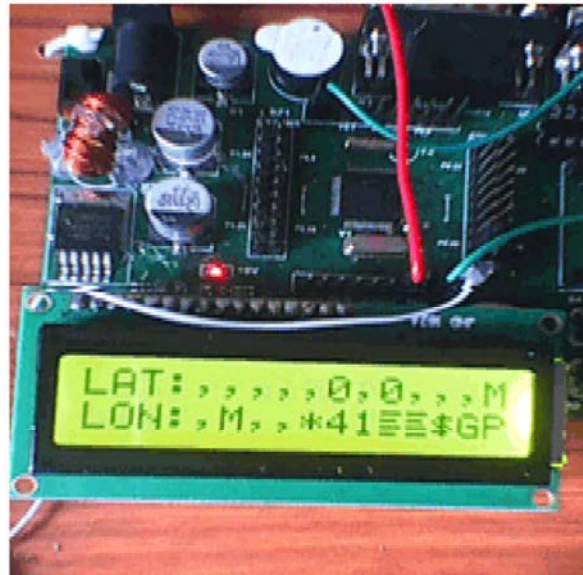


Fig. 7: Display of Longitude and Latitude When Two Train S Come in to the Same Track

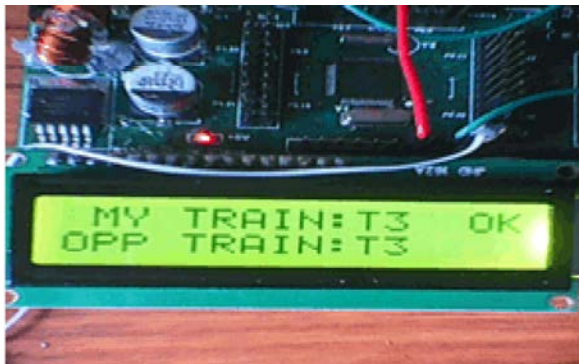


Fig. 5: Indication of Tracks of the Two Trains



Fig. 6: Display of Alert Message When Two Trains Are in Same Track



Fig. 8: Display of Message Alert When Two Trains Come to Same Track to Station Master.

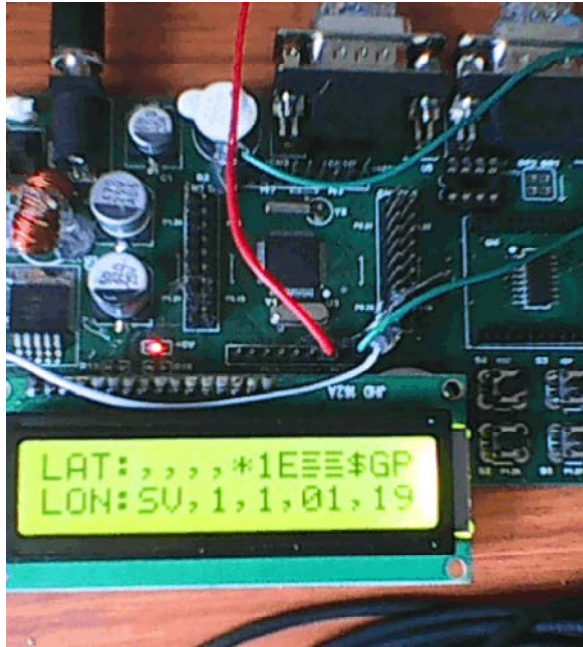


Fig. 9: Display of Longitude and Latitude When Fire Accident Is Occured

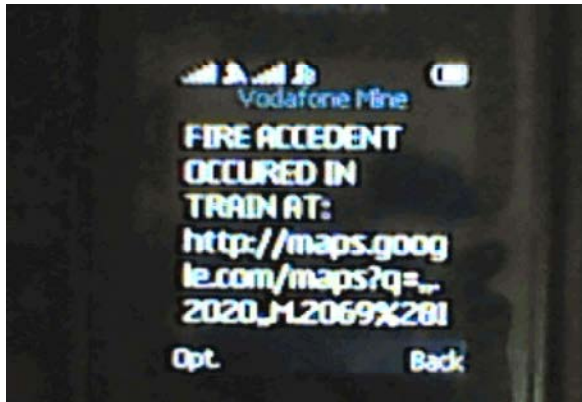


Fig. 10: Display of Message Alert Fire Accident Is Occured.

CONCLUSION

In this paper, an anti collision device has been designed, in this system if two trains are travelling in same track with the speed of 120kmph then immediately the information signal is sent to the train driver and the train can stop at the minimum safe distance of 920m also have safety valves at each window. So that when fire accident is occurred every one can escape from the train without any rush. By implementing this system in railways we can save many human lives

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