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Implementation of Train Accidents Avoidance Using RF Technology

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Abstract- This work is concentrated on predicting the major cause of railway accidents that is collision on the same track. The primary goal of this anti-collision system is to identify collision points and to report these error cases to main control room, nearby station as well as grid control stations. So that if any colision likely to occurs then this system will help to avoid such conditions by giving an alarm to concern units. Implementation of an efficient RF module based Train Anti-Collision for railways is being proposed in this paper. A safe distance of 1 Km has been maintained between two trains after applying the emergency brake in case of collision detection.

Index terms- Microcontroller, Fire sensors, Reed switch, RF module,

1. INTRODUCTION

In these days train accidents are most common and the damage due to these accidents are more severe and takes many lives of passengers hence to reduce the accident rate due to collision and breakage of rails can be reduced to maximum by the means of designing a system that makes use of network to a limited area (using a RF module), microcontroller for monitoring the RF module, train motor, LCD display, sensors, and a part of internal memory for dumping the required program. The design cost is low and the use of the designed system reduces collision between opposite trains on the same train and even when the train is switching between two tracks. Each train contains a single system or a spare one. Accidents in railway lines include collision with snags, derailment and human losses due to movements of trains. Railway transportation is usually very safe for passengers, although railway accidents and train derailment still happen. To solve this problem, a railway security system is proposed in this article. With recent advances in wireless communication and in electronics, there has been a reduction in the price, power, and size of sensor nodes. There sensors include a microprocessor, a multi-byte RAM, a short-range, shortwave radio transmitter, and a small power source (like a Battery). Sensors are employed so that the system can encounter the environment the main technique and the major aim of this system is to develop a new solution, based on a wireless network systems, for the problems faced in railway lines. The purpose in studying railway lines includes finding new methods to reduce the rate of accidents and improving the efficiency of railway-line maintenance.

2. LITERATURE SURVEY

In paper [1], Train Collision Avoidance System Using Vibration Sensors Technology used. Sensors are fitted to the train wheels and IR rays are transmitted in the track. The same facility, if made available in the opposite trains also, then Alarm is made on and get alerts if they are in same track, because the two rays would get collided and get back to their corresponding engines.
In Paper [2] suggested a system for "The Anti-Collision Device (ACD)" in which they used, The Anti-Collision Device (ACD) is a self-acting microprocessor-based data communication device designed and developed by Kankan Railway.
In Paper [3] "Microcontroller Based Model Design of a Train Collision Avoidance System" contain, the system is integrated with the braking system **o**f the train and is capable of detecting the possibility of collisions in real time. The design is intended to automate fully the communication system between locomotives so that rail traffic accidents can be minimized.

3. MODIFICATION

In the system we are using RF technology to avoid train accidents. A safe distance of 1 Km has been maintained between two trains after applying the emergency brake in case of collision detection. RF transmitter and receiver placed in control room of both train. Transmitter of both train transmit RF signal, in 1KM distance receiver receive the RF signal of both train. If two train on same track then both train will stop. Otherwise continuous to run. Also fire sensor and reed switch sensor used in this system. If fire is started in train then by using fire sensor automatic water sprinkler is started. Reed

switch used for platform indication. When train arrives on platform, with the help of reed switch LCD indicates the passengers that train is on platform.

4. TECHNOLOGY

This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter operating at 434 MHzEncoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The serial data is received at the data pin of HT12D. The decoder then retrieves the original parallel format from the received serial data. Decoder converts the serial input into parallel outputs. It decodes the serial addresses and data received by, an RF receiver, into parallel data and sends them to microcontroller.

5. BLOCK DIAGRAM

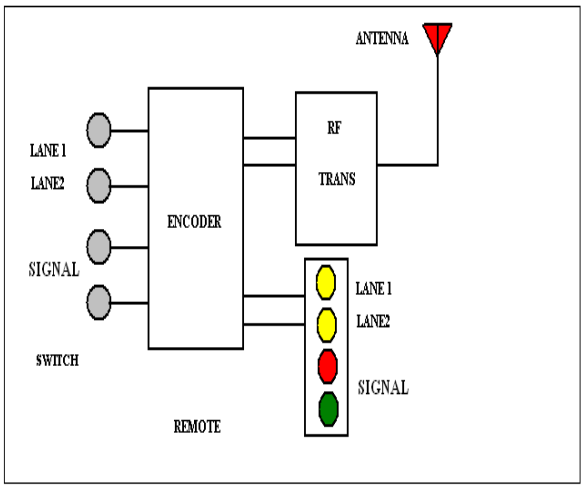

Fig.1 Block Diagram of Transmitter

5.1 RF Transmitter

This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter operating at 434 MHz Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The encoder HT12E encodes these parallel signals into serial bits.

5.2 RF Receiver

The given block diagram shows control through the RF Technique using a micro-controller RF receiver receives the serial data through antenna. Send to decoder. Decoder converts the serial input into parallel outputs. It decodes the serial addresses and data received by, an RF receiver, into parallel data and sends them to microcontroller.

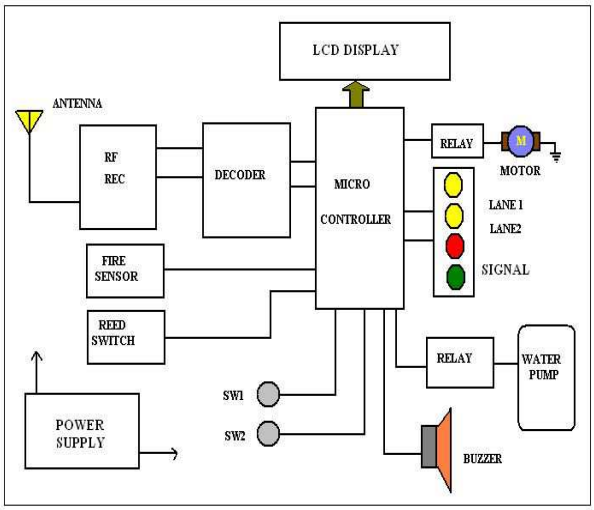

Fig.2 Block Diagram of Receiver

5.3 Microcontroller

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). 4 Kbytes of in-System Reprogrammable Flash Memory. Endurance: 1,000 Write/Erase Cycles. Fully Static Operation: 0Hz to 24 MHz 128 X8 Bit Internal RAM 32 Programmable I/O Lines. Two 16 Bit Timer/Counters SIX Interrupt Sources. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many applications. Compatible with MCS-51 Products.

5.4 REED Switch

The reed switch is an electrical switch operated by an applied magnetic field. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied.

5.5 Fire Sensor

LM7805 monolithic 3-terminal positive voltage regulators in addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and current. A fire sensor is placed inside every couch of train. When a fire is detected whose temperature is above some particular value, then a signal is sent to the train control system which detaches the couch which caught fire and stops the train.

5.6 LCD Display

It is used both is train control system and track control System in order to display appropriate warning messages To base station and train operators.

5.7 *RF Module*

The RF stands for Radio Frequency. Frequency range varies between 30 kHz & 300 GHz. In this RF system, Transmission through RF is better than IR (infrared) because signals through RF can travel through larger distances making it suitable for long range applications.IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. RF transmission is more strong and reliable than IR transmission.

6 EXPERIMENT RESULTS

This project realizes an efficient Train Anti-Collision System based on the emerging wireless communication technology (RF).

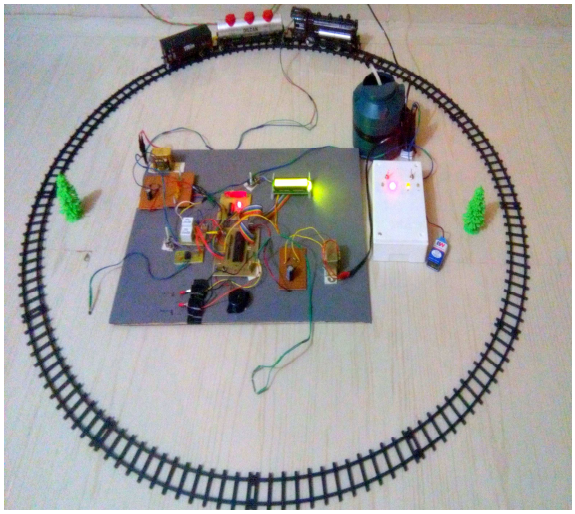

Fig.3 Train Accident Avoiding System.

The design cost is low and the use of the designed system reduces collision between opposite trains on the same train and even when the train is switching between two tracks.

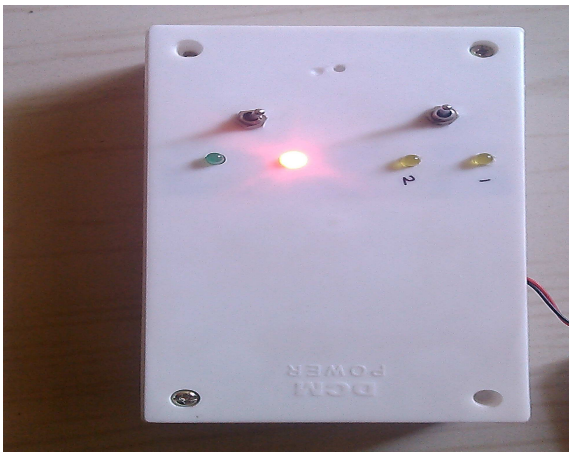

Fig. 4 Transmitter section.

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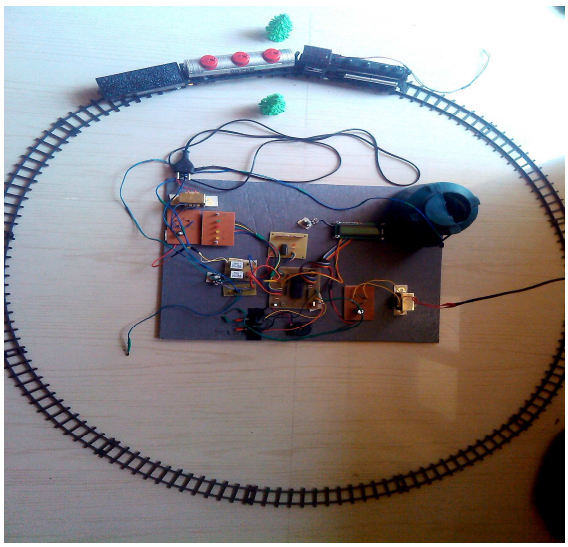

Fig.5 Receiver Section.

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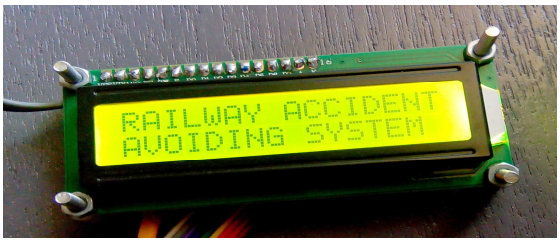

Fig.6 Initial Condition of the Railway Accident Avoiding System.

This display roll is main of the system. Display shows the message that is initial condition of the system which shows the title of project at the start.

Fig.7 Display Shows Happy Journey.

When we applies green signal then train runs and LCD shows this message when train is in running motion.

Fig.8 Display Shows Red Signal.

When we applied red signal LCD displays this message and train stops.

Fig. 9 Display Shows Same Track.

When two train running on same track then LCD shows this message and automatically both train stops.

Fig.10 Display Shows Train on Platform.

By using reed switch sensor, when train comes on platform LCD shows this message.

In this project RF signals is transmitted continuously from transmitter, Under 1KM distance receiver train receives RF signal. If two train on same track, by using RF transmission receiver train receiving signal and trains will stop.

Also by using the fire sensor, if fire is started in train then by using fire sensor detection of fire then automatic water sprinkler is started.

Reed switch used for platform indication When train in platform, by using the reed switch informed to passenger train in platform.

7 APPICATIONS

(1) Anti- collision system can be implemented in railways to prevent collisions.
(2) It used as a tracking device.
(3) In metro trains.
(4) In mono rails
(5) It can avoid accidents caused by the extreme weather conditions.

8 CONCLUSION

In this paper, a design for automatically averting train collisions have been designed and simulated. It has been estimated that, a train travelling at a speed of 140 Km/h can be stopped at 400 meters under normal conditions. As this proposed system has the capability of identifying trains in the same track at a distance of 1KM. While rail continues to be one of the safest modes of transportation, the overall safety has not significantly improved since the Railway Safety Continuous improvement is important to achieving a better safety record. Certain accident categories have seen little improvement in accident rates over time, while others are worsening and have the potential to negatively affect public confidence in the railway system. Nonetheless, we also observed stronger safety records in certain areas and believe they are the result of sustained efforts to improve safety. Through this innovative technique of early

sensing of any possible collision scenario and avoiding it thereof, we demonstrate that it is possible to improve the overall safety of the railway system in India. We believe that success depends on both the railway industry and the regulator working together to achieve that common goal.

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