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Railway Fault Detection System using Mobile Communication and Sensor Technology

Mr. P . Madhusudhan Reddy[1], Mr. I. Sharath Chandra[2], Prof. B. Kedarnath[3]
[1,2]Assistant Professor, [3]Professor &HOD-ECE
Department of Electronics and Communication Engineering,
Guru Nanak Institute of Technology, Hyderabad, Telangana, India-501506

***Abstract:** This paper proposes a cost effective yet robust solution to the problem of railway crack detection, obstacle detection and fire detection utilizing a method that is unique in the sense that while it is simple, the idea is completely novel and hit her to untested. This project helps in safe guarding the railway property.ARM 9 processor is the heart of this project.ARM 9 is embedded with two motors. Of them one motor functions as train brake system and other is used for water flushing whenever a fire sensor gets activated. An ultra sonic sensor is provided to detect the obstacles on the track. A LDR sensor is provided to detect the track damage. A LCD display is used to display the type of defect occurred during train's journey. The proposed scheme has been modeled for robust implementation in the Indian scenario*
***Keywords:** crack detection, obstacle detection, fire detection,ARM9 Processor, LDR Sensor.*

I. INTRODUCTION

Many systems have been come into existence to avoid train accidents. The existing system is a single task module. It is manual watching system. The percentage of accuracy is very less in this case and drivers may not be alert all the time. Even if the person is alert, it takes time to stop the train manually. There is delay in time, operating the existing system.

Multiple functionality system is provided in this paper. Firstly, track damage status is monitored by the sensor and wireless modules, when the sensor not getting signal, immediately notifies and alert or informs to the current train or authority people on the track. The above task can be achieved through microcontrollers, GSM and GPS, sensors.

Secondly, an ultrasonic sensor is provided to detect the obstacles which comes in between the path of the train's journey. It detects the object and automatically applies the brakes and avoids the train accident.

Finally fire sensor is provided to detect the fire. As soon as the fire sensor gets activated, alarm produces and a water flushing system gets activated. Simultaneously display is made available on LCD screen about box on fire and brakes are activated automatically.

A. Literature Survey

The high accident rate, standing at about three hundred a year, constitutes the main problem plaguing the Railways. Although accidents such as derailment and collisions occur rarely in recent times, trains run over many people, especially in crowded areas. Indian Railways have accepted, given the size of operations, eliminating all accidents constitutes an unrealistic goal, and at best they can only minimize the accident rate. Human error represents the primary because (83 percent) blamed for mishaps. The Konkani Railway route suffers from landslides in the monsoon season, which has caused fatal accidents in the recent past.

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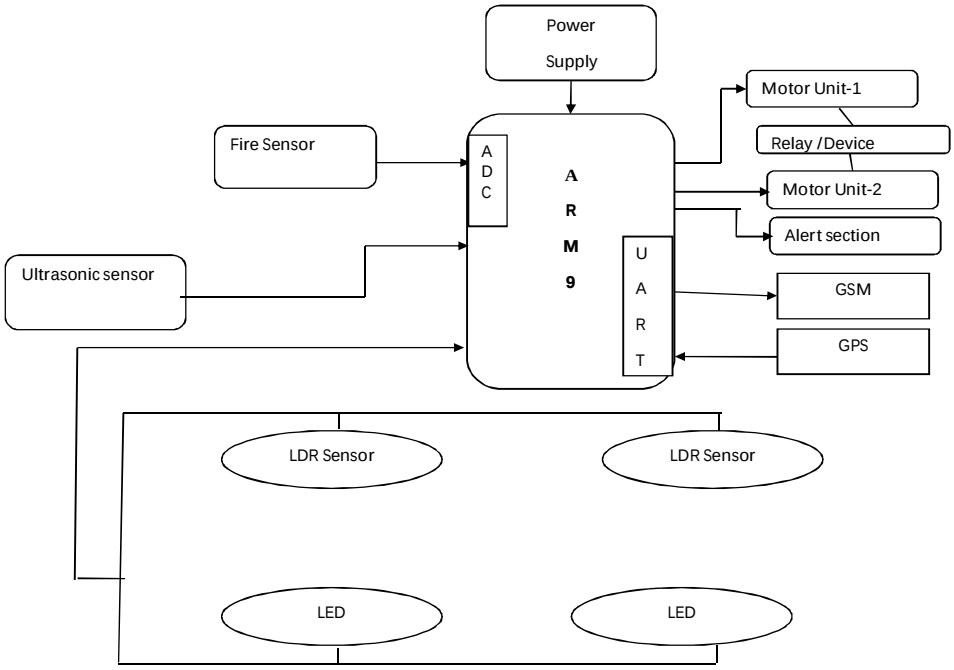

Fig.1.Block diagram of railway safety system

II. OPERATION

Sensor detects objects by emitting a short ultrasonic burst and then "listening" for the echo. Under control of a host microcontroller (trigger pulse), the sensor emits a short 40 kHz (ultrasonic) burst. This burst travels through the air at about 1130 feet per second, hits an object and then bounces back to the sensor. The sensor provides an output pulse to the host that will terminate when the echo is detected; hence the width of this pulse corresponds to the distance to the target.

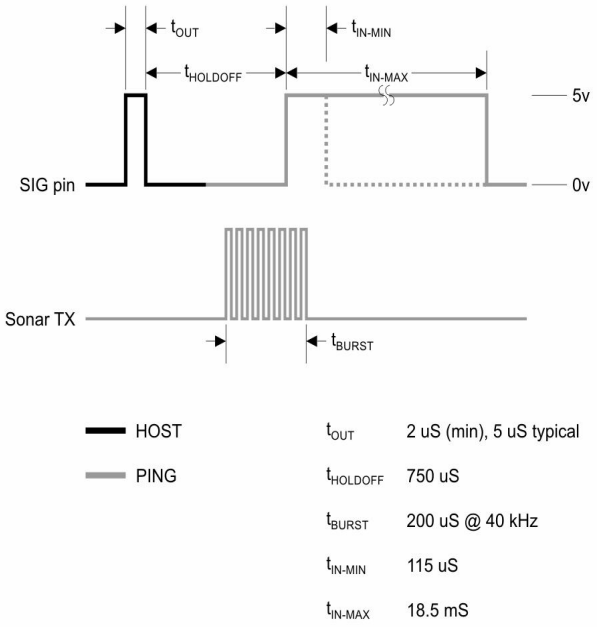

Fig.2: Time diagram of ultra sonic sensor

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III. ALGORITHM

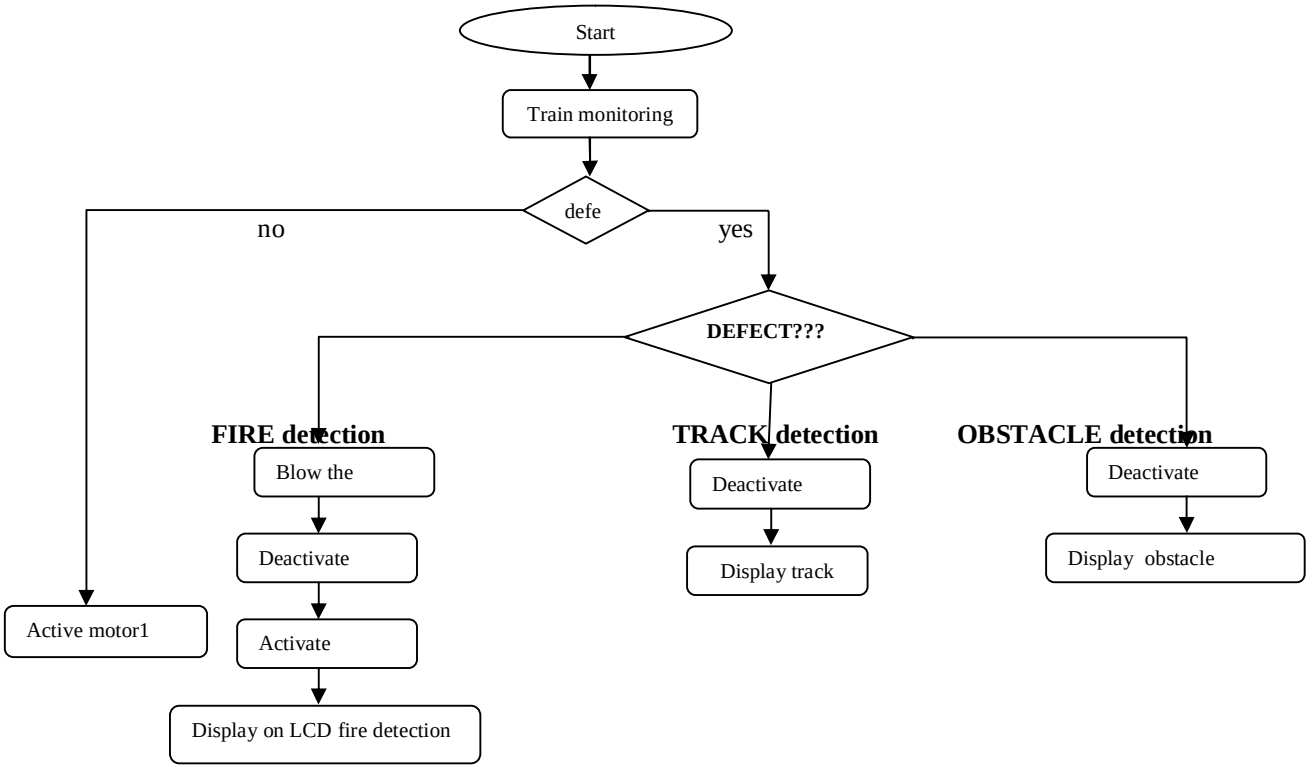

Fig.3. Flow chart for the operation of railway safety system

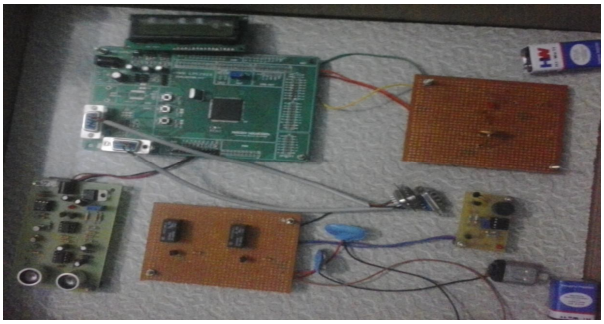

Fig.4. Overview of the railway safety system

Fire sensor is used for detecting the fire when ever fire breaks out in the train and blow the buzzer.

Fig.5. Fire sensor

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When there is no smoke the light from the bulb will be directly falling on the LDR. The LDR resistance will be low and so the voltage across it (below 0.6V). The transistor will be OFF and nothing happens. When there is sufficient smoke to mask the light from falling on LDR, the LDR resistance increases and so do the voltage across it. Now the transistor will switch to ON.

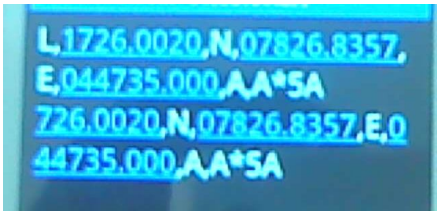

Fig .6: Message of position of train to base station when fire is detected

This entire figure illustrates controller detection of section fire and water flushing system is providing using motors. When the fire detects the buzzer blows and motor 1stops and motor 2 starts running

Fig.7. Ultrasonic sensor

This sensor is detecting the obstacles whichever comes in between the path of the train.

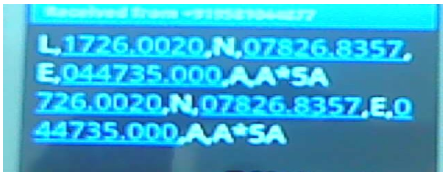

Fig .8.Message of position of trim to base station when object is detected

Fig.9. LCD displaying obstacle detected

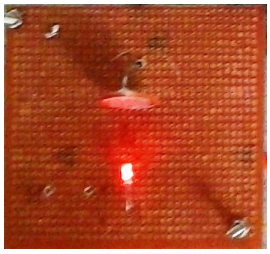

Fig.10. LDR

The above figure illustrates controller detection of section obstacle is provide using motors. When the obstacle detects motor 1 stops running. This is to for checking whether there is any obstacle in the path of train.

Fig.11. LCD displaying track damage detected

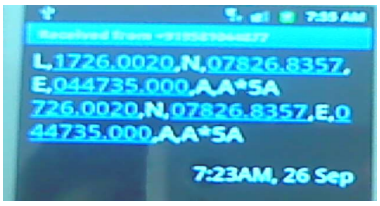

Fig.12. Message of position of train to base station when track damage detected

This entire figure illustrates controller detection section of track damage is provide. When the track damage the motor 1 stops running. This is to for checking track damage in the path of train.

IV. ADVANTAGES AND DISADVANTAGES

A. *Advantages*

1) The sensors sense the input and sends to the microcontroller, where it responds and gives command to the particular component with predefined algorithm.
2) The time parameters are crucial which can be easily changed and modified using Micro-controllers.
3) Thus, this device would work in coherence would help to reduce the train collisions.
4) Reduce the death ratio during the fire accidents to provide help fastly.

B. *Disadvantages*

1) *High Complexity:* Since there are three different sections connected to single system the software program to switch from one mode to another through interrupts becomes difficult. The hardware complexity is also very large which further increases maintenance and upgrade cost.

V. CONCLUSION

In this project, an anti-collision system for trains have been designed, simulated and tested. The simulation has been done using protest electronic simulation package Train collisions, de railing & rail road accidents are avoided. Hence it is expected that, major train mishaps can be prevented and human life can be saved if this system is implemented.
It also helps in preventing the major loss to Indian railways system by providing fire detection system. Flushing of water stops the fire expanding to its adjacent boxes and alerts the passengers with its buzzer system.
It also provides the obstacle detection which helps reducing the suicide cases and protecting the wild life.

VI. FUTURE SCOPE

The collision detection system can be enhanced by connecting it with a personal computer for monitoring and controlling purposes and using the GSM (Global System for Mobile Communications) to send and receive an SMS (short message Service) from the place of the detector to the involved person. Therefore, improve the chances for reducing the risks to life and property. The Anti Collision Device (ACD) is a self-acting microprocessor-based data communication device designed and developed by Konkani Railway (KR). When installed on locomotives (along with an auto braking unit- ABU), guard vans, stations and level-crossing gates (both manned and unmanned), the network of ACD systems prevents high-speed head on collisions in mid-sections, station areas

and at level-crossing gates, thereby saving the lives of rail passengers and road users. This device can be integrated with the Anti Collision Device for better sophistication and optimization

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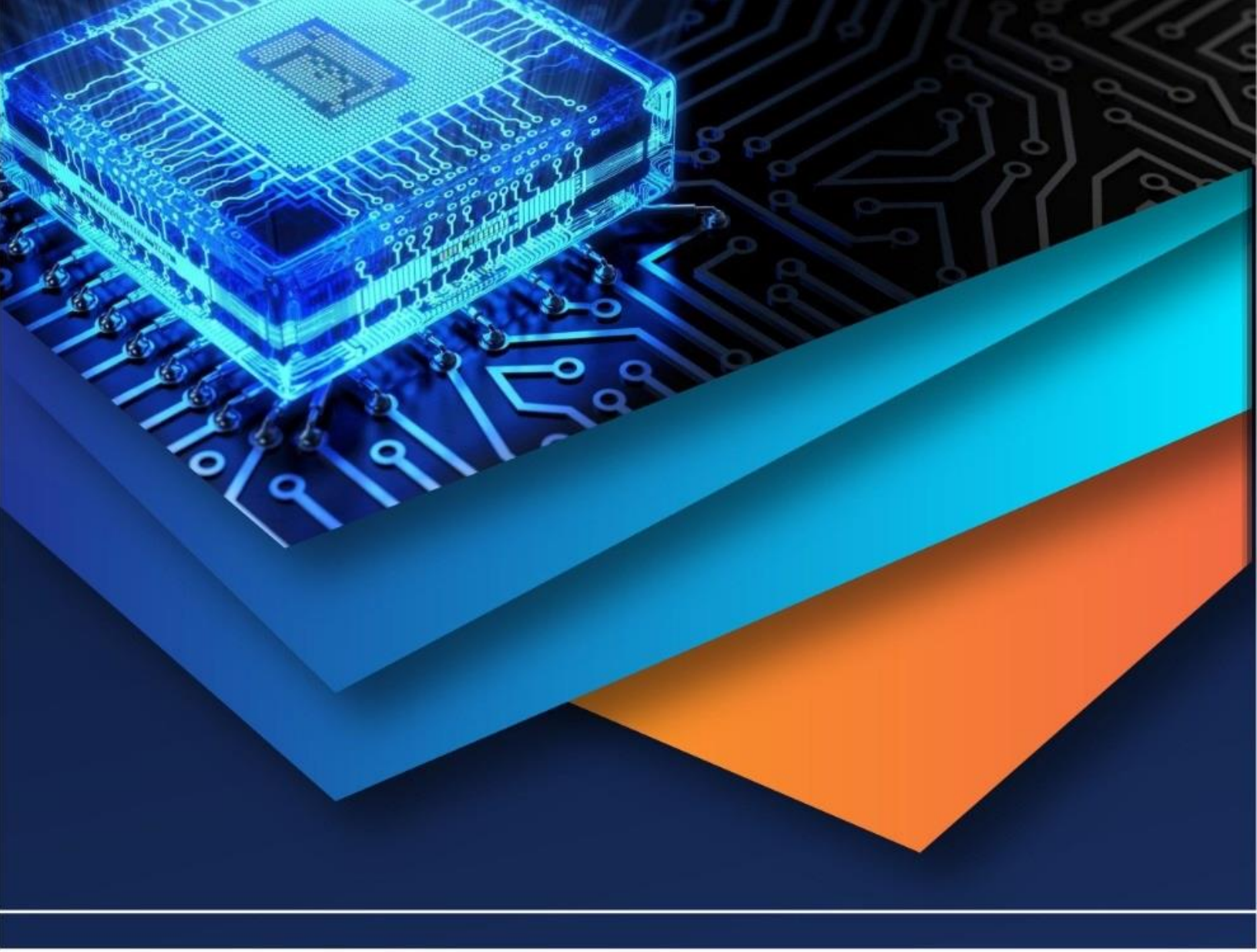

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