ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 5, Issue 4, April 2016

COUF: A RAILWAY SAFETY SYSTEM

Anita Kumari[1], Deepti[2], Jessy Joy[3], Minni Yadav[4], Kumbhar Trupti[5]

1,2,3,4 Students, ECE Dept.

5 Assistant Professor, ECE Dept.

Sambhram Institute of Technology, Bengaluru.

Abstract - *Safety in Indian Railways becomes a subject of discussion when an accident occurs. Large number of accidents happens because of derailments and at railway level crossing. Also that more than 80% of the accidents are caused by Human Failure (Railway Staff or Otherwise) and also fire been one of the major issue existing till date. This paper describes a system that uses sensors(vibration sensor, IR sensor, piezoelectric sensor), GSM technology and microcontroller to provide a safety system. It will help to make railways safer. The COUF will be consisting of four modules which are controlled by the microcontrollers. The four modules will be Collision avoidance module, Obstacle detection module, Unmanned level crossing, Fire detection module All the four modules will take the input from the external environment through sensors, pass it on to the microcontrollers. The microcontrollers analyse the input based on the stored algorithms and gives suitable output back to the environment. Feature such as visual indicators will be included to alert the train drivers and railway stations. Microcontroller will be used to take the decision and to communicate with the four modules. The aim of the proposed system is to develop a system that will meet the safety of railway passengers and develop an automatic system that will take self decisions.*

Keywords **- COUF, vibration sensor, obstacle detection, GSM technology, microcontroller.**

I. INTRODUCTION

The Indian Railway is the fourth largest network in the world carrying 18 million people to their destinations each day. More than 16,000 trains run on Railway tracks each day. But sadly 15% of all the railway accidents across the world (177) occurred last year, happened in India. The accidents killed 1600 railway staff and injured 8700 people. Also, Unlawful trespassing killed about 15,000 people each year as per the report. The major reason for train accidents are being the Fire, collision, derailments and manned railway level crossings. Though there are many projects like the London automatic signalling, which provides the solution only to signalling purpose, the concept failed to say about the presence of obstacle on

the railway track. The proposed system will satisfy all the problems that are mentioned above. This gives a better idea to the simplicity of the system and will be a onetime investment.

The main objectives of COUF is to create a coherent information system, integrating the major railway sub-systems in order to achieve higher levels of performance of the railway system in terms of safety and the optimised usage of resources. It will not replace existing systems but it will be used in conjunction with them. COUF will favour a higher level of interoperability of railway information systems, easier information sharing and increased global optimisation and performance. It will be a onetime investment for railways, as well as enhance environmental sustainability, while maintaining information sharing within the railway community. It will enable optimisation of decision-making for improved performance and high level of safety, compared to other transport modes.

II. EXISTING SYSTEM

Although the railways have progressed a lot during the last few years, this system is still troubled by various numbers of accidents which require immediate attention. There are several factors which are responsible for increasing number of railway accidents; some outstanding being signalling system, fire and collision.

The few existing systems are "Train Collision Avoidance System Using Vibration Sensors and Zigbee Technology", discussed about a Wireless communication which enables transfer of data or signals over part of the entire communication network. When the gap in the track is detected or when a running train is detected in front of the standing train, the sensor (vibration sensor and the gap detector) sounds an alarm which is fitted in the operating room in the engine. It receives input from the sensors and wirelessly sends information to other sensors in the network to sound an alarm thereby preventing any disaster from occurring [1]. "Automatic Obstacle Detection in Railway Network Using Embedded System", described a , the vibration sensor to sense arriving train and the signal is transmitted to activate the system in both the cases to take decisions. In first case, the obstacle is detected in the rail gates. In second case the obstacle is detect in path of the trains and also in the level crossings [2]. "Fire Detection and Notification System in Trains", described the work to help in notifying the passengers and emergency services about the fire accident. . Once the sensors attached in the compartments of train senses the smoke, it assumes a fire accident. The controller assumes it as an emergency and starts the buzzer, LCD display and GSM modem in the engine sends the latitude and longitude information to the specified mobile number and emergency services, by fetching the information from the GPS [3].

III. PROPOSED SYSTEM

SYSTEM ARCHITECTURE

The aim of the system is to develop effective train monitoring and protection. The system is divided into four modules as shown in Fig.1.

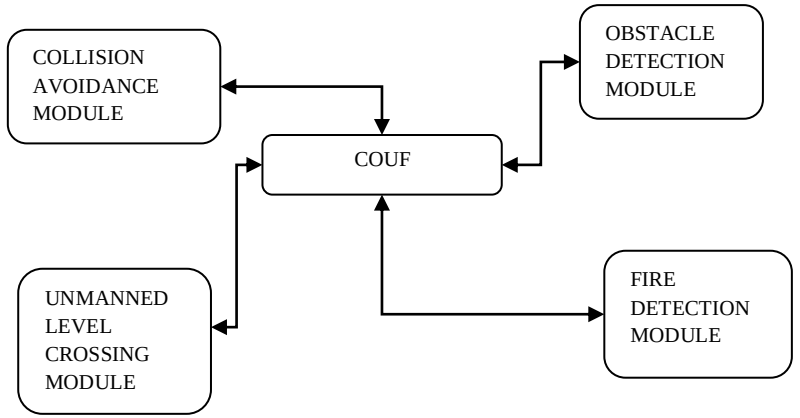


Fig.1. Block diagram of the system.

MICROCONTROLLER:

AT89C51: The AT89C51 microcontroller will be used which provides the following standard features as shown in Fig 2:

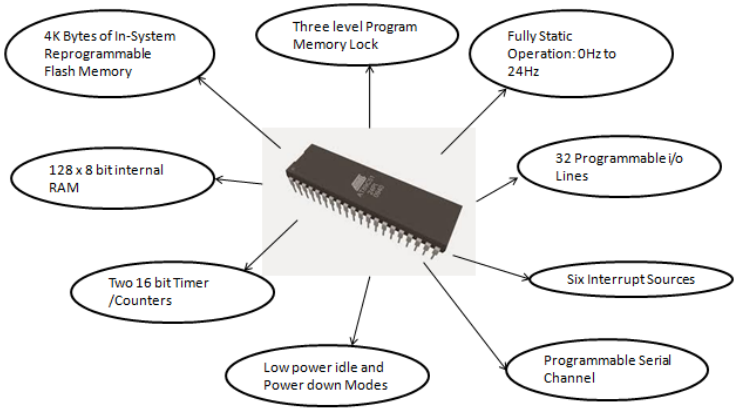


Fig.2. AT89c51 features

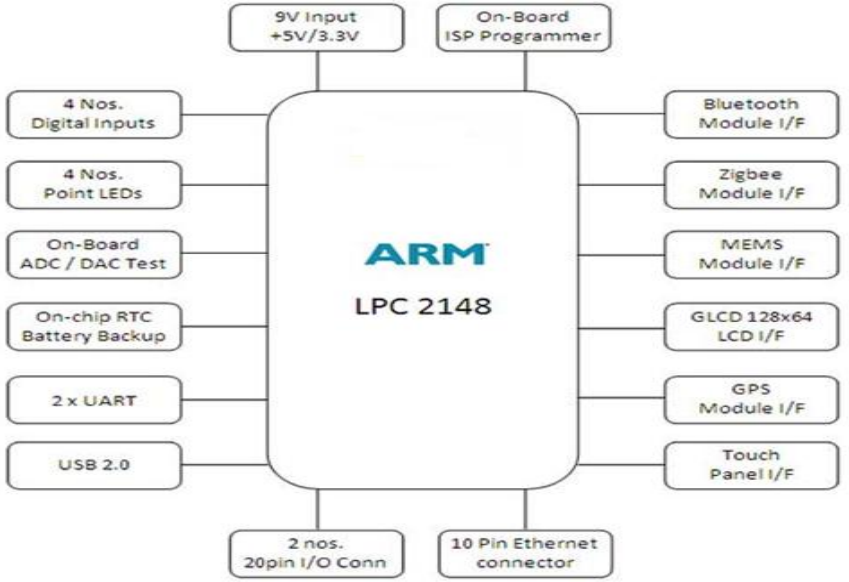


Fig.3. ARM7 features

ARM7:The ARM7 controller is used with the fire detection and the obstacle detection module which provides the following features as shown in fig 3:

SENSORS:

Vibration sensor: A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, strain or force by converting them to an electrical charge. The Vibration sensor detects the vibration of the train and gives its to the controller to control the gates.

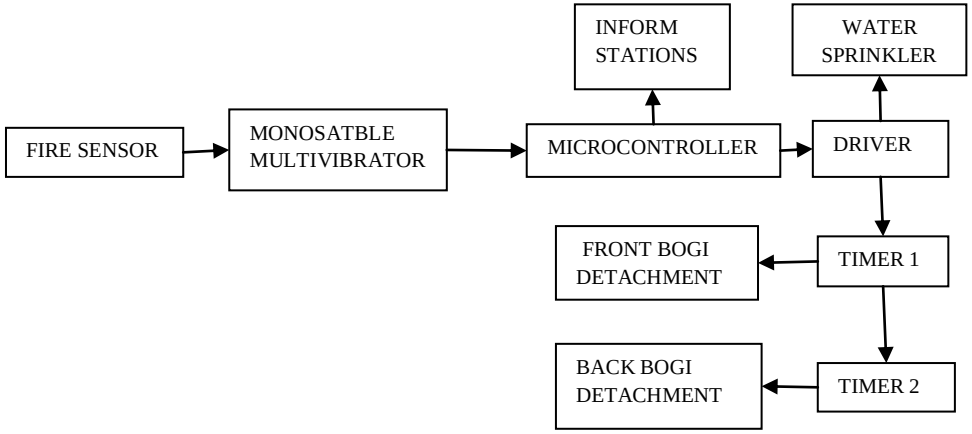
IR sensor: A passive infrared sensor is an electronic sensor that measures infra red (IR) light radiating from the objects in its field of view. The IR sensor will be used with two modules i.e obstacle detection and collision avoidance module. Whenever any obstacle or any other train will be detected on the track, the signal will be passed to microcontroller. The microcontroller will give an output to slow down or stop the train.

Thermistor: It is a thermally sensitive resistor. It is a type of resistor whose resistance varies significantly with temperature. Whenever the temperature near the thermistor will be more, the resistance of the thermistor will change. The change in temperature will be given to microcontroller which will take the necessary decision.

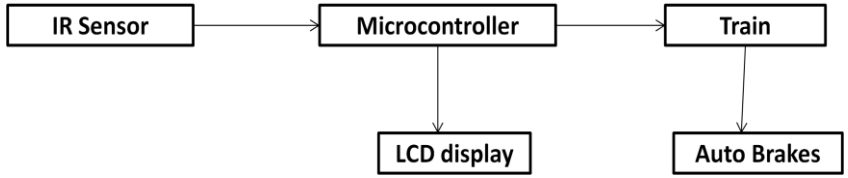
METHODOLOGY

The modules which will be designed are as follows:

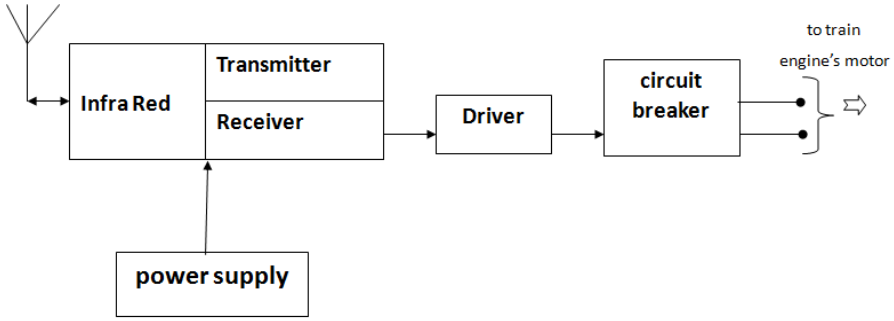
- **Fire Detection Module:** This module will be developed to minimise the accidents caused because of fire on the train. This module detects fire on train using a fire sensor (thermistor). As the temperature exceeds, the sensor detects fire and activates water sprinklers, and simultaneously send the message to the nearest station and the driver. Also after a certain time exceeds the module starts decoupling the front and back bogies.



- **Obstacle Detection Module:** This module is developed to minimise the accidents caused because of the obstacle on the track. For suppose any car or truck or animal is stuck on the track or there's any traffic jam, this module detects those obstacles using the IR sensors, which are placed across the tracks and sends the information to the driver. If there's any obstacle detected the driver can slow down or stop the train.

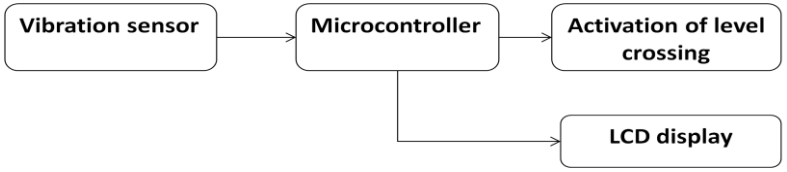


- **Collision Avoidance Module:** The collision between trains commuting on same track face to face or one after the other can be avoided with this module. In this the trains are equipped with IR sensors placed in front of the engine. The signal from other train in opposite direction is sensed using the sensors and stops the train immediately to avoid any accidents.



- **Unmanned Level Crossing Module:** This module controls the level crossings by sensing the vibration of the train. The vibration is sensed using the vibration sensor. As the train approaches a signal is given to the control station as well as indicated

using the traffic signals. Depending upon the status of the signal the railway level crossing is controlled.



All the above modules work simultaneously; even a small set of changed data is given to each and every station. Therefore, each station contains all the information about the train arriving and departing. This will ensure safety and can minimise the train accidents to some extent.

V. CONCLUSION

COUF in railway system will provide better safety for accidents like fire, manned level crossing, obstacle on track and collision with other train. The efficient use of these technologies will minimise the accidents to some extent. The alert and warning system in COUF will alert the train passengers well in advance, hence reducing the loss of property and lives. Moreover it will be small in size and low power consumption system. The work will be able develop fully automated, controlled and improved railway system. In the future the system can be equipped additionally with a GPS and surveying camera with display system in trains.

ACKNOWLEDGEMENT

We express our humble gratitude to Dr. C.V. Ravishankar (H.O.D ECE. Dept, Sambhram Institute of Technology) for his invaluable guidance. We are highly thankful to our guide Mrs. K Trupti for her guidance. They pacified our intense times with their creative and innovative ideas, reinforcing out interest in the work.

REFERENCES

[1] G.Anjali Bissa, S.Jayasudha, Volume 1, Issue 1, March, 2013 "Train Collision Avoidance System Using Vibration Sensors and Zigbee Technology"
[2] N.Ramasamy (2014), "Automatic Obstacle Detection in Railway Network Using Embedded System"
[3] Kuncham Viswa Teja, Suresh Angadi, Vol. 2, Issue 4, April 2013, "Fire Detection and Notification System in Trains"
[4] A Radio Based Intelligent Railway Grade Crossing System to Avoid Collision. IJCSI International Journal of Computer Science Issues, Vol.7, Issue 6, and November 2010.
[5] Accidents in Indian Railways_ Review of the last 5 years By Rakesh Dubbudu on August 5, 2015.
[6] Automated unmanned railway level crossing system. International Journal of Modern Engineering Research (IJMER) Vol.2, Issue.1, Jan-Feb 2012.
[7] www.creativeworld9.com/.../ieee-journals-on-electricalelectronicsc/.
[8] Ver. 17_Indian Railways by ministry of railways global tender no: 2015/dev.cell/icci August 2015
[9] Intelligent Transportation Systems, 2004. Proceedings. The 7th International IEEE Conference on 3-6 Oct. 2004.
[10] 5914238/IEEE_Automatic_Railway_Gate_Control_System.
[11] IEEE 802.20 Based Broadband Railroad Digital Network – The Infrastructure for M-Commerce on the Train.

Mrs. KUMBHAR TRUPTI, Assistant professor, Department of Electronics & Communication, Sambhram Institute of Technology, Bengaluru, India.

Ms. JESSY JOY, Student, Department of Electronics & Communication, Sambhram Institute of Technology, Bengaluru, India.

Ms. ANITA KUMARI , Student, Department of Electronics & Communication, Sambhram Institute of Technology, Bengaluru, India.

Ms. MINNI YADAV, Student, Department of Electronics & Communication, Sambhram Institute of Technology, Bengaluru, India.

Ms. DEEPTI , Student, Department of Electronics & Communication, Sambhram Institute of Technology, Bengaluru,India.