Perspectives in Communication, Embedded-Systems and Signal-Processing (PiCES) – An International Journal
ISSN: 2566-932X, Vol. 2, Issue 6, September 2018
Proceedings of National Conference on Emerging Trends in VLSI, Embedded and Networking (NC-EVEN 18), April 2018

Integrated Intelligent Train System

Suma M O
Asst. Prof, Dept. of ECE, RGIT, Bengaluru, India, suma_mo@rediffmail.com
Shreyassu B Khanagavi, Smita S Patil, Yogesh D S
8th sem ECE, Dept. of ECE, RGIT, Bengaluru, India, shreyaskhanagavi@gmail.com

Abstract - Most of transport in India is being carried out by railway network. Railways provide the cheapest mode of passenger and goods transport. About 60% accidents are occurring at level crossing and due to crack in railway tracks resulting in loss of life and economy. Therefore there is need to think about new technology which is robust, efficient and stable to solve all present day problems faced by our railway department. The aim of this project are, to identify the cracks in rails and unmanned railway gate operation using IR sensors. Fire detection is done automatically if so, the compartments of the train get detached from the engine to avoid the spreading of fire. Station intimation facilities are provided to the passengers. Baggage theft can be identified using an application installed in the user phone. Smoke can be detected using sensors etc.

Keywords: Crack Detection; unmanned gate operation; Fire Detection; Baggage Theft; Station Intimation; Problem Information; Smoke detection.

I. INTRODUCTION

Travelling is an integral part of life. Train travelling is one of the most prominent, efficient and cost effective means of transport. Railways are facing lot of challenges due to human errors, broken tracks and fire accidents.

The system which we are going to develop, reduces all the major problems faced in railways. Addressing the Requirements & Service Needs of the Railway Sector, we are providing a consistent, timely and cost effective services & solutions which makes the Train Travelling and journey more enjoyable and trust the System completely.

The Objective of this Project is to Design an Integrated intelligent Train System, this system consists of Embedded Systems and Sensors. The proposed Embedded System performs tasks using the sensors.

The main problem about railway crack analysis is, detection of crack in the location. This problem leads to derailment which causes heavy loss of property and life. Also delay in opening and closing of the railway gate lead to accidents. In order to avoid the accidents that occur during the operation of gates and due to cracks the proposed paper uses the IR sensor to perform unmanned gate operation and helps in detecting the faulty tracks. We have also used GPS to read and send the current latitude and longitude data on hosted server.

We have witnessed many train accidents due to fire, this system provides compartments detachment system along with the water sprinkler facility to save the precious life. This project provides the station intimation and train tracking system for the passengers who are travelling to unknown destinations. The baggage theft is another major problem faced by passengers in train therefore in this system we have developed an application which can detect the bag theft.

The smoke sensor used detects the smoke in the compartment and alerts the passengers through the buzzer output.

II. EXISTING SYSTEM

The current state of the art in detecting immediate and long-term railway track problem involves both inspectors walking and inspecting the track lines and train cars instrumented with accelerometers and ultrasonic sensors that are capable of detecting cracks and breakages of the rail. This is a time consuming process and it is unable to check all the laid railway lines manually.

There are no measures taken for the fire accidents, once the fire is caught it gets spread to other compartments easily. Even though technology has improved to the greater extent they are manually operating the railway gates. There are no steps taken to detect the smoke inside the compartment.

The passengers do not get information about the current location of train and they will not be intimated of their destination station and there are no measures taken to reduce the baggage theft which is the major problem of all passengers.

III. LITERATURE SURVEY

Many various systems have been proposed and some implemented but they have some disadvantages. Some system have poor stability and performance while others utilize active sensor which leads to instability and short reliable life cycle, hence requiring replacement every few years and thereby making the system expensive. Two IR sensors are present on either side of the level crossing at the distance of 1km, depending on the activation of corresponding sensors the closing and opening of the gates are performed [1]. Microcontrollers and IR sensors

have been employed to automatically close the gates at the level crossings. Hence, the errors due to manual error can be avoided and the fast response system is obtained [2]. A track monitoring system using a probe-vehicle system was designed and rail irregularities are estimated. GPS and map matching techniques have been used to locate the fault on the tracks [3]. Pressure sensor is used for automatic railway gate control. It consists of motor, IR sensor and microcontroller. Operation of the system is controlled by microcontroller [4]. Detection of the cracks in the rails using IR sensors and unmanned operation of railway gates using IOT [5].

Fig 1. Fire accident

Fig 2. Crack in rails

Fig 3. Train derailment

IV. PROPOSED SYSTEM

By taking the valuable inputs from the above mentioned research papers in this proposed system we have found solution for all the above mentioned present day problems and the features of the proposed system is explained in detail in the further segments.

A. Implementation Of Crack Detection

In this paper, we propose a fundamentally different approach to improve the current practices in railway operations using wireless sensor network (WSN). In this system we are deploying the IR sensors in the train to detect the crack in rails. Two IR sensors are used for two railway lines. Whenever the IR sensor detects the crack it automatically applies the brakes and the train is stopped. In this system the loco pilot is provided with an application that helps in sending the problem information to the control unit. This system helps to reduce the occurrence rate of accidents and improving the efficiency of railroad maintenance activities thus by saving many lives.

B. Unmanned Railway Gate Operation

For this purpose we are using two IR sensors, one several meters before the railway gate and the other several meters after the railway gate. When the first sensor detects the train, the railway gate closes automatically and when the train get passes through the second sensor the railway gate opens automatically.

C. Smoke Indicator

Smoke detectors warns about fire when the gas level in the area reaches a certain level. Heat detectors do not notice smoke. A gas detector is a valuable additional protection in areas where heat detectors are not recommended. The gas of a particular area is monitored, indicated with different set points and the data will be transmitted to control unit and alarm is raised through the buzzer.

D. Fire Detection & Alarm System

Fire / Flame identification system is implemented in this project to identify the fire / flame in the train. If any fire accident happens, the message will be sent to the main station and the compartments automatically get detached from the engine by a specially designed compartment locking system to stop fire spreading to other compartments and passengers can easily get out of the train once the train is halted. A water pump is provided to pump the stored water to the sprinklers installed in the compartment to extinguish fire.

E. Train Tracking And Intimation

In this system we are using both GPS and GSM module in the train. The GPS module helps the passenger to track the train and it also helps in identifying the current location of the train by the control units in case of accidents. The GSM module helps in intimating the passenger about his/her destination by sending a message to the passenger prior to the destination station and it also helps in sending the information to the control units in case of accidents.

F. Baggage Theft

It is one of the major problem faced by the passengers in the train. To overcome this we are developing a mobile application which indicates the bag theft and it also helps in tracking the bag. For this, a sensor is kept in the bag which will be continuously communicating with the application installed in user phone in a defined range, if the sensor moves out of this range it assumes bag has been theft and an alarm sound will be heard in the user phone.

V. BLOCK DIAGRAM

To accomplish the above mentioned features the proposed system has to be designed as shown in the below figures.

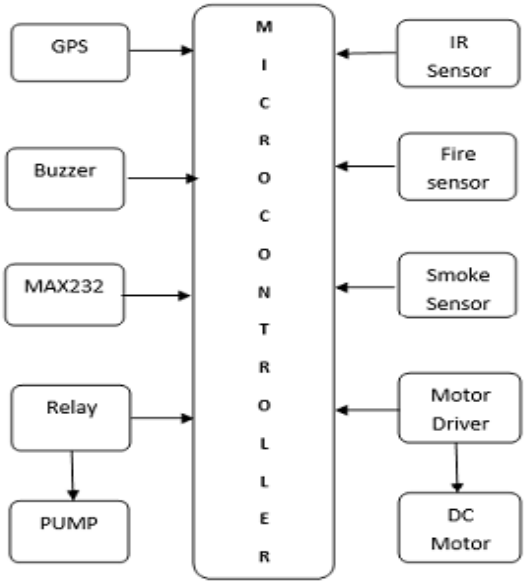

Fig 4. Block Diagram

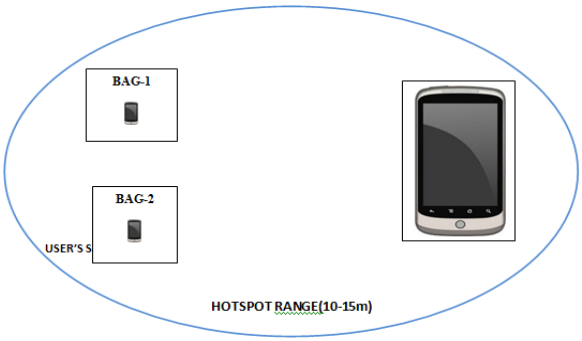

Fig 5. Bag Theft

VI. RESULT AND DISCUSSION

To make the above proposed system possible, in this project we are using the SST89E516RD microcontroller which is a 40 pin IC along with all the sensors and modules which are mentioned in the above block diagram. The IR sensors, fire sensor and smoke sensor are connected to the microcontroller to detect and take the respective measures. The GPS provides the features of identifying train location and helps in sending the message to the passengers and control unit with respect to different situations. DC motors are used for operation of wheels. A 12V DC supply is used for the operation of the circuit. The relay is used to turn the water pump on/ off. Motor drivers are used for the operation of DC motor. Buzzer is used in the compartment for alerting the passengers in emergency conditions. MAX 232 is used for external hardware interfaces. The final output of Integrated Intelligent Train System as shown in the below figure

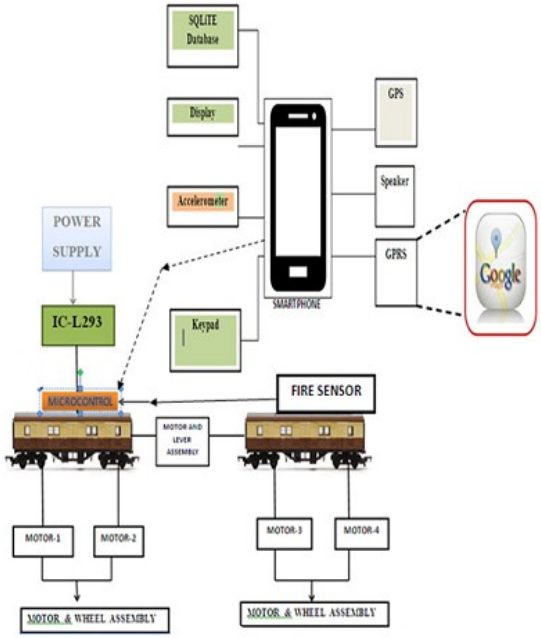

Fig 6. Mobile Interface

Fig 7. Station Intimation

VII. ADVANTAGES

- Time consistent system
- Cost effective method
- Highly efficient
- Passenger trustworthy

VIII. FUTURE SCOPE

This project highlights the benefits of applying distributed techniques to rail transportation system modeling. It can be further enhanced by adding the ZigBee to the system for communication. This enables us to detect the crack in rails before several meters hence it prevents the sudden halting of the train thus by preventing passengers from injuries. Solar panels can be added on top of the train and the generated power can be used for various applications.

IX. CONCLUSIONS

The proposed project enables the handling of more complex problems than the existing technology can handle. This system is very reliable and prevent heavy loss of life using sensors and modules which are mentioned above. It also helps in avoiding many train accidents such as derailment, fire accidents using less human intervention. It also improves the passenger comforts by providing the station intimation, train tracking and baggage theft alerts. Altogether this project provides a complete solution for all problems in railway management system.

Fig 8. Final Model

REFERENCES

[1] Atul Kr.Dewangan, Meenu Gupta and Pratibha Patel, "Automation of railway gate control Using Frequency Modulation Technique,'' International journal of Electrical, Electronic communication Engineering, vol 2(9), pp-288-298, 2012.

[2] ACYM, Kottalil,Abhijith S2, Ajmal MM3,Abhilash L J .4 ,Ajith Bab , "Automatic Railway Gate Control System, ''International Journal of Advanced Research in Electrical and Instrumentation Engineering, Vol.3, Issue 2, February 2014.

[3] H. Tsunashima, T. Kojima, Y. Mastumoto and T. Mizuma "Condition Monitoring of Railway Track and Driver Using In-service Vehicle," IEEE International conference on Railway condition Monitoring, June 2008.

[4] Subrata Biswas ,Rafiul Hoque Bhuiyan ,Samiul Hoque ,Robiul Hasan ,Tanzila Nusrat khan "Pressure sensed Fast Response Anti-Collision system for Automated Railway Gate control ,''American Journal of Engineering Research ,vol-02, issue-11, pp-163-173,2013.

[5] Bharati S. Dhande and Utkarsha S Pacharaney "Unmanned Level Crossing Controller and Rail Track Broken Detection System Using IR Sensor and Internet of Things Technology", International conference on Inventive communication and computational technologies, 2017.