

# Smart Signalling System For Train Accident Avoidance With Energy Saving System

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**Abstract-** *The paper aims at improving the railway management system which will be useful for authorities as well as to passengers. It includes different functions like controlling the signal of train based signals, it notifies the problem in railway tracks, and informs the railway authorities via indicating signal and it can avoid derailment of the train which causes the accident. The station alert SMS function is used in the project for the benefit of passengers.*

*The Raspberry Pi/Microcontroller is the heart of the project. The Infrared sensor is applied for detecting the crack in the railway tracks. Once the crack has been detected, railway authorities will be notified via display & buzzer and also the loco pilot of the train within the coverage area which will further used to avoid accidents. This is used to trace the location of the failure of the railway track. The Fire Sensor is used to detect the fire on the train, once the fire is detected it will inform the railway authorities and fire bridge for an emergency.*

**Keywords:** Raspberry pi/MICROCONTROLLER, IR SENSOR, FIRE SENSOR, FOG SENSOR

## I. INTRODUCTION

Human negligence and human error have become the primary cause of train accidents in India. A train coincidence also occurs due to natural crises. Currently, a major train accident occurs in Madhya Pradesh in Harda on 6 August 2015. The second train accident occurs in Mumbai local train overshoots platform at Churchgate on 28 June 2015.

The first train accident occurred due to natural crises & human negligence. The second train accident occurred due to human error.

To overcome all these limitations, we develop new system such as “**Smart Signaling System for Train Accident Avoidance with Energy Saving System**”

### 1.1 MOTIVATION

Some major train accident in India given to following case study:

May 26, 2014: At least 22 people were exterminated when Gorakhdham Express pushed into a motionless freight train in Sant Kabir Nagar district in Uttar Pradesh. The coincidence took place when the express train move toward on the same track as the goods in transit train near Churen Railway Station  
May 04, 2014: At minimum 18 individuals exterminated, and 124 hurt next the engine and six bogies of a traveler unsettled in the Konkan Railway route in Raigad district of Maharashtra. The Diva-Sawantwadi passenger train, which absent Diva at around 7:30 am, unsettled just after crossing the BhiseKhind tunnel at around 9:30 am killing 18 passengers

February 17, 2014: 3 individuals were exterminated and 7 others bruised when 10 coaches of a train derailed at Ghoti nearby Igatpuri in Nashik district. The disaster took apartment at around 6.20 AM when the 12618 Nizamuddin-Ernakulam Lakshadweep Mangala Express train was transitory finished the Ghoti-Igatpuri section, about 35 km from Nashik.

January 08, 2014: 4 individuals were burnt and five pass away due to oxygen deprivation after three sleeper coaches S2, S3, and S4 of the Bandra Dehradun Express were gutted in the fire. The instance occurred between Dahanu Road and Gholvad station near Surat. Though the reason of the fire was yet to determined, senior railway officers ruled out short circuit

## II. LITERATURE SURVEY

**1. “Towards the internet of smart Trains”, Paulo Fraga-Lamas**

The future of the railway industry is expected to rely upon smart transportation systems cyclecost. New services, such as integrated security, asset management, and predictive maintenance, are expected to improve timely decision-making for issues like safety, scheduling, and system capacity. Smart railways represent a combination of interconnected technological solutions and components, as well as modern transportation infrastructure like automatic ticketing systems,

digital displays, and smart meters. Likewise, these systems require seamless high data rate wireless connectivity and integrated software solutions to optimize the usage of assets, from tracks to trains, to meet the ever-growing demand for energy-efficient and safer services. Driving factors of the smart railways are expected to enforce the growth of the industry. These factors include the increasing importance of sustainability, government regulations, demographics (i.e., growing traffic of passengers and freight, aging population, and rapid urbanization), macroeconomics (i.e., limited public funding and government deficit, government initiatives and partnership models), microeconomics (i.e., price sensitivity, demands for an improved passenger experience, stakeholders interests), the growing importance of smart cities, the incredible pace of telecommunications and technological change, and the need for mobility.

## **2. “Smart Railway Management system”, Prof. Shailaja Udtewar, Mursaleen Shaikh**

In India most of the commercial transport is being carried out by the railway network and therefore if any problem occurred during transportation the major damage is getting occurred to the economy. The Indian railway network today has a track length of 113,617 kilometers (70,598mi). over a route of 63,974 kilometers (39,752 mi) and 7,083 stations. It is the fourth largest railway network. Indian railway network is still on the growth trajectory trying to fuel the economic needs of our nation. Though railway transport in India is growing in a rapid speed, but our facilities are inadequate compared to the international standards and as a result, there have been frequent derailments that have resulted in severe loss of valuable human lives and property as well. On further analysis of the factors that cause these rail accidents, recent statistics reveal that approximately 60% of all the rail accidents have derailments as their cause, of which about 90% are due to cracks on the rails either due to natural causes (like excessive expansion due to heat) or due to antisocial elements. Hence these cracks in railway lines have been a serious problem which has to be solved as early as possible. These railway lines cracks problems are generally not noticed due to improper maintenance and lack of alertness in manual checking work.

## **3. “Standardization of Signaling & Train Control System for Railways, Indian Railways” A Report of the Sub-committee**

The success of Metro rail systems lies in their ability to provide frequent, fast, safe and comfortable journeys in the urban conglomeration, not only to the regular commuters, but also to the occasional traveler or tourist alike. Signaling and

Train Control systems play a major role in achieving these objectives. While enhancing operational efficiency by providing control systems to achieve the target headway, it also ensures total safety of the train movements at all times beside adding value to other systems by on-line interface. To appreciate the need for complex signaling in Metro rail systems, it is necessary to distinguish its aims from the mainline railway systems. Aim of the Metro Rail is to move large number of people over relatively very short distances, at very frequent intervals within an urban conurbation. On the other hand, the main line railways move passengers over long distances with limited number of services on any route and most of the main line Railway is with at-grade track with its implications of grade crossings with the road traffic. Hence, though the fundamental principles of failsafe signaling in Metro Rail are based on the evolution from main line signaling, due to the need for provision of absolute safety in the face of very close headway and stoppage every one km or so and due to the nature of train control coordination required, the Metro Rail signaling systems have evolved in a complex and unique way, with higher order of safety and train control provided to suit the needs of Metro rail as compared to main line networks.

## **III. PROPOSED SYSTEM**

When there is some obstacle present in front of the track or there is a presence of a gap between two joining tracks, the IR sensor will detect the gap between the two tracks and indicate on the LCD display. When the LDR and LED pairs are cut in the sequence, the alert message is displayed on the LCD display. When there is a RED light on the signal pole, the RF transmitter will send the notification to the loco pilot to stop the train which is in the specific range or else the train will be at a standstill automatically, the train will start only once the signal is Green on signal indication pole. Likewise, for the yellow signal on the signal pole, the train speed will get routinely slow. The IR sensor is implemented in the transmitter section of the circuit which will detect the fire in the train and notify all the signals poles will have LDR and LED detectors to locate the train's current position. Let S<sub>ST</sub> may be the signal on Station. This signal will have only red and green signals. Let S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> be the three signals on tracks. These signals have Red, Yellow and Green signals. When there is waterflood, Landslide, Fogg, and Fire is detected, it will indicate by signaling system & display on LCD display

**RASPBERRY PI:**The Raspberry Pi is a credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages.

**LCD DISPLAY:**It is used for the displaying the information for the user.LCD is an Alphanumeric Display it means that it can display Alphabets,numbers as well as special symbol.Here we have used 16X2 Alphanumeric display which means on this display we can display two lines with maximum of 16 characters in one line. explore computing, and to learn how to program in languages like Scratch and Python.

**MOVEMENT DETECTOR SENSOR:**This sensor is used to detect movement in front side train.The movement detector is a popular device for detecting motion in a free space.Ultrasonic sensor(also known as transceiver when they both send&receive,but more generally called transducers.

**RAILWAY TRACK CUT SYSTEM:**This is a system. It is used to identify track cut in railway. In signaling pole ground provided through track.If track cut for pole, then signal ON.

**VISIBILITY SENSOR:**It is used to sense Fogg. This can be LDR. The sensor will be placed on the front panel. It has a high level of rejection of natural light variations, such as sunrise, sunset& the movement of clouds. While it is a passive system, it can also be used as an “active” system.

**RAIN FALL DETECTION SENSOR:** It is used to sense moisture in earth. Rain fall sensor provide a logical probe. Rain fall sensor indicate the water level.

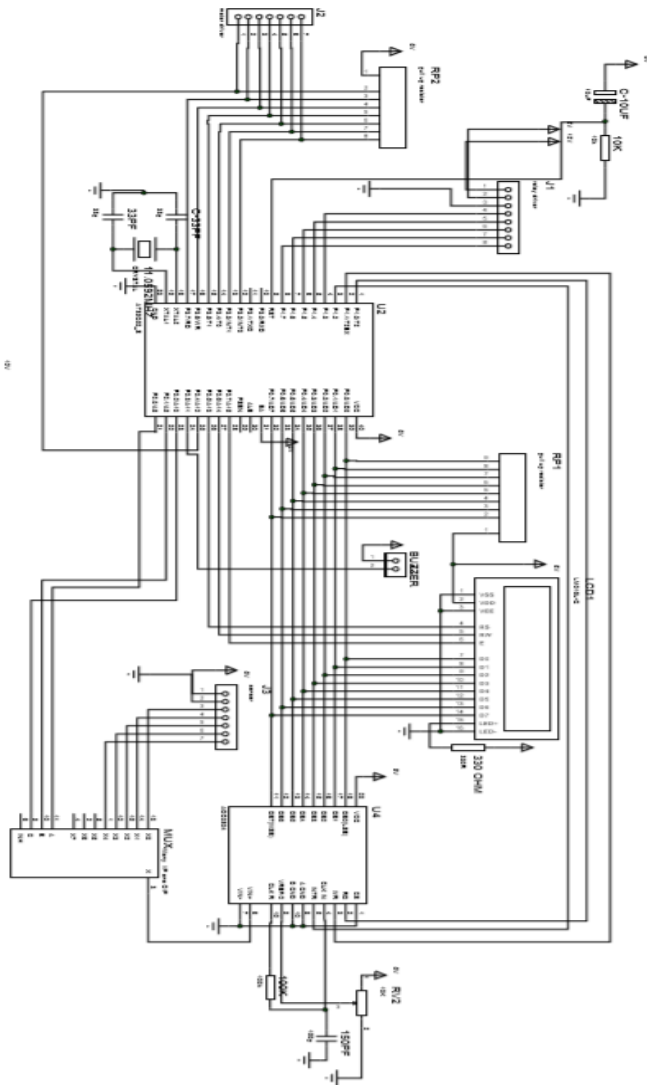
**HEAT SENSOR:**It is used to sense heat in railway engine. The fire sensor is too sensitive & can detect a rise in temperature of 10 degree or more in its vicinity Ordinary signal diodes like IN 34 & OA 71 exhibits this property & the internal resistance of these devices will decrease when temperature rises.

**RELAY:**It is used to drive AC/DC Load & also used for auto switching purpose. It is a component which allow a low-power circuit to switch a relatively high current on & off, or to control signals that must be electrically isolated from the controlling circuit itself.

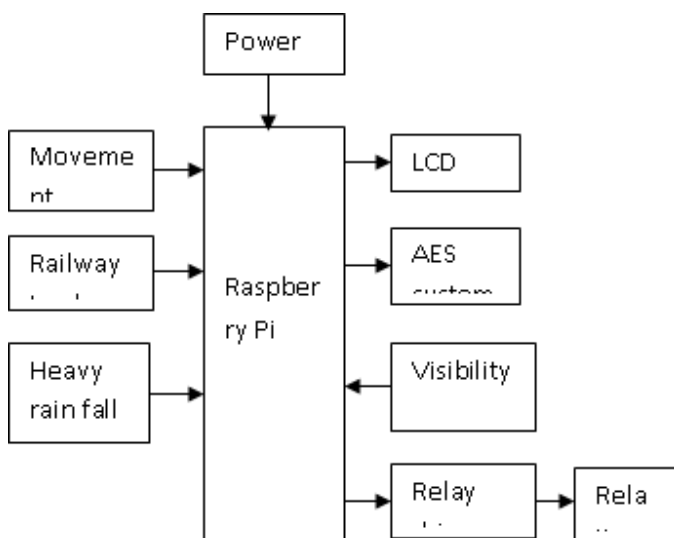
**V. ALGORITHM**

Start

- Initialize LCD Display
- Display welcome message



**IV. METHODOLOGY**



Check if movement detected, if yes engine stop, if no back  
 Check if track cut detected, if yes LED ON, if no back.  
 Check if landslide detected, if yes LED ON,if no back.  
 Check if Train detected, if yes Relay on, if no back.  
 Check if Foggedetected,if yes LED &Buzzer ON, if no back.

Stop.

## VI. ADVANTAGES

- Sensors used have high sensitivity and are easy to handle.
- Low cost system, providing maximum automation.
- Low maintenance and low power consumption.
- The system is more compact compared to the existing ones.
- Provide a user-friendly interface hence will have a greater acceptance by the technologically unskilled workers.

## VII. CONCLUSION

As the railway accidents are the major problem in today's world this system helps to avoid the accidents as well the derailments which occurred due to the failure of tracks, the system also includes other facilities to the passengers as well as to the authorities like SMS alert function of next station and emergency exist. It also includes a fire sensor that detects the fire and informs the authorities. Therefore, this system overcomes the traditional method problems at a low cost.

- AES signaling system is also called a lifesaver system.
- This system can be used to avoid a Train accident due to natural crises and human negligence. It is an energy-saving system.

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