ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

Arduino Based Safety System for Passengers in Railway Transportation

A.Senapati[1], D.Ghosh[2], R.Nayek[3], K.Bhattacharjee[4], A.K.Kashyap[5]

UG Student, Dept. of ICE, Calcutta Institute of Engineering and Management, Kolkata, West Bengal, India[1]

UG Student, Dept. of ECE, Calcutta Institute of Engineering and Management, Kolkata, West Bengal, India[2]

UG Student, Dept. of ECE, Calcutta Institute of Engineering and Management, Kolkata, West Bengal, India[3]

UG Student, Dept. of ECE, Calcutta Institute of Engineering and Management, Kolkata, West Bengal, India[4]

Asst. Professor, Dept of ICE, Calcutta Institute of Engineering and Management, Kolkata, West Bengal, India[5]

ABSTRACT: The objective of the paper is to control unmanned railway gate automatically as well as detection of flood and fire accidents. This type of gate can be employed in an unmanned railway level crossing where a chance of accidents is higher and reliable operation is required. Nowadays we see in a newspaper very often about various railway accidents relating to fire hazards as well as train collisions and thus safety of passengers is matter of concern and very few reliable is available to avoid such accidents. This project based on to avoid such accidents and to ensure safety of the passengers.

KEYWORDS: Arduino, IR sensor, Obstruction, Fire sensor, Flood sensor

I. INTRODUCTION

Rail accidents occurs when train travelling on same tracks collide or when train derail because of technical faults in the rolling stock, or the land slides or object obstructing the rails and other issues (i.e fog ,rain, flood, fire etc.) where the highway or road meets with the railway tracks that point is called **level crossing. T**here are two types of level crossings, one is manned and other is unmanned. In daily newspaper we often see the various accidents that took place in level crossing premises, so instead of using manual operation if we use simple electronics components and to control the gates automatically then the chances of accidents might be reduced. Also the flood is another problem often required to control the overflow of water that submerges the land on which train runs. The track goes underwater and consequently it becomes unable to carry train and the result is **derailment**.So,if we use a flood sensor then this type of accidents may be neglected before it happens . The another problem related to train is the Fire hazards that often happens due to short circuit near the air-conditioning unit and pantry car coach and also generator coach. This paper is also important to give a solution to control the fire which often happens in oil tanker carried by train. Though Railway has installed smoke/fire detection alarm (**Rajdhani** ,**Shatabdi**,**Garib Rath** and **Duronto train**),but yet the accidents not very much reduced and accidents often happens. So in this scenario if we use fire sensor then the accidents will be very much avoided.

Some statistics related to train accidents is given as:

UNMANNED RAILWAY ACCIDENTS STATISTICS:

Train smashes family in car (Agradwip-Patuli , near Katwa on 2008).

FLOOD ACCIDENTS STATISTICS:

Kanyakumari express from Mumbai to baranasi in MP, 2016.

Janata express accidents on 20th March, 2015.

FIRE ACCIDENTS STATISTICS:

Up Bangalore-Nanded express (south western railway), 2015.

Down Dehradun express (western railway), 2014.

Up Gorakhpur – Bandra terminus Avadh express (western railway), 2016.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

II. RAILWAY ACCIDENTS STATISTICS

Here we show some of the railway accidents statistics which will be happened in last few years in INDIA.

Fig 1: unmanned level crossing replaced state wise

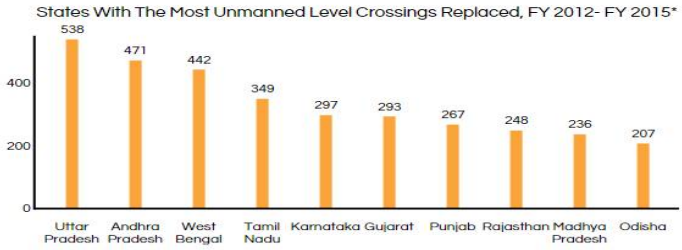
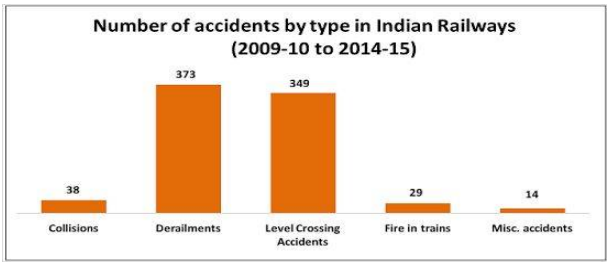


Fig 2: Types of accidents in Indian railway



III. SYSTEM DESCRIPTION

In this section we show the circuit diagram of every parts of the project. The obstacle and Fire detector sensor which will be placed outside and inside the train for detecting the obstacle and fire. The flood sensor placed near Bridge /appropriate places send the signal whenever the overflow occurs. The automatic railway gate which will operate automatically according to the arrival and departure of the train.

Obstacle and Fire detector Sensor:

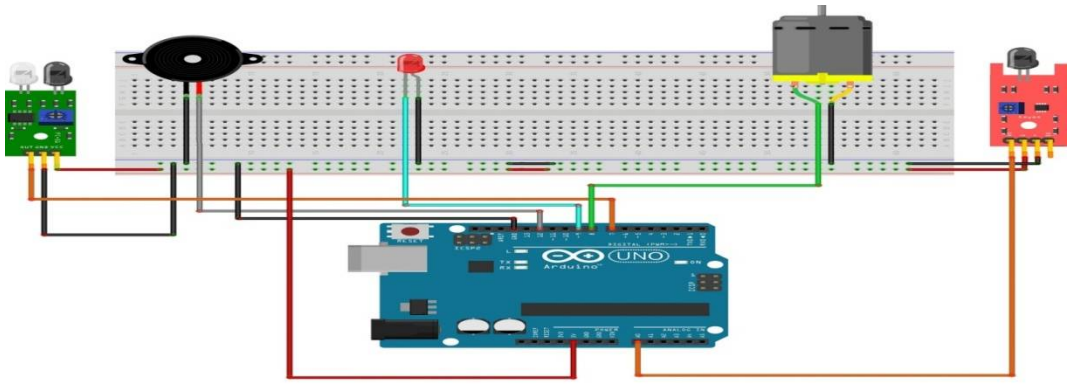


Fig 3: Obstacle and fire detector sensor circuit

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

Flood Detector Sensor:
Automatic railway gate:

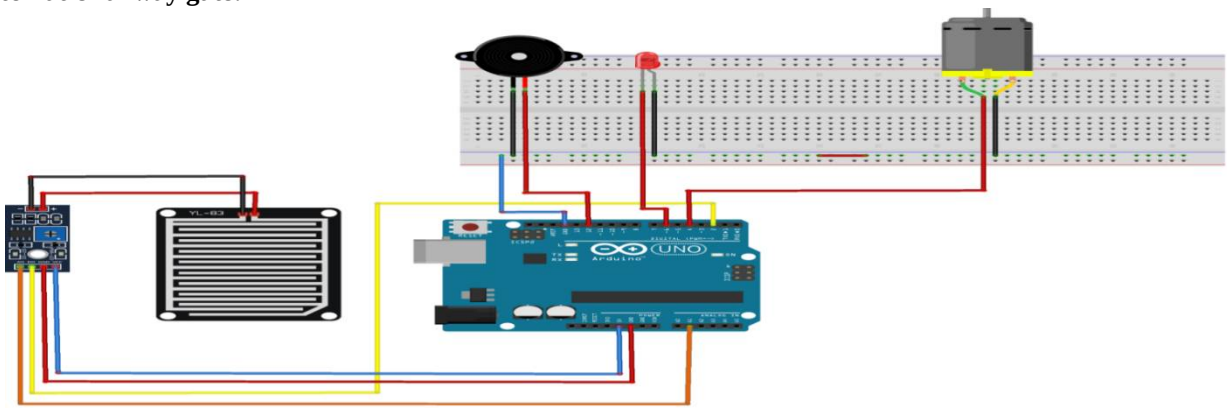


Fig 4: Flood Detector sensor circuit

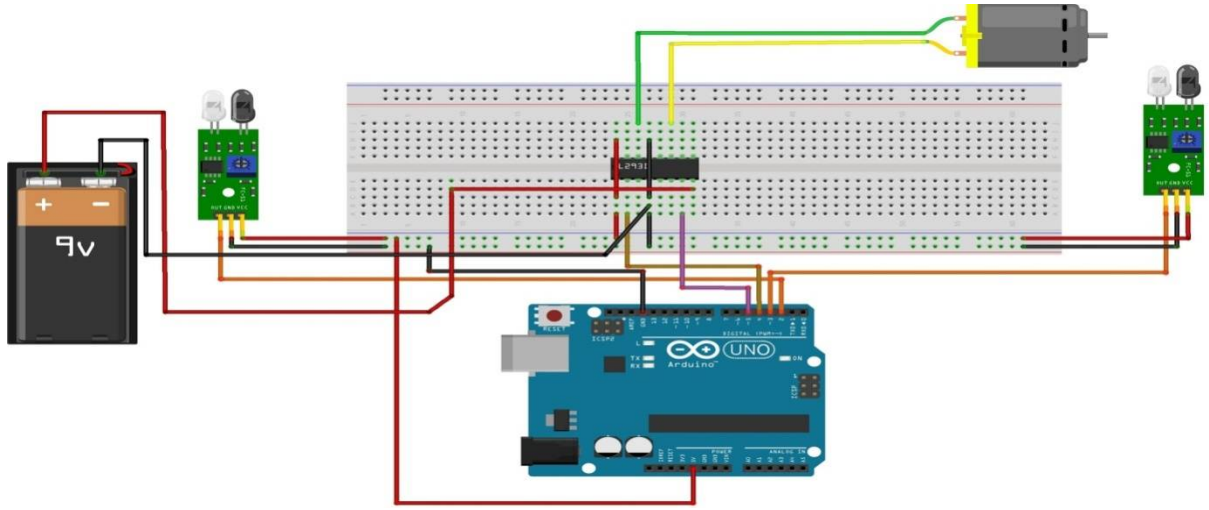


Fig 5: Automatic railway gate circuit

The arduino uno ATMEGA328 is the main controller in the proposed project. The proposed project uses infrared sensor to detect arrival and departure of the train at the railway level crossing. The IR sensor conveys the obstacle message to the nearby railway station and arduino to control the opening/closing of gates through DC motor. The IR sensor which is connected in front of a railway engine to detect the obstacle and fire sensor module connected about a distance for fire detection and convey the signal through LED and buzzer. The flood sensor module around the bridge also detect the level of the water above the safety mark of the railway and it convey the signal through the buzzer and LED and the DC motor provides the railway engine a obstacle detection.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

IV. HARDWARE SPECIFICATION

The hardware components used in the system design are:
a) Arduino uno
b) IR sensor
c) Fire sensor
d) Flood sensor
e) Buzzer
f) DC motor
g) Motor Driver (L293D)

a) Arduino Uno

Fig 6: Arduino uno

b) IR Sensor

Fig 7: IR Sensor

c) Fire sensor

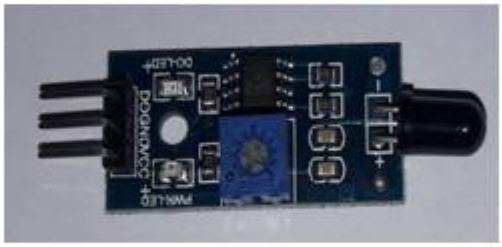


Fig 8: Fire sensor

d) Flood sensor

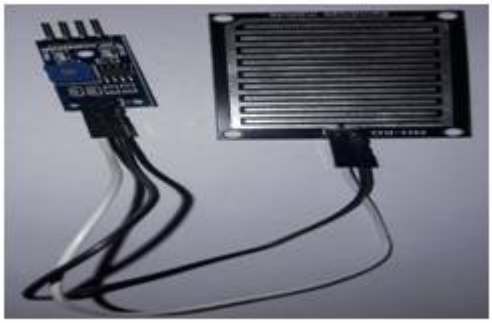


Fig 9: Flood sensor

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

e) Buzzer

Fig 10: Buzzer

f) DC motor

Fig 11: DC motor

g) Motor Driver (l293D)

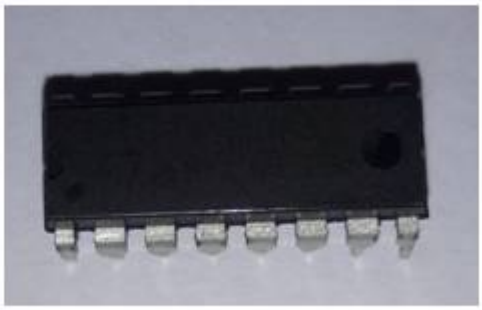


Fig 12: Motor Driver (L293D)

CIRCUIT COMPONENT DESCRIPTION

a) Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started.

b) IR Sensor

The basic concept of an IR sensor which is used as obstacle detector is to transmit an IR signal. The IR portion is divided into three region : near infrared region, mid infrared region, far infrared region.

c) Fire Sensor

The Fire sensor as the name suggests is used as a simple and compact device for protection against fire. The module makes use of IR sensor and comparator to detect fire up to a range of 1to 2 meters.

d) Flood sensor

The Flood sensor module is an easy tool for flood detection. It can be used as a switch when water drop falls through the board and also for measuring falling intensity.

e) Buzzer

A Buzzer is an audio signalling device which may be mechanical, electro-mechanical or piezo-electric.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

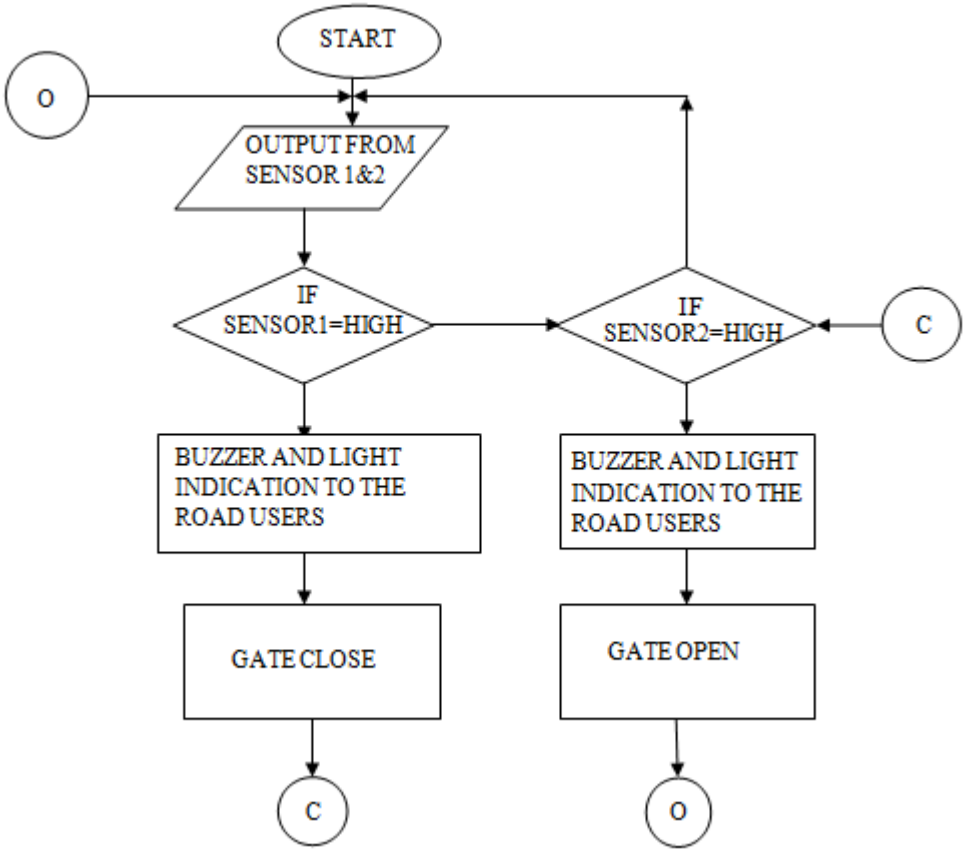
Vol. 6, Issue 12, December 2017

f) DC motor
A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

g) Motor Driver (L293D)
A Motor driver is a device or group of device that serves to govern in some predetermined manner the performance of an electric motor.

V. FLOW DIAGRAM AND OPERATION

At the beginning the IR sensor (sensor 1) sense the detection of the arriving train whether it has arrived and accordingly the output of the sensor1 goes high and then the buzzer and light will be turned on for indication and the gate will be closed by rotating the DC motor. After the sensor2 the output goes high that is the sensor2 senses the departure of the train and the gate will be opened accordingly.



Flow Chart: 1

The flood sensor attached to the bridge /appropriate places send the signal whenever the overflow occurs, Based on transmitted by flood sensor , the DC motor open or closes the gate thus train sense and stops or moves based on obstacle (gate) condition .

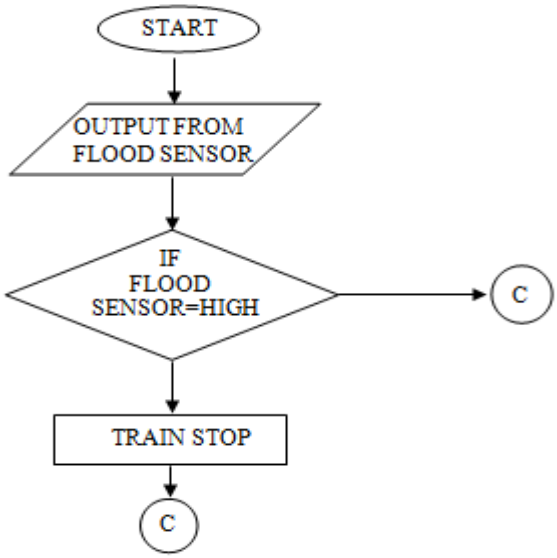
ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

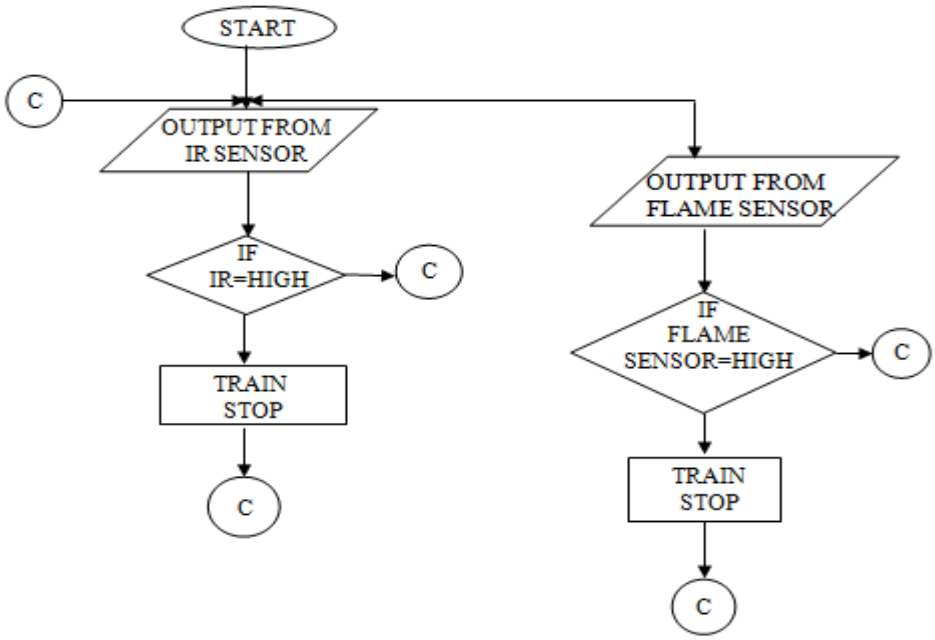
Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017



Flow chart: 2

The IR sensor place at the front of the train obstacle on the track .The output of the IR sensor goes high when the obstacle is detected. Then according to the flowchart the train will be stopped. The fire sensor placed inside the train and senses the fire. The output of the fire sensor goes high when the fire is detected .According to the flowchart train will be stopped at the nearby railway station.



Flow Chart: 3

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

Model of Proposed System

The red light and buzzer goes off when obstacle is moved away from the rail. The sensor placed at the 1km away from the rail cross which detects the departure of the train .when the train is left the gate will be opened for the road vehicle. This step will be repeated for arrival and departure of the train. The fire sensor inside the train when it identified fire it stops the train automatically and inform to the driver cabin. The flood sensor placed near the bridge when it sense that the water level above the safety mark it will closed the gate and train will stop about a safe distance. The Fig.13 small scale prototype of the model.

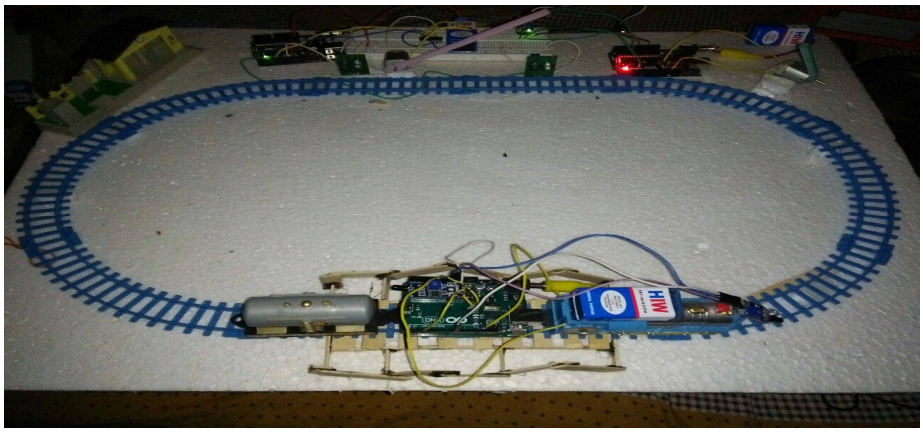


Fig.13 Proposed Model Prototype

VI.CONCLUSION

The circuit of our project was designed and setup using arduino uno, It was found to be very reliable and stable. This circuit used to control railway gate, fire detection and flood detection very preciously. This whole control system gives an idea about the railway security and also involvement of human for such kind of operation .Human makes errors, so manned crossing often fails to give the desired result to avoid accidents. In this case automatic system reduces the chance of failure and also prevent the error which can occurs in the manned railway crossing .Our project is a necessary tool for today's railway crossing due to increased a number of accidents and also due to problems occurring to the road passenger's while wailing a longer time during the passage of train unnecessarily. So by our project the level of water in the track or any fire or flame occurs inside the train or in the track can be easily detected. And thus emergency message will send to the train operator immediately and he or she might be alerted to control the train.

ACKNOWLEDGMENT

We hereby express our sincere gratitude to the Assistant prof. A.K.Kashyap, Dept. of Instrumentation and Control Engineering for providing us with the necessary arrangement for the completion of our project. Without whose valuable guidance and support the project would not have been a success. We thank her for the good will and encouragement extended to us.

REFERENCES

[1] Krishna, ShashiYadav and Nidhi, "Automatic Railway Gate Control Using Microcontroller", Oriental Journal Of Computer Science & Technology, Vol.6, No.4, December 2013.
[2] Ahmed Salih Mahdi. Al-Zuhairi,"Automatic Railway Gate and Crossing Control based Sensors &Microcontroller ", IN International Journal of Computer Trends and Technology (IJCTT) – Volume 4 Issue 7–July 2013
[3] J. Banuchandar, V. Kaliraj, P. Balasubramanian, S. Deepa, N. Thamilarasi," Automated Unmanned Railway Level Crossing System", in

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 12, December 2017

International Journal of Modern Engineering Research (IJMER)Volume.2, Issue.1, Jan-Feb 2012 pp-458-463
[4] "Chronology of major rail accidents ".The Times of India.15th may,2003
[5] H.Salmane, "A video – Analysis Based Railway-Road Safety System for Detection Hazard Situation at Level Crossings,"IEEE Transitions on Intelligent Transportation Systems, vol.16, no.2, April 2015.
[6] J.Xuer, "Visual Monitoring Based Railway Grade Crossing Surveillance System,"Congress on Iamge and Signal Processing, 2008.