# IOT BASED ACCIDENT PREVENTION AND MONITORING SYSTEM IN RAILWAYS

Sarath Chandran.P[1] ,Karthika.M[2]

Assistant Professor, Department of EEE, P.S.R Engineering College, Sivakasi,India[1]

Student, Department of EEE, P.S.R Engineering College, Sivakasi,India[2]

*Abstract*—Now-a-days, Railway is one of the most used means of transportation due to ticketing price hike in buses. For the railway system to operate with continuous monitoring and inspection of railway tracks is required. Currently railway track inspection process and monitoring system was done manually which is time consuming and not efficiently, due to the high chance of man power error occurrence. Moreover, it is not possible to inspect and monitor continuously the track by human power as they run lakhs of miles. In this system, we describe the range of sensing based sensor technologies has expanded rapidly, whereas sensor devices have become cheaper. It leads to an improved expansion in condition monitoring of systems, structures, vehicles, and machinery using sensors devices. Important Key factors in this railway track monitoring system are the now-a-days advanced technology in networking technologies such as wireless, Wi-Fi communication and mobile ad hoc networking coupled with the technology to integrate devices. It can be used for monitoring system and inspection process the railway infrastructure such as rail tracks, track beds, and track hardware equipment along with motor, scooter based vehicle health monitoring such as chassis, bogies, wheels, and wagons. Track based Condition monitoring reduces human's power inspection requirement through automated monitoring, reduces maintenance through detecting faults or error either environmental based normal based before they improves smart, safety and reliability. This is important for the development, upgrading, and expansion of railway networks.

Keywords— Railways, Track, Internet of things,Monitoring and Inspection, Sensors, Ethernet.

## I. INTRODUCTION

Travel is captivating, especially, train travel is more exciting one in travelling when comparing to others. With the increased comfort levels, low tariff in train transport and traffic in trains we are in an high important situation to improve the safety concerns and advantages in train travel. In this paper,it explores the possible approach of improving train track safety using on-board monitoring system, inspection system and dynamic track monitoring system. In History, it shows that many train accidents have occurred because of track failure the recent one being in the year 2005 where seven bogies of an express derailed over ridge and many people were lost. India with its increased advanced technological inputs is in a required situation to counter this event. Especially by imitating the previous human based errors and procedural system where track monitoring system is done thrice in a year, our advanced technology will enable the trains to work and implement without accident and safely. The Existing system had only track monitoring and no on-spot transformation of the data dynamically, but this paper proves its worth by giving solutions. These systems are less cost and high efficient worth systems and on implementation can yield excellent and amazing results. India leading in the train track monitoring distance all over the world and with it will be the best and right place to implement the system. These things are high speed control and user friendliness of this system. The system tackles the hurdlesfrom exiting system drawbacks almost all possible failure things including collisions and how to overcome them by the application of emergency brakes in the train. With the use of high end Internet of Things (IoT) system the consistency of the system is minor concern. This system comes in three challenging models one of the version gets its power from battery and another from power system. Implementation is based which the sensor is included. For traffic tracks, faster train monitoring system are enabled using separate vibratory wireless and circuits placed at suitable areas to increase the consistency of the system and evaluate the results.



Fig. 1. Railway Track

## II. LITERATURE SURVEY

In [1] Abhisekh Jain S, ArvindS ,Balaji B.S Ram ,Viyas N.P.proposed method at solving long prevailing problems in the Railway tracks. This simple method of monitoring and assessment of the condition of the railwaytracks can reduces major disasters and save precious human being lives.

In [2] G.Briundha, B.Perumal, C.Punithkumar, M.Sathyamoorthy proposed that an automatic railway gate control system at unmanned level crossing changing the gates operated by railway gate keepers and also the partial automatically operated gates. It deals with the decreased of time for which the gate is being kept closed. To implement safety to the road users by reducing the accidents, It usually occurs due to carelessness and useless of road users at a times errors made by the gatekeepers.

In [3] B.Siva Rama Krishna, D.V.S Seshendra, G.Govinda Raja, T.SudharshanandK.Srikanth proposed system that introduced Bluetooth based technology, to reduce the train accident. Two digital based IR sensors are inserted at front ends of the inspection robot which monitors the track to detect crack and gives the crack location in railway via Bluetooth to mobile phone.

## III. EXSITING SYSTEM

The existing system is condition monitoring. In this system,itmonitors, detects, and identifies fault in track structures and infrastructure before the fault causes a failure or prevents rail operations. However, this easiest and mini approach may lead to a number of fake and unwanted alarms and missed failures. It only givessimple analysis but takesdisadvantage of the superior capabilities when the sensors are networked and their data processed slowly. Integrated data processing allows images of condition to be achieved and overall condition trends to be determined.

*A. Disadvantages*
- Simplistic approach may rise to false alarms
- Does not make use of network facilities
- Manual inspection

## IV. PROPOSED SYSTEM

In this system, if any human or animals presented in track, PIR sensor intimates it. If the ultrasonic sensor distance is low, railway gate will be opened. If the temperature of the crack goes to abnormal, LED will glow. If the humidity of the crack goes to abnormal, LED will glow to indicate corrosion produced in it. The function of the IOT module being used is to send the current status of the sensor. Ultrasonic Sensor is used to find the Obstacles in front of the train and track. Here we have proposed the IOT to update the Current status of the sensor to the Base station and to update in the server room.

*A. Advantages*
- Network based approach
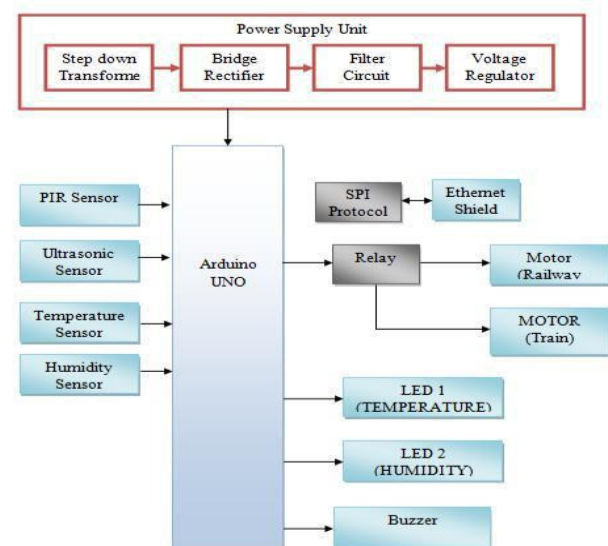- Increased frequency of monitoring

## V. BLOCK DIAGRAM



Fig. 2. Block Diagram



Fig. 3. Receiver Unit

In Fig.2 shows that block diagram of proposed system. It includes power supply unit for supplying input volatage for sensor devices, microcontroller etc to work.In Fig.3 shows receiver unit for output purpose.

## VI. MODULE DESCRIPTION

### A. POWER SUPPLY UNIT:

Power supply unit is a reference to a source of electrical power. A system that provides energy in any form to an output load is called a power supply unit or PSU. This term is commonly applied mostly to electrical energy supplies, less rarely to others and often to mechanical.Basic power supply the input power transformer has its primary winding connected to the mains (line) supply. A secondary winding, coupledin anelectro-magnetically way but it was electrically isolated from the primary is used to get an Alternating Current voltage of preferred amplitude, and after further processing by the Power Supply Unit, to drive the electronics circuit it is to supply.Rectifier circuit is used; to convert the Alternative Current input is converted to Direct Current. The bridge rectifier can be built from separate diodes or a combined bridge rectifier (2W10) can be used.A filter circuit (Capacitor) can be understood by splitting the circuit into two parts, one is the capacitor and another is the low pass filter. Each of these parts gives effects to remove the remaining AC pulses.Voltage regulator Integrated Circuits are available in both fixed and variable output voltages.
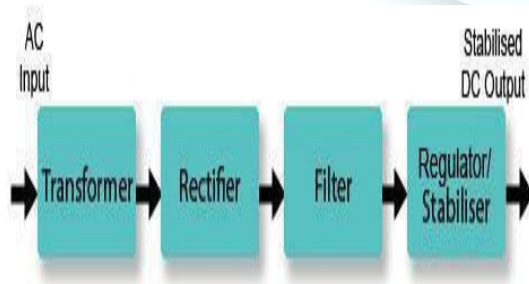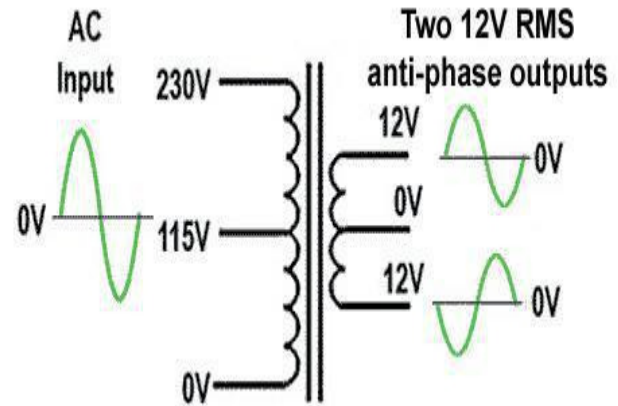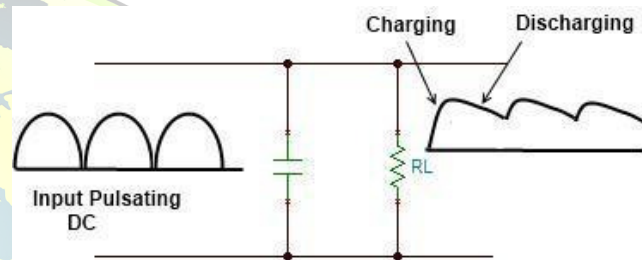


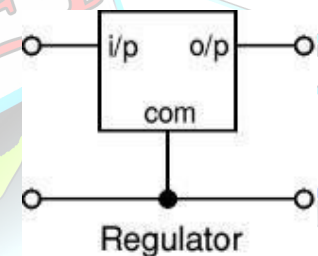Fig. 5. Step Down Transformer



Fig. 6. Filter Circuit



Fig. 7. Regulator Circuit

### B. ARDUINO UNO

An Arduino UNO is embedded system based microcontroller kit which can be used directly by purchasing from the server using the hardware components. The Arduino Uno is anembedded system based micro controller board based on the ATmega328. It has 20 pins. From this, 14 digital input/output pins and 6 analog inputs. It involves everything needed to support the micro controller kit; simply connect it to a PC with a Universal Serial Bus cable or power it with a Alternative



Fig. 4. Power Supply Unit

Current-to-Direct Current adapter or battery to get begun.
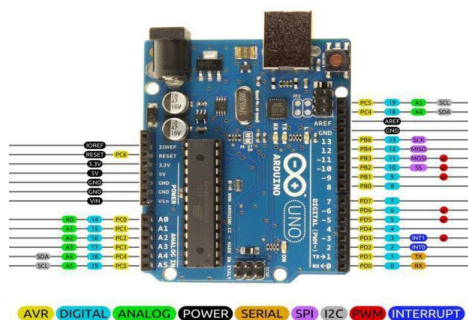


Fig. 8. ArduinoUNO

## C. TEMPERATURE SENSOR (LM 35)

Temperature is the measured process variable in industrial automation basis. LM35 is used to convert temperature value to an electrical value. Temperature Sensors are the device to read temperatures and to control temperature in industrials automation applications.
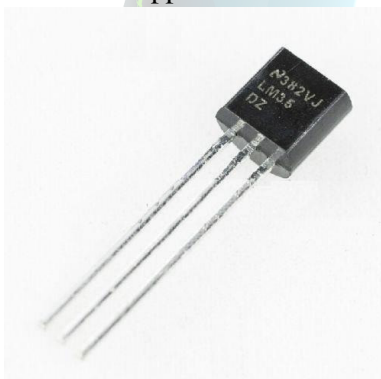


Fig. 9. Temperature Sensor

## D. HUMIDITY SENSOR

A humidity sensor is a device that is used to measure the humidity of in anenvironmental area. A humidity sensor can be used and implemented in both indoors and outdoors environment. They are available in both analog and digital signals.

This Humidity sensor module converts relative humidity into voltage and can be used in weather monitoring application or home applications.

distance accuracy can reach up to 3mm. The modules include ultrasonic transmitters, receivers and control circuit.
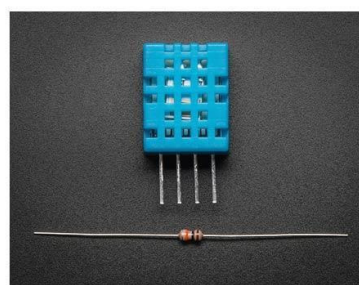


Fig. 10. Humidity Sensor



Fig. 11. Ultrasonic Sensor

## E. ULTRASONIC SENSOR

The HC-SR04 ultrasonic sensor includes sonar to determine distance to an object between sensor and objects. Its operation is not damaged by sunlight or black products like.
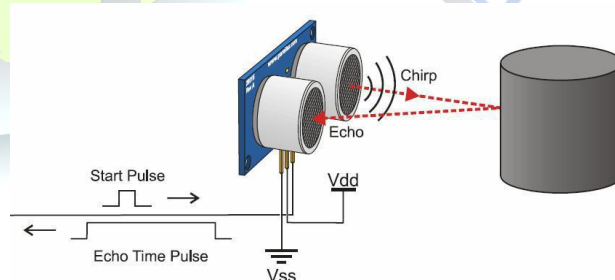


Fig. 12. Working Principle

## F. RELAY:

The Relay can be used to control a circuit. It is used in places where signal can be used to control a lot of circuits like motors, fan and 230v Bulb.The applications of channel relays require high power to be driven by electric motors and so on. Such relays are called contactors.Relays are simple switches

which are worked. Switch based Relays consist of an electromagnet and also a set of contacts. The switching mechanism is continued with the help of the electromagnet. But they differ according to their applications.



Fig. 13. Relay

### G. MOTOR

A DC motor is any of a class of electrical and electronic machines that converts DC electrical power into mechanical power. The most common types relay on the forces produced by magnetic fields.



Fig. 14. DC Motor

communication, primarily in hardware based embedded systems.

### J. ETHERNET SHIELD

The Arduino Ethernet Shield R3 assembled an Arduinouno board to connect to the internet connection. The Wiz net W5100 provides aninternet network (IP) stack capable of both Transmission Control Protocol and User Datagram Protocol. It supports up to four socket connections. Use the Ethernet libraryarduino function to write sketches which connect to the internet using the shield.
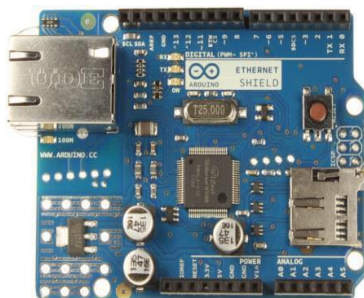


Fig. 17. Ethernet Shield



Fig. 15. Gear Motor

### H. BUZZER

means to create the sound; everything from metal clappers to electromechanical devices.

A buzzer is an audio signaling device for alert system. A buzzer takes some arrangement of input and emits a sound in. They may use various



Fig. 16. Buzzer

### K. PIR SENSOR

A Passive Infrared sensor is a sensing input device that measures digital type infrared (IR) light radiating from objects in its field view. Passive Infra-Red sensors are used in the construction of Passive Infra-Red based motion detectors and animal or human detection.
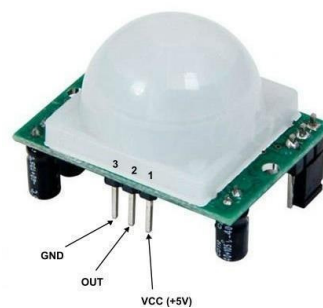


Fig.17.PIR Sensor

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## I. SERIAL PERIPHERAL INTERFACE

The Serial Peripheral Interface communication bus is a synchronous interface specification used for tiny distance

## L. LIGHT EMITTED DIODE

LEDs are the used semiconductor diodes available today. LEDs emit either visible light or invisible infrared light when forward biased. The LEDs which emit invisible IR light are used for controlling TV channel.

Light Emitted Diode is an optical semiconductor device that converts electrical energy into light energy.
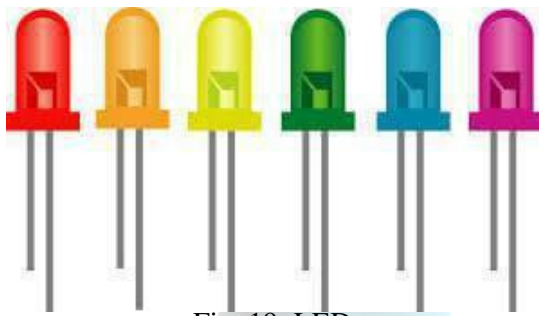


Fig. 19. LED

## VII. RESULTS AND DISCUSSION

In fig 20, it shows that simulation circuit for our proposed system. We believe that the right blend of data and advancements can give a proper answer for the train following framework to clear and improve the effectiveness The arrangement we propose includes anmix ofportable sensors, microcontroller, Ethernet Shield and IoT .
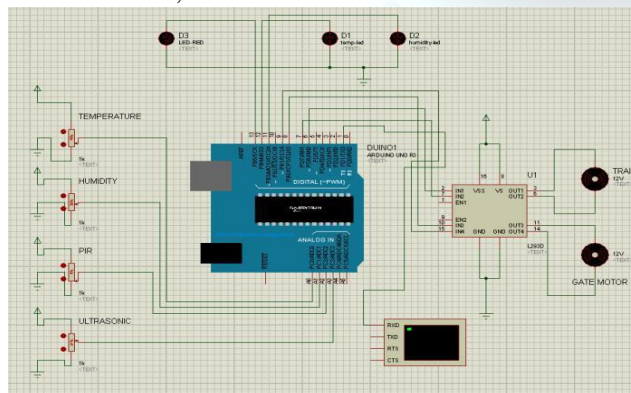


Fig. 20. Railway Track Monitoring Circuit

## VIII. CONCLUSION

Innovation is needed on account application of advanced technology. This is one such proposed method to use the wireless technology for providing safetyto the people in railway track. Due to its dynamic nature the solutionwhen applied will continue to yield good results in a right way for new approach in the field of railway transport safetyand importantly satisfied customers.This work is dedicated to all the people who havelost their life in various train accidents in worldwide.

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