



# WIRELESS RED SIGNAL ALERTING FOR TRAINS AND LOCO PILOT HEALTH MONITORING SYSTEM

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**Abstract:** Railway networks are the biggest transportation networks used worldwide. Handling and managing such a vast network are not an easy task. The rail network consists of a lot of junctions and vast number of signals on set distances to manage the train flow. Well the train driver needs to constantly check for any red signals on every post and decide whether to stop or move forward. It is very difficult to constantly keep track of every visual signal for the driver. The main aim of the project is an automatic alerting system that alerts the driver of any red signal ahead. Whenever a signal turns red, it sets ON an RF transmitter fitted in it. The transmitter constantly transmits rf signals informing about a red signal. Now every train needs a receiver circuit on it.

The receiver circuit when comes within certain range of the rf transmitter, it receives the input and sends it to the microcontroller. The microcontroller then processes this data in order to alert the driver about the signal ahead and if the driver is not responding we can slow down the motor and also monitor loco pilot health like heart Rate, Temperature and SpO2 using max 32102 sensor and data send to thing Speak server.

*Index Terms*— Internet of Things (IoT), Arduino Uno, Sensors.



## 1. INTRODUCTION

Human negligence and human error have become the primary reason for many train accident in India. The primary goal of this project is to avoid train accident and train collision using wireless communication. Our system is useful for train driver. To maintain the train flow, massive amounts of signals are required at pre-set distances. Traditionally, a train driver has to keep a constant lookout for any red signals that might appear on the post. The train driver then decides whether to stop or to continue with his designated path on the basis of these signals. But it's quite troublesome for the drivers to keep an eye out for every visual sign. To make life for train drivers and the maintenance staff as well easier, engineers have come up with an ingenious technology named as wireless red signal alerting for trains. The propose an automatic alerting system that alerts the driver of any red signal ahead. Full assembling works on the basis of RF technology.

. A timer circuit is used in the transmitter circuit and this transmitter circuit is placed at a signal pole. Transmitter circuit to produced RF beam between the pulses for a particular time interval. Then switch is turned ON only when the RED signal is ON. These RF beam cycles are repeated until the RED signal is ON. The transmitter linearly transmits RF signals informing about RED signal. An RF receiver circuit is placed in the train.

This is placed in such a way that it receives RF beam. Then the train whenever comes between the certain range area of the RF transmitter, RF receiver circuit receives the RF signal as input and sends it to the microcontroller.

The microcontroller then processes this receiving data for alert the driver about the signal ahead of train. And also monitor loco pilot health monitoring like heart Rate, temperature and spo2 using max 32102 sensor and data send to thing speak server.

### 1.1 PROBLEM IDENTIFICATION

We have seen that many train accidents are caused by red signal crossing red signal. Crossing of red signal in the railway track causes various severe trains accidents due to the train driver negligence and driver health issues. in order to overcome this issue, the wireless red signal alerting for trains and loco pilot health monitoring system by using IOT technology for solving the discussed issue.

## 2. LITERATUR SURVEY

The author proposed a Human incompetence and human error have been the prime cause behind multiple train crashes in India. The main aim of this project is to prevent train crash and train collision using wireless communication. Our device is useful for train driver. To maintain the train

traffic, large quantities of signals are needed at pre-set distances. Traditionally, a train driver needs to hold a continuous watch for any red signals that may show on the post. The train

driver then determines whether to halt or to proceed on his designated route on the basis of these signals. But it's very troublesome for the drivers to have an eye out for any visual symbol. To make life for train drivers and the repair workers as well simpler, engineers have come up with an ingenious technology called as wireless red signal alerting for trains. At this time train would be progressively sluggish they still allow for a strong control device [1].

The authors introduced an accident at unmanned level crossings and collision of trains running on same track are the major accidents in railways which cause heavy human causality and damage to train. Hence it is proposed to develop a fail proof system to avoid such accidents. In this project, it is proposed to develop automatic railway gate operation to prevent accidents at unmanned gate and automatic closure of unmanned gate. It is also developed to prevent collision of trains running on same track.

Automatic closure of unmanned gate reduces the time for which the gate is being kept closed and provides safety to the road users by reducing the accidents. The collision of trains running on same track is also prevented by employing IR Transmitter-Receiver system at each sections of the station and passes the information to a master control room via Zigbee / GSM MODEM. The operation is automatic and error due to manual operation is prevented and safety is assured.

To ensure the railway safety and improve the passing efficiency in railway crossing, we design a new railway crossing warning system based on GPS and GPRS. The high-precision positioning of GPS and efficient transmission rate of GPRS, combining with computer control technology are used in this system, which provides a safeguard for railway system.

## 3. EXISTING METHOD

The current method is one that is regulated manually and by humans. Once the train has departed from the station, the station master will call the gatekeeper to let them know that the train will be arriving shortly. When the gatekeeper has received all of the necessary information, he will then close the gate in accordance with the estimated arrival time of the train. Therefore, in the event that the train is running behind schedule as a result of a certain set of circumstances, the gate will remain closed, which will result in increased traffic around the gates.



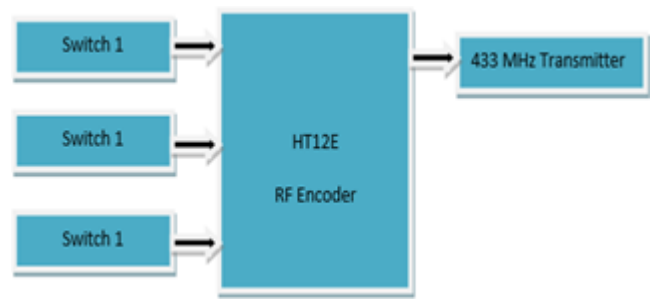
## 4. PROPOSED METHOD

### OPERATION:

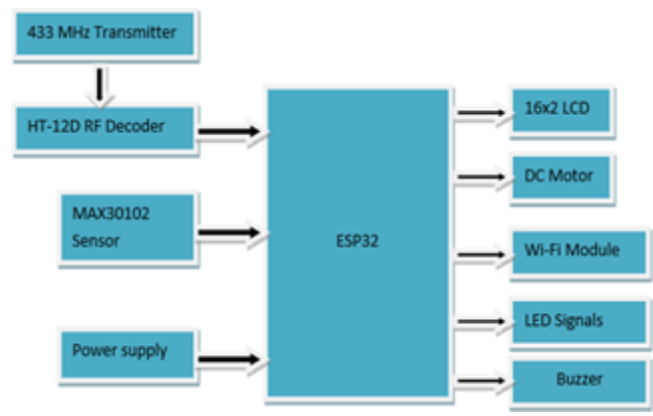
Here we propose an automatic alerting system that alerts the driver of any red signal ahead. Our system works on the basis of Rf technology. Whenever a signal turns red, it sets on an rf transmitter fitted in it. The transmitter constantly transmits rf signals informing about a red signal. Now every train needs a receiver circuit on it. The receiver circuit when comes within certain range of the rf transmitter, it receives the input and sends it to the microcontroller.

### BLOCK DIAGRAM:

#### Transmitter:



#### Receiver:



The microcontroller then processes this data in order to alert the driver about the signal ahead and also monitor loco pilot health monitoring like heart Rate, Temperature and SpO2 using max 32102 sensor and data send to thing Speak server.

In this project, a simple demonstration of RF Communication with the help of Arduino UNO boards is given. The aim of the project is to successfully transmit data between the RF Transmitter – Receiver modules using two Arduino UNO microcontroller boards. The working of the project is explained here.

**Note:** The project can be implemented with or without the help of a special library called “VirtualWire.h”. The project implemented here uses the library. If we want to implement the project without the library, then we need to change the receiver part of the circuit.

VirtualWire.h is a special library for Arduino created by Mike McCauley. It is a communication library that allows two Arduino’s to communicate with each other using RF Module i.e. transmitter – receiver pair. This library consists of several functions that are used for configuring the modules, transmission of data by the transmitter module and data reception by the receiver module.

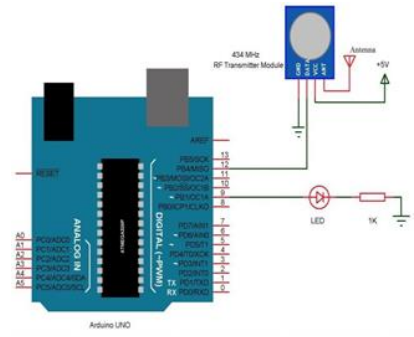
In this project, the transmitter simply sends two characters i.e. it sends the character “1” and with a delay of few seconds, it sends the character “0”. Whenever the “1” is sent, the LED on the transmitting side of the project will be turned ON. As this “1” is transmitted via RF communication, the receiver will receive the data “1”.

When the receiver receives “1”, the Arduino on the receiver side of the project will turn ON the LED on its side.

Similarly, when the data “0” is transmitted by the RF transmitter, the LED on the transmitter side is turned OFF. As a result, the receiver now receives “0” and the LED on the receiver side is also turned OFF.

Hence, the receiver is imitating the actions of the transmitter.

### CIRCUIT DIAGRAM:





## HARDWARE REQUIREMENTS:

- RF module
- ON/OFF switches
- RF Module
- 9V battery
- ESP32
- 16x2 LCD
- DC motor
- Buzzer
- LED lights

## SOFTWARE REQUIREMENTS:

- Arduino IDE
- Embedded C

## SENSORS:

A sensor is a tool that collects physical input from its surroundings and transforms it into information that can be used by either a machine or a human to understand. Most sensors (which transform the data into electronic data) are electronic, but others are simpler, such a glass thermometer that displays visual data. Sensors are used by people to measure temperature, determine distance, measure Heartbeat, control pressure, and a variety of other things. Electronic sensors come in two types: analog and digital. Physical data is converted into an analogue signal using analogue sensors. Compared to digital sensors, which are restricted to a small range of potential values, analoguesensors are far more accurate.

## ARDUINO UNO:

One of Arduino's standard boards is the UNO. The Italian word UNO here is for "one." To identify the initial release of the Arduino Software, it was given the moniker UNO. It was also the first USB board that Arduino has ever released. It is regarded as a strong board that is employed in many projects. The ATmega328P microprocessor is the foundation of the Arduino UNO. Compared to other boards, such the Arduino Mega board, etc., it is simple to use. The board is made up of shields, various circuits, and digital and analogue Input/Output (I/O) pins. The Arduino UNO has 14 digital pins, a USB port, a power jack, and an ICSP (In-Circuit Serial Programming) header in addition

to 6 analogue pin inputs.

## 5. RESULT

This results in a system that is completely semiautomatic. When compared to manually controlled gates, the amount of time that is required for the automatic railway gate control at the level crossing is significantly shorter, and it also minimizes the amount of labour that is performed by humans. It is possible to install this kind of gate at an unmanned level crossing, which is a form of crossing where the risk of accidents is higher and where the operation needs to be trustworthy. Because the process is automated, there is no chance of making a mistake due to human intervention. And the operation of the railway system can be centralized, which would help to reduce the number of accidents.

## 6. CONCLUSION

The implementation of wireless red signal warnings for trains. This revolutionary technique is intended to prevent train accidents. In Indian railways, train accidents have occurred due to poor timetable management, therefore, we propose an automatic train stop. This technology enhances and greatly increases the safety of rail transit. We believe that the railway industry and the regulator must work together to achieve this common objective. Level Crossing protection systems are designed using microcontrollers to provide extra safety shields at both manned and unmanned level crossings by an audible and visible signal to road users. Additionally, it saves a great deal of time because it is automated, whereas manual systems require the lineman to inform the station master to close and open the gate, which consumes a great deal of time. Also, since it is fully automated, there are fewer opportunities for error. Therefore, this design is very applicable to railway application. This technology improves the transportation through the railway system and makes it much safer with health situation of loco pilot is also considered. We believe that success depends on both the railway industry and the regulator working together to achieve that common goal.

## 7. FUTURE SCOPE

The future scope for a wireless red signal alerting for trains and loco pilot health monitoring system is vast and promising. The integration of this project with Artificial Intelligence/Machine Learning can enhance their capabilities. Additionally, this project may be connected to GSM technology to deliver SMS alerts about health conditions of the loco pilot to registered cell phone number.



## ACKNOWLEDGEMENT

We take this opportunity as a privilege to thank all individuals without whose support and guidance we could not have completed our project in this stipulated period.

We express our deep sense of gratitude to our guide Mrs. S. S. Vidya Balantrapu for her valued suggestions and inputs during the project work, readiness for consultation at all times, his educative comments and inputs, his concern and assistance even with practical things have been extremely helpful.

We highly indebted to our Head of the Department Mr. V. Satyanarayana for his motivational guidance and the vision in providing the necessary resources and timely inputs.

We are also thankful to Dr. M. Sreenivasa Reddy, Principal, Aditya Engineering College for providing appropriate environment required for this project and thankful to Faculty of Electronics and Communication Engineering Department for the encouragement and cooperation for this successful completion of the project.

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