SMART RAIL-GATE SAFETY ALERT SYSTEM

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***Abstract*- According to NCRB statistics on railroad accidents, 32 persons perished every day on average. Unmanned railroad level crossings are to blame for 66% of these incidents. Trespassing and gate guards' tardiness in closing crossing gates are two of the leading problems. This study provides an overview of the ways in which such fatalities are prevented by our operational paradigm.Two gadgets make up our operating model, one of which is located at the station master and the other at the gatekeeper. The Internet of Things (IoT) can be used to accomplish this by creating connectivity between two devices, and ongoing monitoring of the date and time will help to determine when and who is accountable when the error has occurred. This prototype offers optimal security andlevel crossing accident prevention.**

Keywords: **Thingspeak, Arduino, ESP8266, Level Crossing, IOT.**

I. INTRODUCTION

Whenever a train is coming, there are barriers that lower to totally or partially obstruct the route. Freight trains have variable schedules; they don't run on a regular basis. For the purpose of allowing road traffic to cross railroad tracks, level crossings are provided. The crossing is referred to as a level crossing since the railroad track and the road traffic both travel at the same level. The schedule of passenger trains is a more predictable schedule. Even when the driver slams on the brakes, a loaded train can take more than a kilometer and a half to come to a stop. The likelihood of you surviving a crash is low because trains can't swerve to avoid you, and airbags won't be able to save you if you collide with one. To prevent these types of damages, many researchers came up with their ideas, like automatic movable level crossing gates, which use various types of sensors, motors, and other components. Since they entirely lack human labor and there is a large potential for risk, Some models consume more power, while others require expensive maintenance, etc.We developed a novel technique to get around these disadvantages. This study provides a broad overview of how our operational paradigm prevents such fatalities. The two gadgets that make up our operating system—one at the station master and the other at the gatekeeper—are what allow communication between them. The gatekeeper receives a signal from the master whenever a train leaves the station. This technique serves to notify the gatekeeper that there is a signal from the station master by getting an alert message and buzzer, which will be useful if the gatekeeper is unconscious. Since lives are at stake, we must ensure maximum safety, which is only feasible through the use of labor. We all know that putting more people ona software project makes it take longer.

1.2 Main contribution of this work

- Our project's goal is to increase rail management safety and lessen the likelihood of mishaps close to level crossing gates.
- It is an innovative model for the proactive management and new design of level crossing infrastructure.

II. LITERATURESURVEY

Many literature survey articles that are used as references are described in this section. The methodology in [1] describes about the technology which performs the control of railway gate system using Infrared Sensors (IR) which identifies the appearance of train at the crossing. radio frequency indication device (RFID) which consist of transmitter and collector these are set at the door of two sides. RFID is mainly used to close the gate. Liquid Crystal Display (LCD) displays data for the people of status of railway gate.

Advantage: RFID is a secure device which reduces the accidents at the railway level crossing gate. It is reduces the accidents compared to manual operation. *Disadvantage:* cost of RFID is high and it requires more tags to maintain the batteries, limited storage.

The methodology in [2] describes about the technology which performs the automation of gate operation at the gatekeeper and helps in detection of railway track cracks across the train travelling on the track. By using Infrared (IR)sensors, Internet of Things (IOT), Stepper motor. In Automatic gate control the stepper motor is mainly used to control the gate and it will be done using Stepper control. IR sensors will sense the track before the arrival of the train on to the track. In detection of railway track the IR transmitter, reciever and GPS module are used. Before the railway track scan both IR transmitter and reciever gets activated. GPS module shows the correct geographic coordinates. When light gets fall on IR transmitter by reciever crack is said to be found and otherwise crack is not found. GPS records the latitudeand longtitude data which is stored in IOT.
Advantage: Crack detection system which was managed by Internet of Things and helps to find the exact location i.e where the crack gets occur on the railway track and it aslo helps in saving of human lives.
Disadvantage: IR waves are very harmful to human eyes, IR sensors can also be influenced by hard particles,and cost of Stepper motor is high.

The methodology in [3] describes about the automatic rail gate at level crossings operation which managed by the Sensors. Sensors are used to detect the arrival of the train on to the track at level crossing gate. stepper motor is also used to control the gate. i.e used to open or close automatically based on clock- wise and anti clock-wise direction. IR sensors areused to track the transmitting and receiving signals.

Advantage: It helps in reduction of time and saving of lives of a human beings.8051 microcontroller is mainly is used to avoid railway accidents.

Disadvantage: The results of using sensors are not accurate and a disturbance in signals causes severe damage.

The methodology in [4] describes about the technology which performs the automatic railway gate
i.e open and close automatically by using Ultrasonic Sensors. 4 ultrasonic are used 2 are at one side and other at another side.The sensors detect the train arrival once the two sensors detected it for more than 10 seconds placed in 50m distance. The input sends to Ardunio and ESP-32 and send the signals to server motor ,which operates in forward and reverse based on input .On other side ESP-32 captures the train obstacle and sends it to train driver.
So that driver operates according to obstacle. *Advantage:* Control of accidents at railway gate level crossing by capturing the obstacle of the train and reduction of manual error
Disadvantage: use of ultrasonic sensors causes inaccurate results and applicable to limited testing distance, and cost of server motor is high.

The methodology in [5] describes about the technology which performs detection of status of the railway gate is whether closed or opened using Ardunio UNO, Ultrasonic Sensor ,WIFI module, alarm
,switch. When the gate is open the circuit is also at open and default gate is said to be open. whenever the gate is closed,ultrasonic sensor monitors the area alarm gets buzzed at that time and Ardunio UNO records it and using WIFI module it uploades the dataon IOT cloud.
Advantage: It helps in control of traffic jams at the railway gate and control of railway accidents.
Disadvantage: Usage of WIFI module gives in accurate results ,which are harmful to the people.

COMPONENTS	FABRICATION OF SMART RAILWAY CROSSING	AUTOMATIC GATE CROSSING AND IOT BASED TRAIN TRACK CRACK DETECTION SYSTEM USING IR SENSORS	AUTOMATED UNMANNED RAILWAY LEVEL CROSSING SYSTEM	SMART RAILWAY GATE OBSTACLE DETECTION AND WARNING SYSTEM	RAILWAY GATE SYSTEM: RAILWAY GATE STATUS DETECTION	SMART RAIL-GATE SAFETY ALERT SYSTEM
COST	More	More	Less	More	Less	Less
DATA STORAGE	Yes	Yes	No	Yes	No	Yes
EFFICIENCY	High	Moderate	Low	Moderate	Low	High
RELIABILITY	High	Low	Moderate	Low	Moderate	High

III. PROPOSEDMETHODOLOGY

There are many models which are developed for controlling the railway gates. But most of the them are not efficient. Their models didn't provide the facility to store the details of the train. This is the main advantage in our system. The suggested system makes use of cloud technology, which enables users to access and save data using devices that are linked to the internet. Here, the ThinkSpeak platform was utilized. You may collect, display, and analyze real-time data streams on the cloud with this free software. The train number, date, and time will be immediately updated in the cloud after the station master enters the train number and presses the submit button.There are two devices in the suggested system. A power supply must be supplied to this system. The gatekeeper uses one device, while the station master uses the other. Using the keypad that is present in the first device, the station master enters the train number. The gate guard is then informed of the train's arrival by a message he sends. In the second gadget, a buzzer is used to notify the gate attendant. The level crossing gate is shut by the gateman, who also sends the station master an acknowledgement. The first device has a buzzer so that the station master can hear the gatekeeper acknowledge his buzz. For later use, the cloud has all of this data recorded. When compared to other systems on the market, our suggested solution is incredibly straightforward and affordable. Our system makes the communication fast as it uses the internet. *Fig 1* shows the basic architecture of our proposed system.

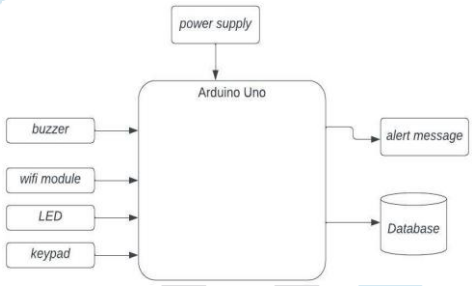

Fig 1. Architecture

IV. ALGORITHM

Device 1**:**
Step 1: Provide power supply to the device Step 2: Enter the train number using the keypad
Step 3: Because of the wifi module's assistance in establishing communication with it, the buzzer will be audible in the second device.
Step 4: The data will be automatically updated in the cloud.
Device 2:
Step 1: Receives the buzzer.
Step 2: close the level crossing gate.
Step 3: Send an acknowledgment back to the stationmaster after closing the gate.
Step 4:Additionally, the acknowledgement informationwill be kept in the cloud for later use.

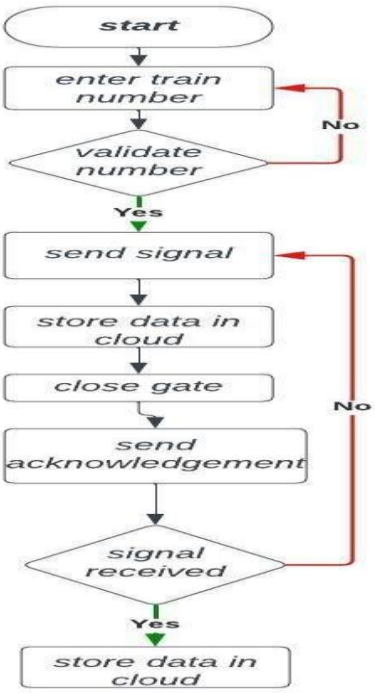

Fig 2. Flow chart

V RESULT ANALYSIS

The gate guard is informed of the train's arrival using the proposed system. The train number that will be passing through that gate is sent by the station master. A keypad is positioned on the sender side of the proposed system. Using this, the master pushes a button after providing the train number.A wifi module is used at each end. The transmitter and receiver of our system communicate using the internet. A global platform for communication is the internet. Its use is growing every day. When the master presses the push button, an alarm will sound in the receiver's side kit. The distance and internet speed affect how long it takes to sound an alert.The distance between a station and a gate often ranges between 2 and 3 kilometers. The buzzer announces the arrival of the train. So the level-crossing gate is shut by the gatekeeper. After that, he replies with an acknowledgement to the station manager. Additionally, the receiver kit has a buzzer. This serves as the gatekeeper's message. The cloud stores all of the information related to the train number, time, and date that messages are sent. The primary benefit of our suggested system is this. This was created in accordance with the client's specifications. There is no way to store data for cross-verification in any of the current implementations.

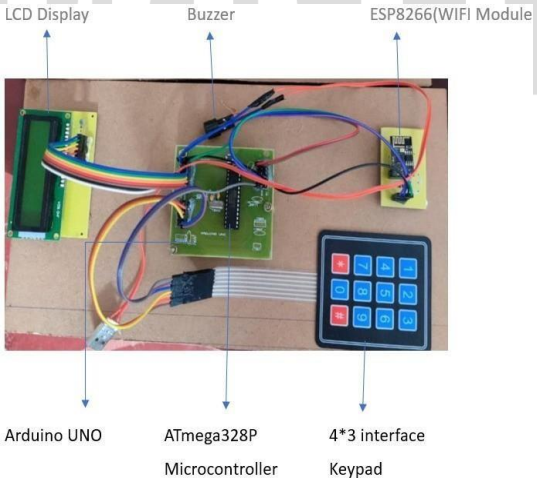

Fig 3. Sender side setup

Fig 3 shows the prototype, which is a connection protocol, for a smart railway gate safety alert system. The LCD display, keypad, WiFi module (ESP8266), ATMega 328 U MicroController, jumper wires, and buzzer make up the prototype.

LCD Display: To show a train's status
Keypad: The keypad is used to input the train number.
The ESP8266 WiFi module is a small, affordable, and low-power component that enables integrating WiFi connectivity into electronic designs. It is a microcontroller with built-in WiFi capabilities, allowing it to connect to a network and send and receive data over the internet without the need for a separate WiFi module.
Microcontroller AT Mega 328 U: A straightforward, inexpensive microcontroller is necessary for many projects and autonomous systems; the ATmega328 is commonly used in this regard. On the well-liked Arduino development platform, especially.

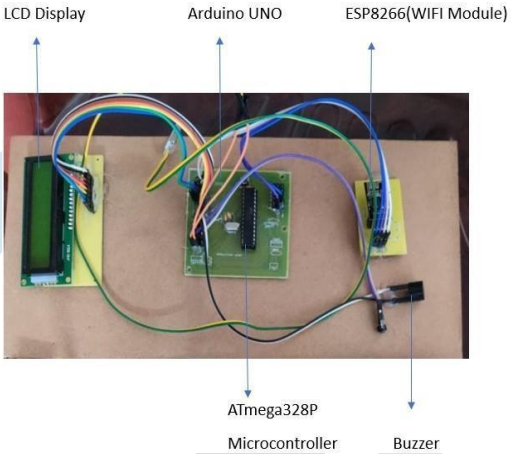

Fig 4. Receiver side setup

Fig 4 shows the prototype, which is a connection protocol, is for a smart railway gate safety alert system.The prototype is made out of an LCD display, an ESP8266 WiFi module, an AT Mega 328U microcontroller, jumper wires, and a buzzerA mechanical, electromechanical, or piezoelectric audio signaling device called a buzzer, also referred to as a beeper (piezo for short).
.LCD Screen: To display a train's status WifiModule(ESP8266): This WiFi module is a small, inexpensive, and low-power gadget that makes it simple to include WiFi connectivity into electronic applications. This microcontroller has built-in WiFi capabilities, so it can connect to a network and send and receive data over the internet without the use of an additional WiFi module.

Fig 5. Status of train

Fig 5 shows the details of trains, a transmitter of a connection protocol that is used to broadcast the train number to the receiver and receive the status—a return acknowledgement—from the receiver(line man).The information about the train number, date, day we sent the information, and time we sent is stored in a graph.The data is kept in the ThingSpeak Cloud.In a ThingSpeak Cloud, the information can be utilized to refer to anything at any moment.The amount of entries can be determined using the ThingSpeak cloud.

Fig 6. Status of acknowledgement

Fig 6 shows the details of acknowledgement from the gate guard. A device used to receive information froma transmitter and broadcast a return acknowledgement to the transmitter.The train number, date, day we sent the acknowledgement information, and time we sent are allstored in the graph.The data is kept in the ThingSpeak Cloud.

V. CONCLUSIONAND FUTUREWORK

Our model improves communication between the lineman and gateman , resulting in fewer accidents and increased safety for those using level crossings. The data is also updated in the cloud for proof checking. The scope is limited between two consecutive stations.(Later Extended)

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