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Automatic Railway Gate Controlling and Accident Avoidance System

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ABSTRACT: This work aims to provide an automatic rail crossing at the level crossing that supports and cancels the cancellation of the train and checking for any obstacles if it blocks the level crossing, generating a corresponding alarm signal and controlling the crossing. , to reduce the railroad. Accidents occurred at level crossings (Intersection points).The solution is provided by developing a module using the NodeMCU Microcontroller that helps to automatically open and close the train door by detecting the arrival or departure of the train and notifying the vehicles that the train is arriving by means of LED light so that this system make use of servo motors. They are used toopen and close railroad gates. The two infrared sensors (IR sensors) are used to detect the arrival and departure of the train and it also includes twoother IR sensors that are used to detect the obstacle stuck at the level crossing. This system is implemented using IoT technology.

KEYWORDS: Automatic Railway Gate, IR sensor, Servo motor, Level Crossing, Detect obstacle, NodeMCU, Microcontroller

I. INTRODUCTION

Railways are the most prominent means of transport in the entire country, reaching all corners of the country. Accidents have been a major headache for the Indian railway. Accidents that have been occurring at the railroad crossing are marginally increasing at a higher rate. This is mainly due to carelessness in manual operations or lack of workers at the level crossing. Therefore, it is essential to maintain and improve the current level of security. Rail safety is a crucial aspect of rail operation around the world. The place where the railroad track and the road / highway intersect at the same level is known as a "level crossing". In the 6 years between 2oo9-1o and 2o14-15, there were a total of 8o3 accidents on the Indian railways that killed 62o people and injured 1,855 people. 47% of these accidents were due to train derailments and level crossing accidents.
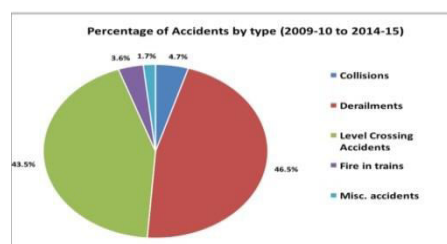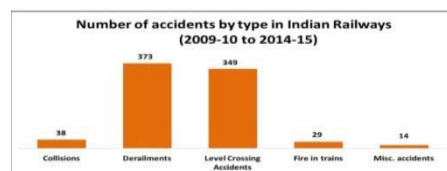
A railroad gate automatic control system is an arrangement of physical components that detect the arrival of the train and cause the gate to go up and down automatically. When a train approaches the rail crossing from either side, sensors placed at a certain distance from the door detect the approaching train and consequently monitor the operation of the door. To avoid accidents, sensors placed at a certain distance from the door detect the departure of the train. The output signal is sent to the microcontroller, which in turn runs the motor and opens the door. Thus, the door closing time is shorter compared to manually operated doors and any obstacles in the way are identified by an infrared sensor.

II. LITERATURE SURVEY

In the existing system, the doorman receives a call from the nearby train station at the time of the train's departure. Then the doorman closes the door at the railroad crossing. But in some situations, the door is closed even if the train is late. Previously, this prototype has been tested by various methodologies that had several limitations, which have been overcome.

C.R.Balamurugan, P.Vijayshankarganth, R.Alagarraja, V.E.Subramanian, R.Ragupathy proposed "Automatic railway gate control system with 8o51micro Controller" [1]. In this document, the use of 2 IR sensors toopen and close the railway gate with the help of the DC motor and the buzzer sounds immediately on the activation of the front side receiver, but there is noobstacle detection system if the object or vehicle is stuck at the level crossing.

Vishwanatha CR, Vidyashree PV Sujit Kumar. proposed, "Intelligent railway gate system using the Internet of things" [2]. The author provides some solutions to accidents and delays in the arrival of the train, a door is placed to control the movement of vehicles that require human effort and coordination. The doors are operated manually, an error that may result in opening and closing the door and technique is suggested here.

Saifuddin Mahmud et.al proposed an "Automated railway gate control system" [3]. In this system when the obstacle or vehicle is stuck in the level crossing, there is no space to move that vehicle that is stuck in the level crossing. And using an ultrasonic sensor is not an efficient way to detect an obstacle on the track, as it can detect smaller objects crossing the railroad track at that time.

Ms J. PraiselineKarunya M.E et.al implemented "Automated control of railway gates and object detection by wireless communication" [4]. When anobstacle is detected, there is no alternative if the sensor does not work and they make use of an additional radio frequency module to identify the oncoming train.

III. PROPOSED SYSTEM

In this system, infrared sensors are placed close to the railway line on both sides of the level crossing. These sensors that are placed at a distance from the level crossing detect the train coming from any direction to the level crossing. Then the train information is transferred to the microcontroller, that is; NodeMCU and the microcontroller switches on the red signal generate an alarm and lower the door immediately. Sensors on each side determine whether or not the train passes a certain distance from the level crossing. If a train passes, the controller turns on the green signal, stops the alarm generation and raises the door. If any vehicle or obstacle gets stuck in the railway level crossing is detected by the sensor placed in the level crossing, the microcontroller will issue a command to the train signal that alerts the train to slow down.
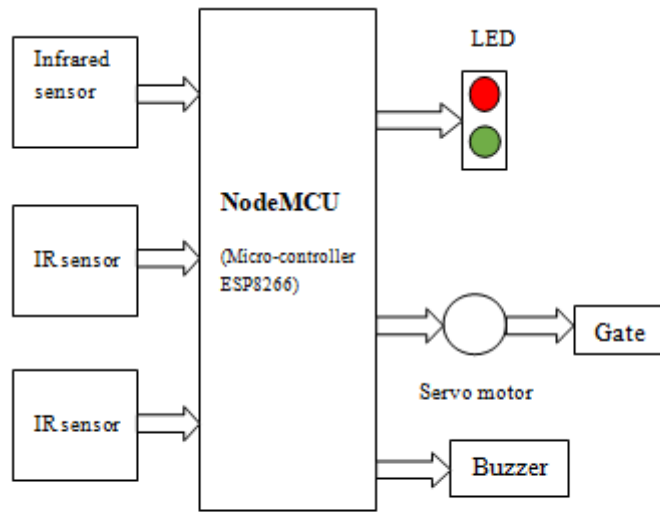
Fig.1: Block diagram of the system

A. MICROCONTROLLER

In this framework, we are using ESP8266 wifi-soc based NodeMCU.
The microcontroller functionalities are
1) Identify both the arrival and departure of the train.
2) The servo motor is used tooperate the railway gates.
3) Alert vehicles near the train door of the arrival of the train by using the bell.
4) To control the red and green traffic lights at a railroad crossing.
5) Send the information to the control room via blynk when the obstacle is detected.
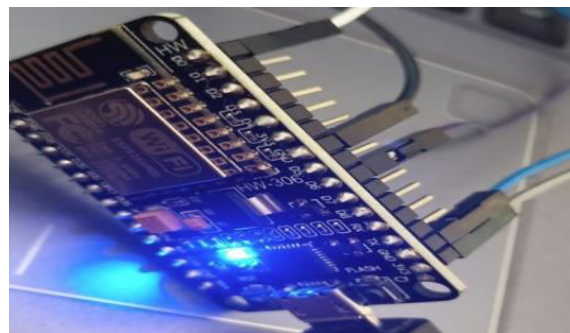
B. IR SENSOR

Infrared sensors act as an input unit positioned some distance from the ends of railroad gates. These sensors are responsible for detecting the arrival and departure of trains. These sensors act as input units for the frame. Infrared sensors work on the principle of transmission and detection of infrared radiation.


C. SERVO MOTOR

A Servomotor is a rotary actuator or linear actuator that allows for precise controlof angular or linear position, velocity, and acceleration. Servomotors are used tooperate the gates forward and backward.

D. LED and BUZZER

LEDs (light-emitting diode) are smart and effectively manageable when integrated with IoT technology. With IoT, it is easier to keep track of data, like the number of operation lights and power consumption of each light fixture. The usage of LED is to alert the road users near the level crossing.

A buzzer is a tiny speaker that can connect toNodeMCU. The buzzer produces sound based on the reverse of the piezoelectric effect. Warning signals are given near level crossing using Buzzer sound in the system.
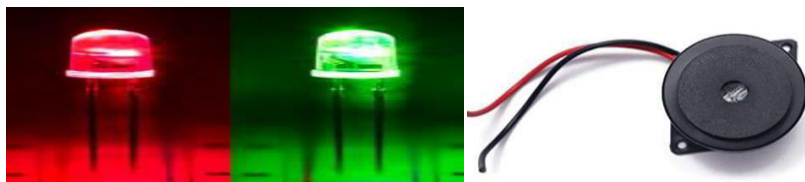
IV. CONCLUSION

By implementing this system, we can achieve a reduction in the number of accidents that occur at railroad crossings across the country. This work brings a benefit to the rail department and road users. Two sides of the door are equipped with sensors. The arrival and departure information of the train can be obtained by means of an infrared sensor. This system makes use of the servomotor to open and close the doors automatically; It is rotated clockwise or counterclockwise and also this system provides the interest of buzzer information and LED indicators when crossing the train.

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