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SMART RAILWAY GATE MANAGEMENT

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I.ABSTRACT

In the rapidly flourishing countries accidents in the unmanned level crossings and due to obstacle on track are increasing day by day. No fruitful steps have been taken so far in these areas. Our project deals with automatic railway gate control at a level crossing replacing the gates operated by the gatekeepers and detection of obstacle on track By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensors placed in the side of the tracks. Hence, the time for which it is closed is less compared to the manually operated gates. Detection of obstacle on railway track deals with two things, Firstly it senses the any obstacle on the track by using sensors placed on the front end of the train and Secondly, to convey the obstacle detection message to the nearby railway station. The proposed system uses RFID Module to detect the arrival and departure of trains at the railway level crossing, laser to detect the obstacle on the track, WiFi to convey the obstacle message to the nearby railway station and to the train and Servo motor to control the opening/closing of gates

KEYWORDS

Arduino; RFID Module; Obstacle; Infrared sensor; Laser.

II.INTRODUCTION

The place where track and highway/road intersects each other at the same level is known as “level crossing”. There are mainly two types of level crossing they are manned level crossing and unmanned level crossing. Railways being the cheapest mode of transportation are preferred over all the other means. When we go through the daily newspapers we come across many railway accidents occurring at unmanned railway crossings obstacle on track system. This is mainly due to the carelessness in manual operations or lack of workers. We, in this paper have come up with a solution for the same. Using simple electronic components we have tried to automate the control of railway gates. As a train approaches the railway crossing from either side, the RFID placed in the track at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate and sends the signal to Arduino to indicate train arrival.

RAILWAY ACCIDENTS STATISTICS

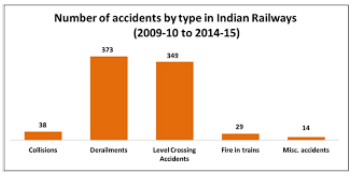

Fig 1: Illustrates the percentage of railway accidents in India

Due to various reasons during 2009 to 2013. There are various reasons for railway accidents but derailments and level crossing accidents are more in terms of percentage of accidents. The percentage of level crossing accidents are more, this is due to errors made by gatekeepers and also due to unmanned level crossings. This can be avoided by implementing automatic gate system at level crossings.

III.SYSTEM DESCRIPTION

The Arduino UNO and ESP8266 is the main controller in this proposed system. The proposed system uses RFID to detect the arrival and departure of trains at the railway level crossing, Laser to detect the obstacle on the track, wifi to convey the obstacle message to the nearby railway station and arduino to control the opening/closing of gates through servo motor and also to convey the obstacle message and indication signals to the road users (LED and Buzzer).When the arrival of the train is sensed, signals are sent to the traffic post indicating red light for the arrival of the train and at the same time gate remains

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closed until the train completely moves away from the level cross.

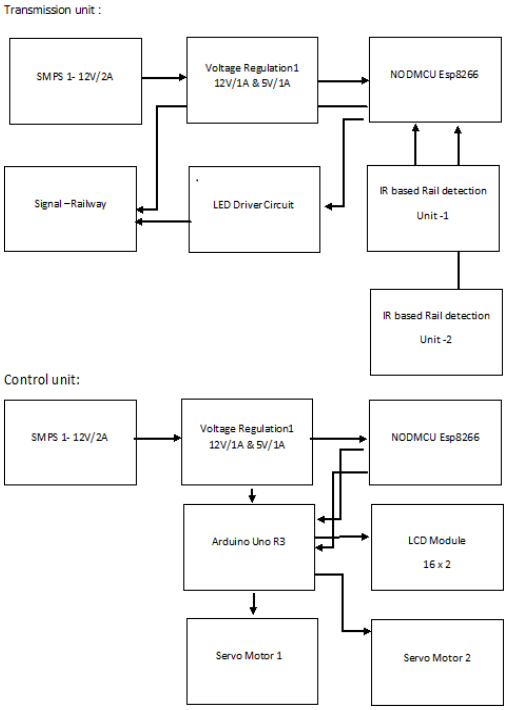

Fig 2: Block diagram of proposed system

When the departure of the train is detected by the second sensor, the traffic signal in the post turns green and the servo motor 3kg torque operates to open the gate. Thus automation of the gate operations at the railway level cross is achieved using sensors. When there is any obstacle on the track the laser placed in the level crossing will detect the presence of any obstacles and send signal to the Arduino. Then Arduino convey the obstacle detection message to the nearby railway station through wifi.

IV.FLOW CHART

PROCEDURE

STEP1: RFID senses the arrival of the train.

STEP2: Gate will automatically close when it receives the signal from the train.

STEP3: Laser will be activated when the gate is closed

STEP4: If there is any obstacle in the level crossing the Laser beam cuts, that indicating the obstacle

STEP5: The Obstacle instruction is send to the train and displays in the LCD Display.

STEP6: The train remains stop until the obstacle is cleared.

STEP7: The gate will open after the train departure.

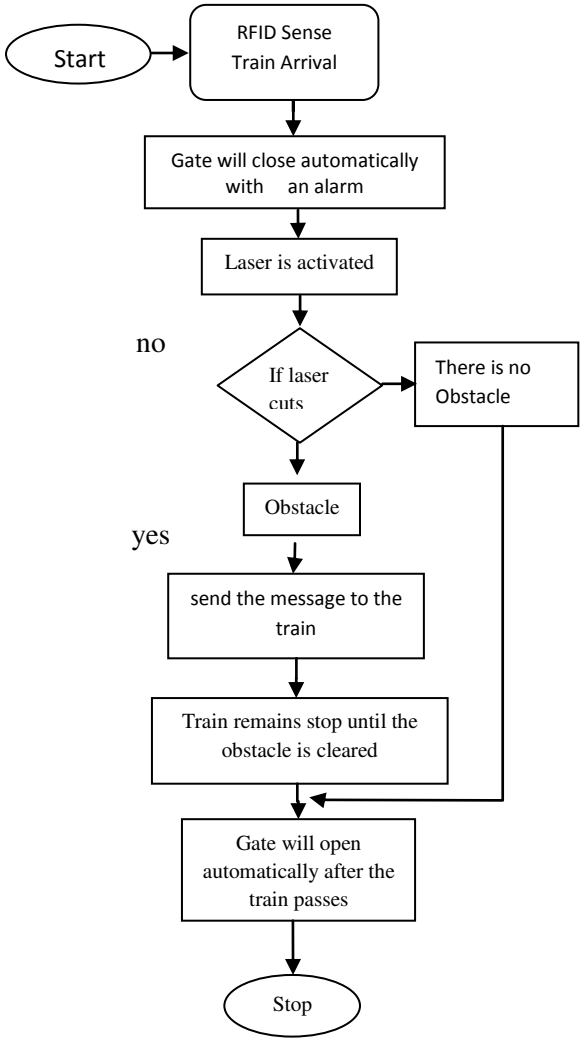

Fig 3: Flow chart for automatic railway gate control

V.HARDWARE SPECIFICATION

The hardware components used in this proposed system are:

A. Arduino UNO R3
B. RFID Module
C.Servo Motor
D.Buzzer
E.Laser
F.NodeMCU ESP8266

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A.Arduino UNO

The Arduino Uno is a microcontroller board. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller.

B.RFID Module

RFID is abbreviation of Radio Frequency Identification. RFID signifies to tiny electronic gadgets that comprise of a small chip and an antenna. This small chip is competent of accumulating approx 2000 bytes of data or information.

A fundamental advantage of RFID gadgets above the other stated devices is that the RFID device is not required to be placed exactly near to the scanner or RFID code reader.

C. Servo Motor

A servo motor 3kg torque is basically a DC motor along with some other special purpose components that make a DC motor a servo. In a servo unit, you will find a small DC motor, a potentiometer, gear arrangement and an intelligent circuitry.

D.Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

E. Laser

A laser is a coherent and focused beam of photons. The acronym laser stands for "light amplification by stimulated emission of radiation." It is for the detection of obstacle that is present in the level crossing of the train track. When the laser beam is cutted due to the obstacle in the level crossing wifi intimates the train that the obstacle is there in the track.

F.NodeMCU8266

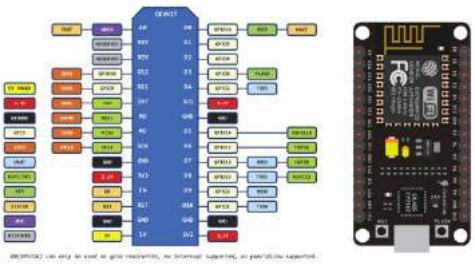

Fig 4 : NodeMCU8266

ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area

VI.MODEL OF PROPOSED SYSTEM

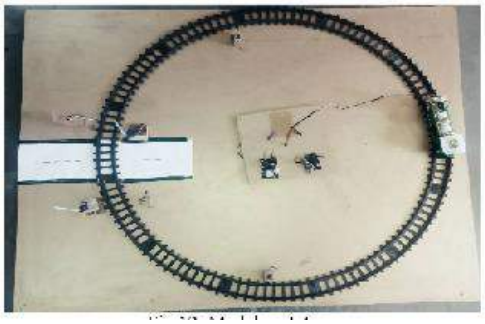

Fig 5: Model prototype

VII.EXPERIMENTAL RESULTS

The proposed system is practically experimented as a working model prototype. The major components used in the model are an 80cm diameter railway tracks, a toy train, RFID Module, Laser, a servo motor with which the gate operates, 4 LEDs as the traffic signals, NodeMCUESP8266 to convey message and buzzer to indicate the arrival of

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train to the traffic.

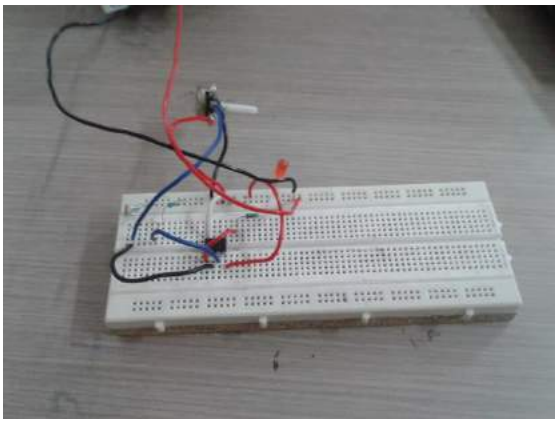

Fig 6: No obstacle

Obstacle detection: Any obstacle on the track is detected by placing an laser in the level crossing and the presence of obstacle on the track is notified by a signal at the control room and the LED glows indicates the presence of obstacle. The train movement is then controlled based on the presence of the obstacle on the track and obstacle detection

Fig 7: LED glows due to obstacle

message is conveyed to the nearby railway station through wifi.

VIII.CONCLUSION

Automatic railway gate control system is centered on the idea of reducing human involvement for closing and opening the railway gate which allows and prevents accidents near level crossing. The railway gate is a cause of many deaths and accidents. Hence, automating the gate can bring about a ring of surety to controlling the gates. Human may make errors or mistakes so automating this process will reduce the chances of gate failures and reduces the errors made by gate keepers. The accidents are avoided at place where there is no person to manage the railway crossing gates. Here we use the servo motor to open and close the gates automatically when it rotates clockwise or anticlockwise direction to operate the gate automatically. In the obstacle detection part the laser detected the obstacle and the train stops as soon as the obstacle detection message is conveyed to the nearby railway station as well as for the train operator. So through this system any obstacle on track can be detected and accident can be avoided and also the message as been conveyed to the concerned.

IX.FUTURE WORK

The accidents due to railway level crossing and the obstacle can be avoided in real time by implementing this system and the whole process is completely automatic. In future the features like wireless system can be implemented in the real time operation. And also the GPS system can be implemented and interfaced with the circuitry. GPS system ensures that the correct location of the obstacle can be sent to the nearby railway station through GSM modem. This helps to get the exact location of the obstacle so that the work for the clearance of obstacle can be done faster.

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