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ANDROID APPLICATION FOR UNMANNED RAILWAY LEVEL CROSSING

Ms.C.Banupriya
Department of Computer Science and Engineering,
Indra Ganesan College of Engineering
Trichy,Tamilnadu.Trichy,Tamilnadu

D.Indra Devi, ,Asso. Professor,
Department of Computer science and Engineering,
Indra Ganesan College of Engineering,

1. ABSTRACT

The system is constructed so as to achieve the control over the gate crossing situated at the railway level i.e. closing and opening of the crossing gates. In current scenario the gates are mostly controlled involving manpower which is usually placed at the level crossing. Here the proposed system makes use of an android platform. The working of the gate i.e. closing and opening of the gate is controlled with the help of an android application which will be on an android smart phone or a tablet. When a train is anywhere nearby the level crossing gate a SMS will be send from an android application using the WIFI module. The SMS will be sending to the GSM modem which will interpret the SMS and it will then forward the command to the microcontroller. Then the microcontroller will feed the output signal to the motor and motor driver is switched on. It results in closing of the gate. Then for opening of the gate other command to open the gate will be given to the microcontroller through GSM modem from android application which will forward the signal to the motor driver. Here 8051 microcontroller is been used to complete the process. Here an LCD is been used to display the current status of the railway gate i.e. open or closed which is attached with the microcontroller.

KEYWORDS: Railway gate, unmanned level crossing,WIFImodule, android

mobile GSM Modem, IR Transmitter-Receiver, Microcontroller, Stepper motor.

2. INTRODUCTION

Indian railways are in operation for more than 160 years and it covers the whole of India. Indian railways is among the world's largest network which consist of 115,000 km of track. It covers an entire route of about 65,000 km and 7,112 stations.

Recently, the collision accident with train and automobile at the level crossing comprises more than 90% of all level crossing accidents and has tendency to be caused by personal mistakes more than other railway accidents

The operation of railway gates at level crossings is not so reliable nowadays. Primarily the road users have to wait a very long time before the arrival of train and even after the train is left. And secondly the chances of accidents that usually made by the carelessness of the road users or due to the time errors made by the gatekeepers is more.

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K. AjithTheja, et al., proposed their model using WSN, the positioning of the reader head may be collapsed in some situation which causes damages to the rail system and human lives. But in the proposed system wifi module is used in which of other external force may lead to damage.

NafisaMapari, et al., in their proposed model a sms will be send to the android application, which may not be able to receive by the application due to any network problem. But in the proposed model wifi module is used which works under any situation.

3. EXISTING SYSTEM

Presently railway-crossing gates area unit operated manually. At this time scenario, in level crossings, a gatekeeper operates the railway gate usually once receiving the data regarding the train's arrival. Once a train starts to go away the station master of the actual station delivers the data to the close gate.

The opening and closing of railway gate is traditionally operated through manual lever pulling method. This method leads to a lot of accidents due to the rational technique and lever jamming.

Rail road related accidents are more dangerous than other transportation accidents in terms of severity and death rate etc. Therefore more effort are necessary for improving safety. Collision with train is generally catastrophic in that the destructive force of a train usually no match for any other type of vehicle. Train collision for major catastrophic, as they cause severe damage to life and property.

4. PROPOSED SYSTEM

In the proposed system we build an android based controller for railway level gate crossing. Themodel is proposed for controlling the same by using some electronic components. When the train is approaching the railway level crossing from one of the two side, the sensors will be placed at both the sides which will be at a certain distance from the railway gate detects the train approaching and then the gate operations are controlled. The figure4.1 gives the brief view about the architecture that is used in the proposed system. There is an indicator light which has been provided so as to alert about the approaching train. This will help in reducing the accidents which occurred at the railway gate crossing may be due to error in signaling or due to faulty mechanism at unmanned crossing

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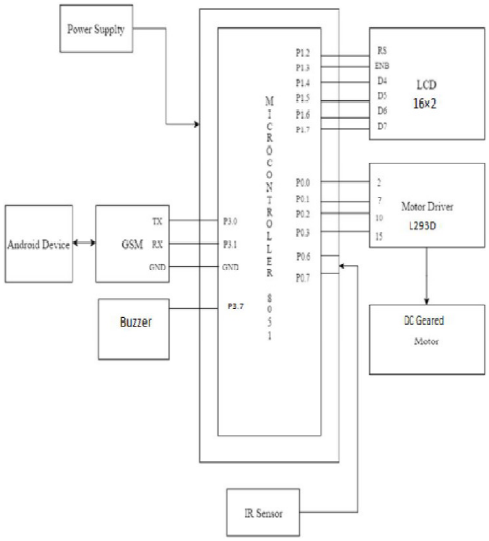

Fig.4.1 Architecture of proposed system

In the proposed system there will be a pair of IR sensors which will be placed on both the sides at a fixed distance from the railway level gate crossing. As soon as the train which will be in motion seems to be appearing from one end towards the railway gate it will be detected by those IR sensors being placed. Once the approaching train is being detected the sensors will give a red signal which will be indicating the coming train. This red signal can act as a warning to the road users informing them about the arrival of the train at the level crossing. Also sensors can give a notification to the station master about the arrival of the train. The station master will get a notification on its android application which will be forwarded from the microcontroller through the modem once the approaching train is detected.

5. IMPLEMENTATION

When the train is approaching the railway level crossing from one of the two side, the sensors will be placed at both the sides which will be at a certain distance from the railway gate detects the train approaching. There is an indicator light which has been provided so as to alert about the approaching train. This will help in reducing the accidents at the railway gate crossing. Initially the signals are kept OFF alerting the road users that the gates are also opened so as the road users can traverse through the tracks to reach the respective other sides.

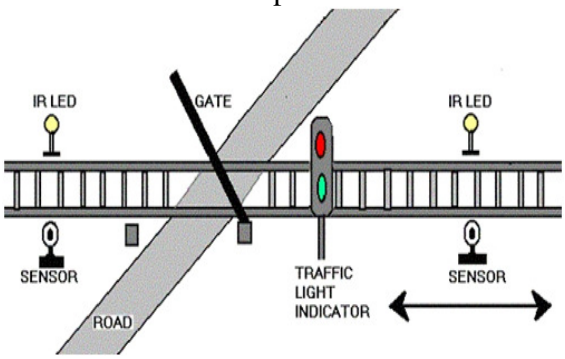

Fig.5.1 Sensor setup

Then if any train is appearing towards the railway gate crossing then it will be detected by the sensors. Immediately, it will send a notification informing about the train arrival to the train driver/ station master on android application. The fig.5.1 represent the sensor setup on either side of the railway crossing. The train driver/ station master will be using the android application. This notification send will help the user in knowing that the train is about to arrive at the railway gate crossing. Also the signals will be turned ON once train is detected by sensor thereby alerting the road users.

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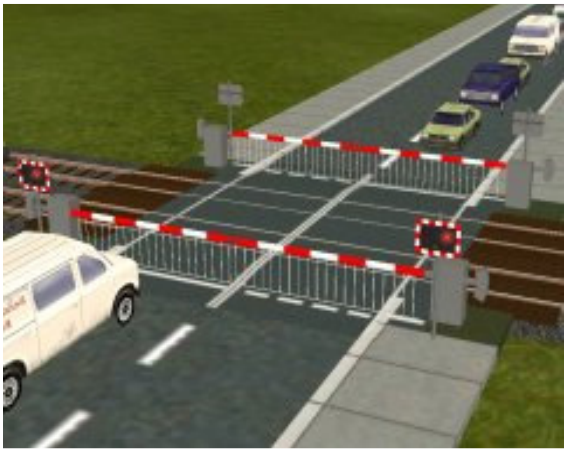

Fig.5.2 Display model of proposed system

Then the train driver will send the SMS through a wifi-module to close the gate from the android application resulting in closing of the railway crossing gate. The crossing gate will be kept closed until the train completely passes through the railway crossing. Once train has completed passed the railway crossing then the sensor which is placed on the other side will detect the train departing.

The fig.5.2 represent the display model that is fixed on the railway gate for the road users about the status of the train.

Once again a notification will be passed on android application to the train user informing him about the departure of train. Then again the train driver will send the open SMS using wifi-module for the gate to open resulting in opening of the railway crossing gate.

Now the signals will once again be turned OFF indicating the road users that train has departed and now they can traverse through the railway crossing. The system works whenever the train is detected by the sensors and the respective operations are carried out in a sequential manner.

6. ALGORITHM

Thefigure6.1 represent the flowchart for the working system of the proposed system of unmanned railway level crossing using android application through wifimodule.A Buzzer is being used in order to alarm the road user about the train arrival at the railway level gate crossing. The algorithmic steps are as follows:

1. Start
2. Make the initial setting of the signals for thetrain and gate.
3. Check arrival of train by sensor. If train issensed go to step 4
4. Else go to step 3.
5. Change the signal to alert the road user.
6. Send notification to android application aboutthe train arrival.
7. Send SMS to close the gate from androidapplication.
8. Gate is closed.
9. Check departure of train by sensor. If train isdetected go to step 9.
10. Else go to step 7.
11. Send notification to android application aboutthe train departure.
12. Change the signal for road user.
13. Send SMS to open the gate from androidapplication.
14. Gate is opened.
15. Go to step 3.
16. Stop

Operations of GSM modem are as follows:

1. Initially the connection is made to microcontroller.
2. Power supply is switched ON.
3. Now an SMS is send from android application to SIM present in GSM modem using the wifi module.

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4. On receiving the SMS it forwards the commands to microcontroller.

The functions performed by the android application are:

1. Receives a notification regarding the arrival and departure of the train at the railway crossinggate.
2. Sends the SMS i.e. to open or close the railway crossing gate.

LCD Display working

A 16*2 LCD module is been used in the system. TheLCD is been used which will display the status of the gate i.e. whether the railway level crossing gate is opened or closed.16*2 LCD module has 16 rows and 2 columns. It has 16 pins.

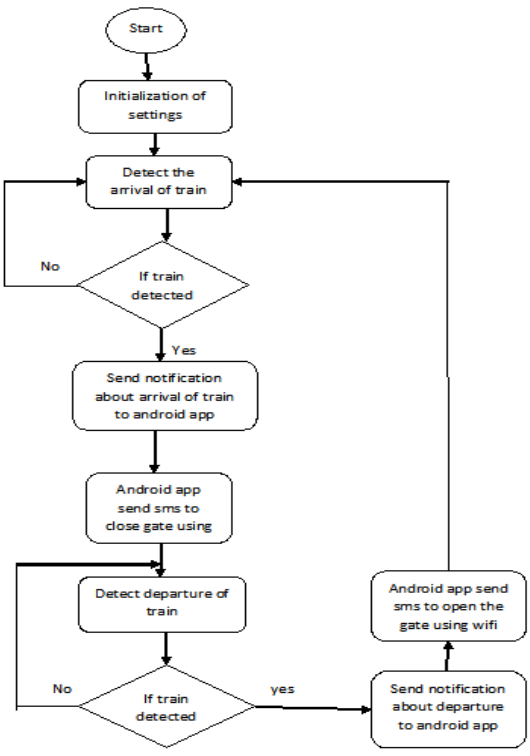

Fig.6.1 Flowchart for railway crossing

7. LAYOUT OF ANDROID APP

The figure.7.1 represent the layout of the android application that uses wifi module.

Fig.7.1 Layout of android application

8. EXPERIMENTAL RESULTS

The proposed system is practically experimented as a working model of the real world level cross. The major components used in the model are an 80cm diameter railway track shown in Fig.8.1, a toy train, four IR sensors, a stepper motor with which the gate operates, 4 LEDs as the traffic signals and buzzer to indicate the arrival of train to the traffic.

GATE OPERATION: An IR sensor is placed at a distance of 30cm and another at 5cm from the level cross. The toy train passes the first sensor and when it is detected by the sensor, a yellow LED glows at the level cross indicating the traffic that the gate is about to close. When the second sensor placed at a distance of 20cm from the level cross detects the train, the buzzer is activated and the motor is completely closed and the signal turns red.

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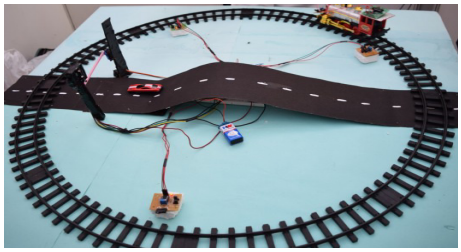

The buzzer rings until the gate is placed at a distance of 20cm after the level cross detects the departure of the train and the motor is reactivated to open the gate.

9. CONCLUSION

The android application is being used to control the working of railway crossing gate. The figure illustrate the android application layout which has commandsfor opening and closing of railway crossing gaterailway crossing. Also the signal is turned ON to alert the road users about train motion. Once the train has completely passed the railway level crossing then the command to open the gate is given from train driver through android device. The gate is now opened after the train departure and the signals have turned OFF and the road users are traversing through the railway crossing to the other side of the road.

Fig.8.1.Model of gate level crossing

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