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Automatic Railway Gate Control with Safety Features Using Microcontroller

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Abstract- Microcontroller computer techniques for automatic gate control for railway gate crossing. The model of railway track controller is designed by using 8952 microcontroller to avoid accidents at railway crossing by automating the gate control system using microcontroller when we go through the daily newspapers we come across many railway accidents occurring at unmanned railway crossings. This is mainly due to the carelessness in manual operations or lack of workers. And also the collision of two trains due to the same track. This project is implemented using sensor technique. We placed the sensors at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. Also an indicator light has been provided to alert the motorists about the approaching train with timer facility to indicate the time remain to close the gate.

Index Terms- Microcontroller, IR Sensor, Power Supply, DC Motor.

1. INTRODUCTION

Now a days, India is the country which having world's largest railway network. Our country is a progressive country. Railroad is one of transient mode which has an important role in moving passengers and freights. Over hundreds of railways running on track every day. As we know that it is definitely impossible to stop the running train at immediate is some critical situation or emergency arises. Train accidents having serious consequence in terms of loss of human life, injury, damage to Railway property.

Train accidents having serious repercussion in terms of loss of human life, injury, damage to railway property. These consequential train accidents include Collisions Derailments, Fire in Trains, and Collisions of trains at Level Crossings. When we go through the daily newspapers we come across many railway accidents on crossings. This is mainly due to the carelessness in manual operations or lack of workers. Using simple electronics components we have tried to automate the control of railway gates. The concept of the model is to control the railway gate using microcontroller. A microcontroller can be compared to a small stand alone computer. It is a very powerful device which is capable of executing a series of preprogrammed tasks and interacting with other hardware devices. In this model sensor will be placed at definite location , which will be sense the Train on the track and will gives the command to Microcontroller to closed the gate at railway gate crossing if railway gate crossing signal is green also. If not green, it will wait to that moment when that signal is to be green and then closed the gate.

2. LITERATURE SURVEY

The country like India, the operation of Railway gate is generally done by manually. But it is found that there are so many accidents are happened at railway gate crossing because of so many manual errors.

2.1. *Manual Operation*

In this operation the gate is control by manually i.e. opening and closing of gate. Basically station master knows the status of the train on the both track. i.e. up and down track. When train is to be arrival to the particular railway gate crossing point, then station master inform to the Gate keeper controller at railway gate crossing by telephone regarding the status of train on either up track or down track or both the tracks. Then controller starts the closing railway crossing gate. The gate controller closed the gate by rotating the handle manually .The gear system is connected to this handle .The gate will remain closed unless the train passes from crossing and station master will not give the information to open the railway crossing gate. Once station master gives the command to controller that no train is come on either or both track then controller will open the gate.

2.2. *Working Methodology*

Present project is designed using 8051 microcontroller to avoid railway accidents happening

at unattended railway gates, if implemented in spirit. This project utilizes two powerful IR transmitters and two receivers; one pair of transmitter and receiver is fixed at upside (from where the train comes) at a level higher than a human being in exact alignment and similarly the other pair is fixed at down side of the train direction. Sensor activation time is so adjusted by calculating the time taken at a certain speed to cross at least one compartment of standard minimum size of the Indian railway. We have considered 5 seconds for this project. Sensors are fixed at 1km on both sides of the gate. We call the sensor along the train direction as 'foreside sensor' and the other as 'after side sensor'. When foreside receiver gets activated, the gate motor is turned on in one direction and the gate is closed and stays closed until the train crosses the gate and reaches aft side sensors. When aft side receiver gets activated motor turns in opposite direction and gate opens and motor stops. Buzzer will immediately sound at the fore side receiver activation and gate will close after 5 seconds, so giving time to drivers to clear gate area in order to avoid trapping between the gates and stop sound after the train has crossed.

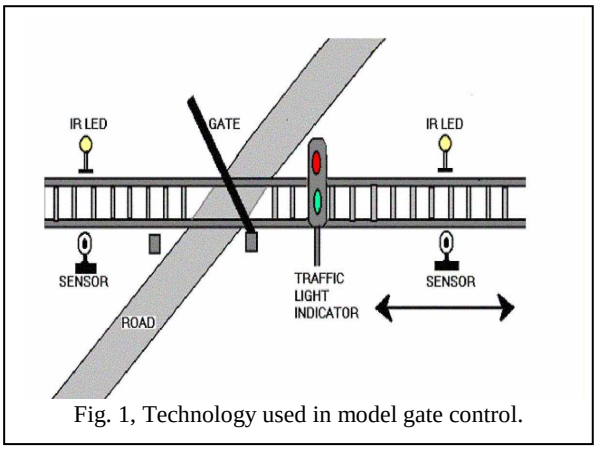

Fig. 1, Technology used in model gate control.

3. HARDWARE REQUIREMENT

3.1. *Sensors*

Photo interrupter ITR9813 sensor is used as an IR sensor in this system. This sensor consists of an infrared emitting diode and an NPN silicon phototransistor in the same package. Phototransistor receives radiation from the IR LED. But when an object is in between, phototransistor could not receive the radiation. Output is taken from the collector pin of the phototransistor.

3.1.1. *IR Sensor:*

This sensor is fitted in front of train engine to detect any obstacle present on track with in the line of sight. It sends appropriate signal to train control system, which in-turn stops train immediately if an obstacle is detected.

3.1.2. *IR curve detection sensors:*

This sensor is fitted to left side of train engine. An obstacle is placed near the curves to the left of the track. When train nearer a curve, obstacle is detected by this sensor and curve detection signal is sent to the train control block which in-turn controls the train speed in curve.

Displayed equations are to be centered on the page width. Standard English letters like x are to appear as *x* (italicized) in the text if they are used as mathematical symbols. Punctuation marks are used at the end of equations as if they appeared directly in the text.

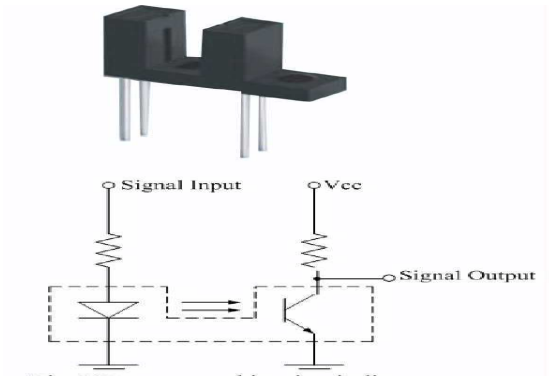

Fig. 3.1.2.1:- IR sensor and its circuit diagram.

3.1.3 *Features:*

1. Detection of train presence, speed and direction
2. Switch control
3. Wheel detection systems

3.2. *Microcontroller*

An embedded microcontroller is a chip which has a computer processor with all its support functions (clock & reset), memory (both program and data), and I/O (including bus interface) built into the device. These built in functions minimize the need for external circuits and devices to be designed in the final application.

Creating applications for microcontrollers is completely different than any other development job in computing and electronics. In most other applications one probably have a number of subsystem and interfaces already available for his/her use. This is not the case with a microcontroller where one is responsible for

- Power distribution
- System clocking
- Interface design and wiring
- System programming
- Application programming
- Device programming

Before selecting a particular device for an application, it' s important to understand what the different options

and features are and what they can mean with regard to developing application.

3.3. *Buzzer Alarm*

When the security system detects an intruder, the microcontroller activates the buzzer
Alarm and the telephone auto dialer. The buzzer alarm serves the following three functions:

1. It alerts the occupants and neighbors that someone has broken into the building.
2. It drives the intruder away.
3. It signals to the police which house has been broken into.

3.4. *DC Motor*

We can control a DC motor easily with microcontrollers. We can start it, stop it or make it go either in clockwise or anti clock wise direction. A DC motor is a electromechanical device that converts electrical energy into mechanical energy that can be used to do many useful works. It can produce mechanical movement like moving the tray of CD/DVD drive in and out. The speed of DC motor can also be controlled with MCU. PWM or pulse width modulation technique is used to digitally control speed of DC motors. As the MCUs PORT are not powerful enough to drive DC motors directly so we need some kind of drivers. A very easy and safe is to use popular L293D chips.

3.5. *Power Supply*

Supply of 230V, 50Hz ac signal from main supply board is given to a step down transformer. The transformer is selected such that its output ranges from 10V to 12V, which is supplied to the power supply block for making the output compatible with the TTL logic supply. This TTL logic supply acts as the power supply for the microcontroller, IR sensor, auto dialer, timer circuit and buzzer. Thus the main function of the power supply is to give the voltage supply required for the logic families, which is an output of +5V.

4. PROPOSED SYSTEM

In our proposed system there are two tracks i.e. Up and Down having four sensors A, B, C & D respectively. The distance between the railway gate crossing and the A & C sensor which are up & down track sensor respectively, is near about 4km. The system consists of microcontroller, buzzer alarm, LCD display, DC motor, down counter etc.

Whenever the track line is not clear, then the destination station master don't give green signal to train situated over the source station. If the track line between sources to destination station is clear then destination station master gives the track line clear signal to the source station. After receiving this signal source station master will gives the signal to train to start from source station to destination station. When train reach to the sensor a it sense the train and it will indicate the signal over the main control panel i.e. train on line track. As soon as sensor senses the train the microcontroller also check the signal corresponds to gate crossing, whether it is green or red. If it is green then microcontroller instantly gives the command to close the gate. The closing of railway gate is done according to following sequence.

1) First buzzer alarm is starts.
2) On the same time timer is also start i.e. timer for 0 to 9 second.
3) Once timer is over the gate will close immediately.

As train crosses the railway gate crossing and reach at sensor B and sensor sense it and if there is no signal from A and C sensor then gate will open immediately. A,B and C,D are the IR sensors of up and down tracks respectively and P & Q are the up and down track signals respectively.

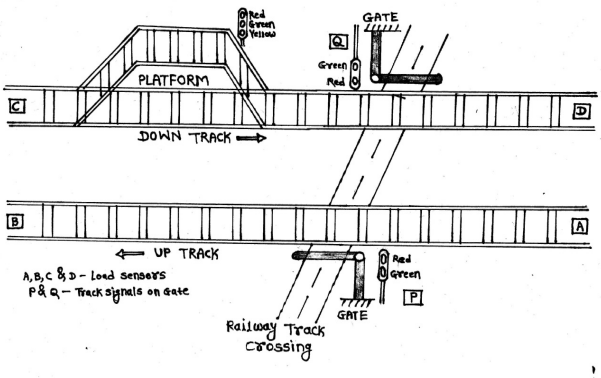

Fig. Actual Proposed System.

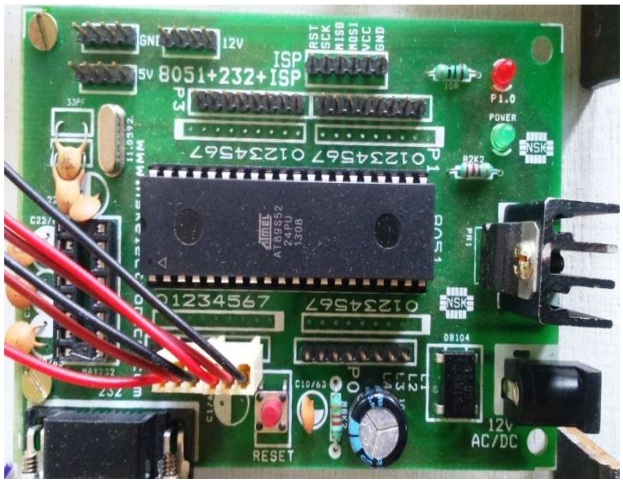

Fig. Microcontroller circuit

5. COMPARISON

In previous microcontroller base automatic railway gate control system the gate is closed immediately after first sensor sense the train but in case of halting of train in between the sensor and gate then there is problem of traffic occur on the railway gate crossing. This drawback is overcome in our system by applying the gate controlling on the signals placed at railway gate crossing.

6. CONCLUSION

Automatic railway gate control system offer an effective way to reduce the occurrence of railway accidents. This system can contribute a lot of benefit either to the road users or to the railway management. Railway sensors are placed at specific distance which will sense the arrival and departure of the train. This system uses the DC motor to open and close the gates automatically when it is rotated clockwise or anticlockwise direction according to the position of train. This system indicates timer circuit and buzzer alarm while the gate is closed. This system is controlled by using 89C52 microcontroller. Now a day's automatic system occupies each and every sector of applications as it is reliable and accurate.

REFERENCES

[1] Krishna, Shashiyadav And Nidhi, "Automatic Railway Gate Control Using Microcontroller", Oriental Journal of Computer Science & Technology.

[2] Hnin Ngwe Yee Pwint, Zaw Myo Tun, Hla Myo TunInternational Journal of Science, Engineering and Technology Research (IJSETR), Volume 3, Issue 5, May 2014 3, May - 2012

[3] Karthik Krishnamurthi, Monica Bobby, "Sensor based automatic control of railway gates", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 2, February 2015.