Automatic Railway Gate and Crossing Control based Sensors & Microcontroller

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Abstract

Railroad related accidents are more dangerous than other transportation accidents in terms of severity and death rate etc. Therefore more efforts are necessary for improving safety. There are many railways crossing which are unmanned due to lock of manpower needed to fulfill the demands. Hence many accidents occur at such crossing since there is no one to take care of the functioning of the railway gate when a train approaches the crossing. The main objective of this paper is to manage the control system of railway gate using microcontroller. The proposed model has been designed using 8052 microcontroller to avoid railway accidents occurring at unattended railway gates if implemented detection of train approaching the gate can be sensed by means of two sensors placed on either side of the gate. This work utilizes the two sensors placed on either side of the gate. This work utilizes two powerful magnetic sensors is fixed at upside and similarly the other magnetic sensor is fixed at down side of the train direction. Sensors are fixed on both sides of the gate. We call the sensors along the train direction as foreside sensor and the other as after side sensor. When foreside sensor gets activated the sensed signal is sent to the microcontroller and the gate is closed and stays closed until the train crosses the gate and reaches after side sensors. When the side sensor activated and the signal about the departure is sent to the microcontroller motor turns in opposite direction and gate opens and motor stops automatically.

Keywords: Railway Gate, Level Crossing.

1.Introduction

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. Railroad is one of transient mode which has an important role in moving passengers and freights. However railroad related accidents are more dangerous than other transportation accidents in terms of severity and death rate etc. Therefore more efforts are necessary for improving its safety. Now a day's India is the country which having world's largest railway network. Over hundreds of railways running on track every day. As we know that it is surely impossible to stop, the running train at instant is some critical situation or emergency arises. 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. In our country is a progressive country. It has already enough economical problems which are ever been unsolved. To avoid all these things

some sort of automatic and independent system comes in picture. There are mainly two types if level crossings they are manned level crossing and unmanned level crossing. Mannes level crossing is classified into spl.Class, A Class, B Class, C Class. Unmanned level crossing is classified into C Class, D Class. 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 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. As a train approaches the railway crossing from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. When the wheels of the train moves over both tracks are shorted to ground and this acts as a signal to the microcontroller indicating train arrival. Also indicator light has been provided to alert the motorists about the approaching train.

1. Train Accident Avoidances

A classification of accident by their effects derailments. Head on collision one type of train accident is when two trains collide front face with each other or train colliding on the same track from opposite ends called head on collision. Rear end collision the other kind is when a train collides into the other that is in front of it called a rear end collision. When the train arrives in a particular direction the transmitter IR senses and generates appropriate signal then at the same time the IR receives the signal and generates an interrupt.

When interrupt is generated the stepper motor rotates in clockwise direction. When the interrupt ends the stepper motor rotates in anti clock wise direction.

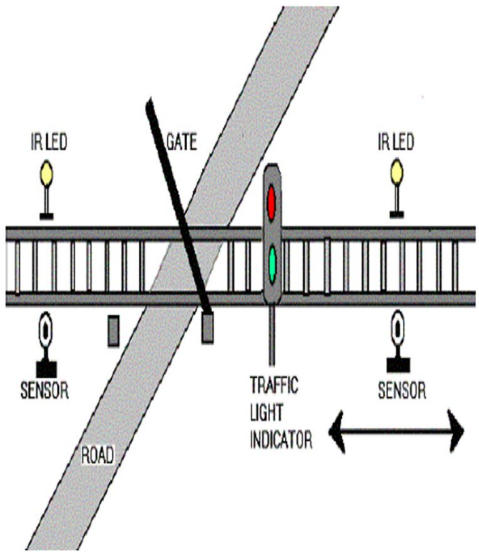

Fig 2.1 Railway crossing on middle of road.

2. Indian Railway Technology

The ministry of railways has taken steps to reduce the consequential train collisions accidents and level crossing accidents. Ministry of railways has invested several Crore rupees for modernization and uplift nets of the technologies used in Indian railway. Presently Indian Railways provides some sign and signal to prevent the train accident.

Hardware Implementation

i) Micro Controller
Totally 40-pin DIP package manufactured with CMOS Technology.

ii) L293D (motor driver)
Racially L293D 16DIP/ULN 2003 IC is used to drive the steeper motor.

iii) Steeper Motor
This is used to open and close the gates automatically when it is rotated clock wise or anticlockwise direction. Stepper motor requires 500m amps current so use the uln 2003 or L293D driver to drive the stepper motor.

iv) Software Implementation
Keil software.

3. In Indian Railway Using Different Warning Signs to Reduce the Level Crossings

3.1.1 Advance Warning Sign

Sign tells you to slow down look and listen for the train and be prepared to stop at the tracks if a train is coming.

Fig 3.1.1.1 Advance Warning Sign

3.1.2 Cross bucks Sign

Cross bucks are located at all grade crossings on both approaches to the crossing. From an X via the interconnection of two 1200 mm x 200 mm retro-reflective pieces. A cross buck sign provides the last indication to the driver where the crossing is located.

Fig 3.1.2.1 Cross buck Sign

3.1.3 Stop Sign and Line

Minimum standard stop sign dimensions are 600 mm X 600 mm and sign shape is octagonal. A stop line painted across your lane of the road shows you where to stop and lock for an approaching train. On a gravel road with no marking stop at least 15 feet from the railroad tracks.

Fig 3.1.3.1 Stop Sign and Line

3.1.4 Manually Activated Sign

Manually Activated Signals are operated by level crossing staff on instructions transmitted by telephone or telegraph signal

from the nearest station. Automatic Warning Signal need short track circuit or markers which detect trains and activated warning indications are usually flashing lights or sounds emitted by bells or claxons or a combination of these two.

3.1.5 Mechanical Crossing Barriers

Mechanical crossing barriers are operated by level crossing staff using hand or electrically powered levels winches or windlasses. In addition mechanical barriers providing complete protection of level crossing are connected to manually operated warning signals (light and sound).

3.2 Technology Used to Reduce the Train Accident by Indian Railway

3.2.1 Walkie-Talkie Set of Crew

In that 5W walkie-talkie sets have been provided to drivers and guards of all the trains for communication in static mode or at low speeds. 25W VHF sets have also been provided at stations on board gauge double line multiple line sections so that train crew can communicate with the nearest station masters in the case of emergencies. This is duplex communication where in both the parties can talk simultaneously. The work for provisions of MTRC have been sanctioned on 2,415 km. it will be GSM based MTRC system with digital technology as being used by cellular networks worldwide.

3.2.2 Railway Signal

Hand signals flags, lamps, bells, and whistles, all right signal, guard's signals all ready signal. Hand signals include signals given by hand, or by flags or lamps used by the signalman, drivers, guards, or station staff. The all right signals refer to the display of green flag is held in the left hand. The red flag is kept ready to be displayed in case of a problem in the right hand. A steady green signal shown by the guard is an indication that there is no problem and that the train can continue on its journey. A green flag or lamp waved violently up and down however is the signal that the train has parted and the driver should bring his portion of the train to a halt. The already signal is given to indicate that the everything is ready and in order for the train movement for which it is given.

4. Methodology

When train crosses the first sensor that is S1. Sensor S1 start incrementing to the microcontroller and microcontroller decides to close the railway crossing because the microcontroller senses that the railway crossing is open before sensing the sensors.

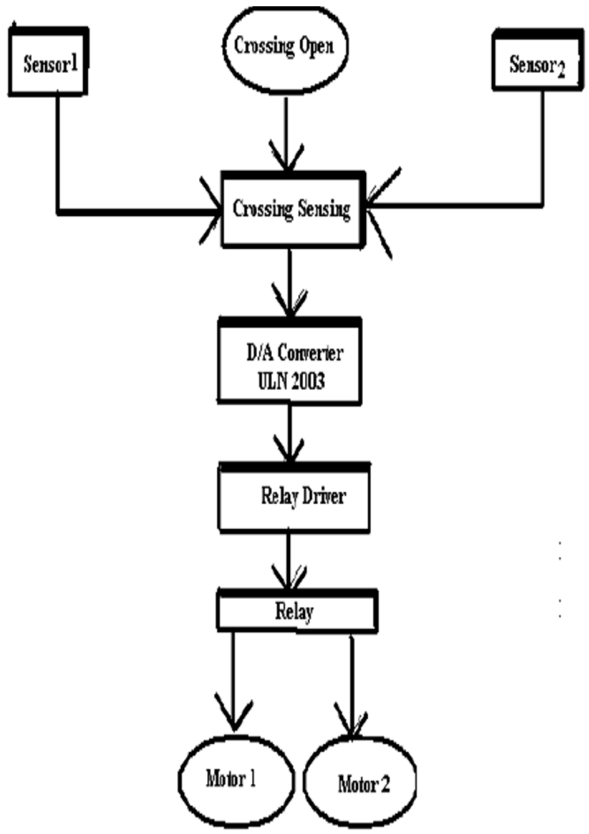

Fig 4.1 Architecture of hole processes.

The microcontroller decides to close the railway crossing and extract a digital signal through pin 28 of the microcontroller and it provides a micro voltage of 1.5 to 3 volts digital signal through a 10Ω resistance positive feeding signal for boosting of the voltage. This signal into analog from and it extract 1.5 to 3 volts analog from pin 15 of UNL IC or4017 IC, which drives the relay driver. This consists of NPN transistor and these drivers drive the motor according to the instructions of microcontroller. The same process is repeated after crossing of the S2 sensor. This S2 sensor senses and gives an increment to microcontroller and the microcontroller opens the crossing because previously microcontroller got the instruction that the railway crossing is closed by switch SW2.

5. Result and Discussion

At present the existing system is manually and human controlled system once the train leaves the station. The station master informs the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information then he closes the gate depending on the timing at which the train arrives. Hence if the train is late due to certain reasons, then gate remain closed for a long time causing traffic near the gates. There is no centralized system is available presently signals are control by mean of interlocking and wrong signals and signal device which is totally semiautomatic system.

The automatic railway gate control at the level crossing and anti collision device. The time for which it is closed is less compared to the manually operated gates and also reduces the human labor. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since the operation is automatic error due to manual operation is prevented. And implementing the work railway system can be centralized which can control the train collision accidents.

6. Conclusion

A new approach for improving safety at LCs and train collision on IR has been suggested. Formats have been given to maintain records of LC inventories accident/incident reports. A regular assessment of safety performance

should be done. This approach should be able to bring down the rising trend in accidents at LCs and train collision accident. This project uses the present infrastructure of railways e.g. present signaling method and meets all the requirements to have an automatic controlling of the railway traffic. It provides the supervision and control system provide the mean for real time inspection review and data collection fo the purpose of maintenance on the movable and fixed facilities for the guarantee of operation safety and maintenance efficiency as well as the safety appraisal decision-making system based on the share of safety data. The great achievement of modern technologies in each relevant field and the technological development of the railway industry itself have provided railway with feasibility to win higher service quality and faster speed.

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