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# Railway Crossing Automation using Infrared Sensor

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***Abstract*** — As we came across many newspapers, many accidents that are made in unmanned level crossings. The trains running on same track are also the cause of major accidents at railways crossing. In both of the cases, human loss and damage to the train are the results [1]. In this paper, we proposed an automatic railway gate operation to avoid such accidents at unmanned gate and automatic closure of unmanned gate without gate keeper. This is also developed to avoid the collision of trains running on same track. Automatic closure of unmanned gate reduces the time for which the gatekeeper closing and provides safety to the road users by reducing the accidents. In India, totally 28,607 level crossings are placed, in that 19,267 are manned & 9340 are unmanned crossings. The collision of trains running on same track is also prevented by employing infrared (IR) Transmitter. The IR system at each station receives the information and passes to a master control room [2]. IR wireless technology devices convey information of data through infrared radiation.

***Keywords*** — *Infrared Sensor; Microcontroller; Receiver; Transmitter.*

## 1. Introduction

The place where the track and the highway roads intersect with each other at the same level is known as "level crossing". There are two types of level crossing in our country that are manned level crossing and unmanned level crossing.

The drivers of the vehicles shall get down from that vehicle and himself to ensure that no trains are approaching from either side before the railway track is crossed. This is mainly due to the carelessness of manual operations or lack of the workers in that place. The simple electronic components are used here for the trial to automate the railway gate control. Road accidents at railway gates are one of the leading causes of death and injury worldwide [3]. In Indian Railway, totally17% of the railway accidents are taken place while crossing train tracks. The accidents happened majorly in passive railway crossings. The operation of railway gate level crossings is not so far reliable nowadays. We use IR sensor with the help of microcontroller. When the train arrives, the red light will appear and the gate is closed after the train passes the green light will appear and the gate opens automatically. This process is to avoid the accidents and keep our country safe. It is the failsafe prototypes of the Automatic Railway Crossing System.

The sensors detect the presence of the train near railway crossing and barrier shuts down when train is approaching to the railway crossing. Once the train crosses barriers it automatically opens the gate by itself. Automatic railway crossing control will provide better safety, and reduce the manual assistance and number of the accidents.

Intel introduced an 8-bit microcontroller called 8051. It was referred as system on a chip because it had 128 bytes of Random Access Memory, 4Kilo bytes of on-chip Read Only Memory, two timers, one serial port, and 4 ports (8 bit wide), all in a chip. With this microcontroller, the information is passed to the system and the gate will automatically function during the arrival of the train.

## 2. Existing System

A fault tolerance method is used for both hardware and software components. The method is implemented in Korea earlier [4] [5]. This method is effectively done and accident rate is reduced. Magnetic sensors are used for automation system in Korea. Sensors are placed underground to avoid environmental changes which recognize the direction and movement of vehicles [6] [7].

### 2.1 Disadvantage

- Chance of occurring accidents.
- Manually activated railway signals and the railway warnings at the level cross are dangerous.
- It needs a man power to close or open a gate in normal case.

## 3. Proposed System

On both sides of the railway crossing, at a fixed distance the sensors (Reed Switches) was placed. As the train that passes over the sensor, it gives input to the microcontroller with the help of the H-bridge circuit. The motor drives after obtaining the signal and the gate opens and closes automatically. There was a buzzer which produces buzzing sound as the train arrival near the railway crossing. Thus, it gives notification to the system approaching to the railway barrier.

### 3.1 Advantage

- Automatic railway crossing control will provide better safety.
- Reduce manual assistance and number of accidents.
- Reduce time.

## 4. Methodology

To avoid the day to day accidents in level crossing, we use 8051 microcontroller. This paper utilizes two powerful IR transmitters and two receivers; one pair of transmitter and receiver is fixed at upside of the gate and the other pair is fixed at down side of the gate. Transmitter and receiver must face the direction where train comes. The IR sensors are placed on the track at a distance of 5km and 1km on both sides of the level crossing.

The sensor is classified into 'foreside sensor' and 'after side sensor'. When foreside receiver gets activated, the gate motor will automatically turn on in one direction and the gate is closed in a while, and it remain until the train crosses the gate and reaches after side sensors. When after side receiver gets activated motor turns in opposite direction and gate opens and motor stops. Buzzer will immediately sound at the foreside receiver activation gate and automatically gate will close after 5 seconds, this gives time to the drivers to clear gate area in order to avoid trapping between the gates and the sound stops after the train has crossed.

## 5. Implementation

Implementation of sensor in the track which intellect the arrival of train and gives the information to the microcontroller to close the gate. The red signal will appear and the buzzer sound will be produced at the same time. After the train leaves from the gate, automatically the gate is open and the green signal is on.

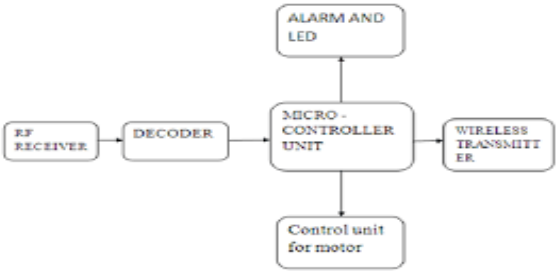


**Fig.1: Circuit design**

The Major components of this method are 8051 microcontroller (AT89C52), Reflective Type IR Sensor, L293D Motor Driver Integrated Circuit (IC) and stepper Motor. The mandatory connections for 8051 multiprocessor include that the oscillator circuit, reset the switch and EA Pin. A crystal oscillator of upto 20MHz can be used as a source of external clock. At last, the EA pin is dragged high using a resistor.

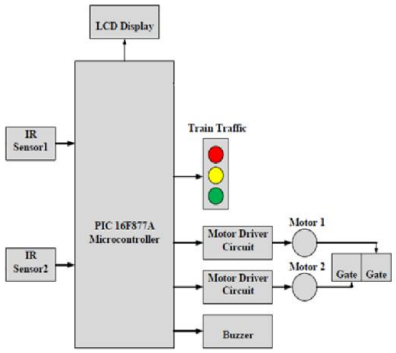


**Fig.2: Block diagram**

The block diagram that consists of the six major blocks that are IR sensors, Microcontroller, L293D, Stepper motor, gate and power supply.

- *IR SENSORS* - The two IR sensor pairs (331,333) are used for transmitting and receiving signals.
- *IR CIRCUITS* - This circuit has two stages: First is a transmitter unit and Second is a receiver unit. The transmitter unit consists of infrared LED and it's the associated circuit.
- *IR TRANSMITTER* - The transmitter circuit that consists of Resistors and IR LED components:

The IR LED emitting infrared lights and it put on the transmitting unit. Infrared LED is driven through the transistor BC 548.

The existing system is manually done by the human controlled system once the train leaves the station. The station master gives information to the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information about the train he closes the gate depending on the time at which the train arrives. Hence, if the train is late due to certain reasons, then gate remain closed for a long time and that causing traffic near the gates. So, the peoples and vehicles should wait for a long time. To avoid this process the railway crossing automation is invented.

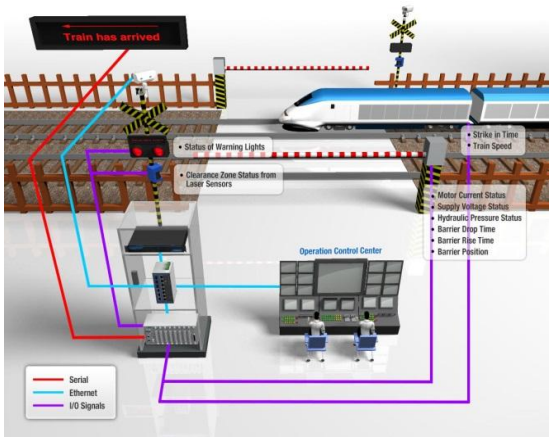


**Fig.3: Railway crossing**

## 6. Conclusion

This paper includes the regular assessment of safety performance. It avoids accidents and provides safety to everyone and it provides higher quality. We constrained to develop new railway rules & traffic norms. This equipment of process model can be utilized in railway department to prevent 75% of accidents. The cost is very low. This process provides equipment which helps in Indian railways development.

## 7. Future Enhancement

In future, we can use Closed Circuit Television (CCTV) system with Internet Protocol based camera for monitoring the visual videos captured from the track. It also used for increase the security for the both rails and the passengers from crime and attacker. The interrupted power supply for the motor operation and signal can be avoided by a battery charged by means of a solar cell. Automatic slowdown of train when approaching stations without stops may also be implemented as per requirements of Indian railways. Bidirectional gate controlling or Bidirectional train sensing can be introduced in future.

## Reference

[1] Acy M. Kottalil,"Automatic Railway Gate Control System" , International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 2, February 2014, pp. 7619 -7622.

[2] M and K., "Track switching device for two-rail type tracks", U.S. Patent No. 4109584, (1978) August 29.

[3] Krishna, ShishaYadav and Niche, "Automatic Railway Gate Control UsingMicrocontroller", Oriental Journal Of Computer Science & Technology, Vol.6, No.4, page 435-440 December 2013.

[4] Ahmed Salih Mahdi. Al-Zuhairi"Automatic Railway Gate and Crossing Control based Sensors & Microcontroller", International Journal of Computer Trends and Technology, Vol. 4(7), July 2013, pp. 2135-2140

[5] Mrs. Swati Rane1,"Automatic Railway Gate Track Switching with Automated Train, International Journal of Science, Engineering and Technology Research (IJSETR)Volume 4, Issue 4, April 2015

[6] Aditya Kakde1,"Railway Tracking & Gate Control System by Using Android App& Wi-Fi Module" , International Journal of Computer Science Issues, Vol. 9, Issue 1, No 2, January 2012, pp. 237-242

[7] Mrs. Ashwini Sawant1,"Holistic Railway System Control", International Journal of Application or Innovation in Engineering & Management, Volume 4, Issue 3, March 2015.