AUTOMATIC RAILWAY GATE CONTROL USING IR SENSOR

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ABSTRACT

The main aim of our project is to operate and control the unmanned Railway Gate in the proper manner to avoid the accidents in the unmanned railway crossing. In a country like ours where there are many unmanned railway crossings, Accidents are increasing day by day. The railway gate can be operated to prevent the accidents at the level crossing in terms of speed of the train. Automatic Railway Gate Control System is an innovative circuit which automatically controls the operation of Railway Gates detecting the arrival and departure of train at the Gate. This system uses ATmega16A microcontroller with the help of obstacle sensors. It has six obstacle sensors which is used to detect arrival and departure of the train. The system is concern on the hardware development where all electronic components have included. Obstacle sensors are the input components while buzzer, DC motor and LCD display are the output components.

These are controlled by the controller circuit. The microcontroller forms the main unit of the system. It receives input signal from the sensors and sends information to the gate motor driver for opening and closing the gate. Besides, the output signal microcontroller will activate alarm. The first obstacle sensor is fixed at a certain distance from the gate and the second sensor is fixed at the same certain distance after the gate. The gate is closed, when the train crosses the first and the gate is opened, when the train crosses the second obstacle sensor. This system deals about one of the efficient methods to avoid train accidents. In this system we have shown four gates and eight obstacle sensors, two for each gate.

Keywords: Railway gate control, IR sensor, Microcontroller.

1. INTRODUCTION

Railroad is of transition mode, which has an important role in moving passengers and freights. However, railroad-related accidents are more dangerous than other transportation accidents. Therefore, more efforts are necessary for improving its safety. This system is to manage the control system of railway gate using the microcontroller. The main purpose of this system is about railway gate control system and level crossing between railroad and highway for decreasing railroad – related accident and increasing safety. In addition, it also provides safety road users by reducing the accident that usually occur due to carelessness of road users and errors made by the gatekeepers. Railways preferred the cheapest mode of transportation over all the other means. This system is designed using ATmega16A microcontroller to avoid railway accidents happening at railway gates where the level crossings. Microcontroller performs the complete operation i.e., sensing, gate closing and opening. As a train approaches the railway crossing from either side, the sensor placed at a certain distance from the gate detects the approaching train and controls the operation of the gate. This system was operated after signal received from the sensors. This signal is used to trigger the microcontroller for operating the gate motor, alarm system. The main purpose of this system is about railway gate control system and level crossing between railroad and highway for decreasing railroad-related accident and

increasing safety. In addition, it also provides safety road users by reducing the accidents that usually occur due to carelessness of road users and errors made by the gatekeepers. Railways preferred the cheapest mode of transportation over all the other means.

Accident that is Collision of trains with automobiles, at railway crossing covers large percentage of train accidents. Accident causes loss of life and property. Train delay results in economic losses as well affects smooth functioning of train schedule. Accidents at railway crossing are mainly due to personal mistake that is irresponsibility of human being rather than train's mistakes. Accident at railway crossing leads to increased number of deaths, despite several measures taken by the authorities, the railway crossing are the bigger killers, although trespassing into railway track is punishable offence but then also no one cares. It has become a human habit; one can wait for long in cinemas, restaurants etc. but can't wait for crossing to- be clear. Before going deep into the matter, we all must be well aware about the basic meaning of the term" level crossing".

So, what is railway crossing? railway crossing level is an intersection where a railway tracks or lines crosses a road or a highway at same level, this is called railway crossing. And the most important problem that is very difficult to minimize is the careless behavior of the passengers to cross the railway crossing even if the gate is closed and that's how the accidents takes place.

Most of the researchers have worked upon Railway crossing, some have tried to reduce the manual operation by designing railway crossing as total automatic opening and closing of gates and some have made intelligent railway crossing using load sensors etc. But still better technology is needed to minimize the accident. Here, this journal consists interfacing of automatic railway crossing with new technologies and trying to present something ahead of previous researches.

It has been prepared keeping in mind all possible measures for safety of the people. Before going into detail lets have look upon the system setup. It proposes a unique and economical method for improving the safety of our level crossings. Road accidents at a railway gate is a leading cause of death and injury worldwide. Surveys conducted by Indian Railway found that about 18% of total railway accidents in is crossing accidents of which majority occurs at passive railway crossings. The operation of railway gates at level crossings is unreliable nowadays. Primarily the road users have to wait a very time before the arrival of train and even after the train in left. And secondly the accidents that occur by the carelessness of the road users or due to the time errors occur by the gatekeepers. In this project detect the train and warn the road users about the arrival of train. If is found a green signal is given for the train to pass, otherwise a red signal is given to slow down. After they are cleared, the gate is closed and train is passed. We will make sure that the train is passed and reopen the gate. The system deals with two things. Firstly, to provide safety to the road users by reducing the accidents and secondly, it deals with the reduction of time for which the gate is being kept closed. In the automatic railway gate control system, at the level crossing the arrival of the train is detected by the sensor placed at some distance from the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also reduces the human worker. In this project we are using PLC to avoid the error which is occur in the use of microcontroller.

Practically, the two IR sensors are placed at left and right side of the railway gate. The distance between the two IR sensors is dependent on the length of the train. In general, we have to consider the longest train in that route. Now we'll see how this circuit actually works in real time. In this image, we can see the real time representation of this project.
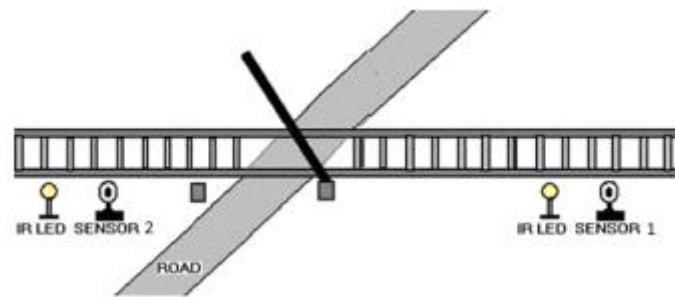
If the sensor 1 detects the arrival of the train, microcontroller starts the motor with the help of motor driver in order to close the gate.
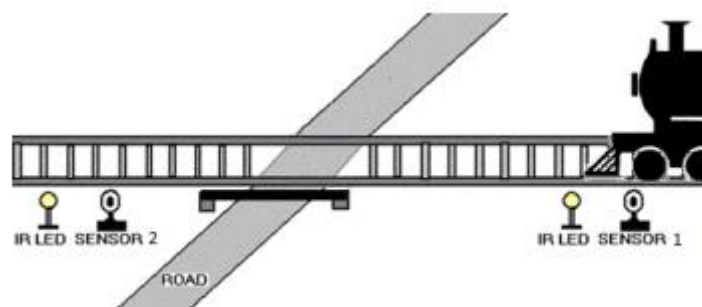
i.   The gate remains closed as the train passes the crossing.
ii. When the train crosses the gate and reaches second sensor, it detects the train and the microcontroller will open the gate.
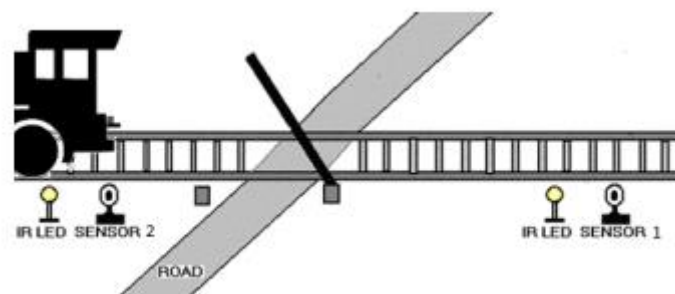

Fig. 1: Automatic gates open and closes.

2. LITERATURE SURVEY

The railway systems in India and other countries are the most commonly used mode of transportation and it is also one of the low-cost modes of transportation. There are thousands of rails running on track every day. In railway systems it is impossible to stop some of the critical situations or emergencies that occur during the running of the train. Every year nearly 20,000 people lose their lives in railway crossing accidents. The system which is used today by the Indian railways at the railway crossings is not reliable and safe. The railway gates are manually operated by a gatekeeper when any communication mismatch occurs while sending the train status to the gatekeeper this will lead to accidents at railway crossing. The present solution is not the best and efficient way to handle railway gates and it is very error prone. A railway crossing is an intersection of a road and a railway track.

It requires human coordination to open and close the gates when the train arrives at the crossing station. Lack of this proper communication to the gatekeeper about train arrival will lead to accidents and loss of human life, loss of property. To avoid the human mistakes which, occur while operating the gates a new automatic railway crossing system is developed using IoT. The second important problem in the manual railway crossing system is that vehicles must wait more time at railway crossings even if the train leaves the crossing station. In manual systems the gatekeeper will close the railway gates when the train is at a distance of 10km from the station and open the railway gates after the train departed the station and it goes 10km away from the crossing station. When the train leaves the station there will be no chance of causing accidents and the vehicles can go now. In order to avoid the number of accidents occurring at railway crossings and reduce the maximum time delay at railway crossing we proposed a solution which is used to automate the manual operations of the railway crossing system using IoT. Our System will provide a smart solution to the railway crossing system and provides a high accurate and reliable solution to operate the railway gates.

In India the Railway Crossing stations are manually operated by the railway gate operator. The railway gate operator is responsible for operating the gates according to the train arrival and departure. The Train arrival and departure information is sent to the gate operator by using the communication devices. The present system is very error prone, and which leads- to many accidents at railway level crossings.

The train information is shared from one crossing system to- another when the train leaves the crossing station. Over 50% of train accidents occur at railway level crossings due to many errors present in the existing system used by the Indian Railways. The method adopted by the Indian railway system is not safe and which is causing more accidents every year.

Railways have one of the largest and busiest networks in the world. So, it is very difficult to manage the railway track in real time especially in winter having dense fog. Accidents in railroad railings are increasing day by day. This project deals with one of the efficient methods to avoid train accidents. There are sections in this project. Here we design a more reliable and easily handled rail track system, which is controlled and co-ordinated by programmed embedded chips. And it controls the railway track switching mechanism automatically. It will reduce the collision of train and will also manage the route of a particular train to avoid any delay in reaching its destination. Also, it replaces the struggle of platform to platform luggage transfers, very helpful for old age peoples who may have problems by over or under bridge and it is possible to move fast from platform to platform with less effort.
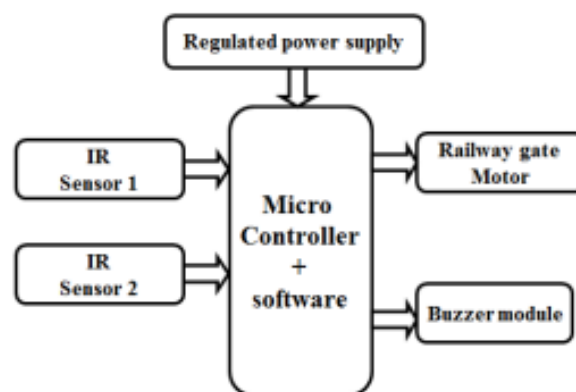
3. PROPOSED SYSTEM

Fig. 2: Block diagram of automatic railway gate using IR sensor.

The above block diagram represents the architecture of the proposed system "Automatic Railway Gate Control". The microcontroller that has been used for this project is ATMEGA16A. It is used as the brain of this project. The function of this section is to collect the information from various parts of the system. Then it makes decision as per the program. Railway Sensors: They are placed at two sides of each gate. It is used to sense arrival and departure of the train. The main control unit of this system is ATmega16A microcontroller, and it can manage the control process of all input and output units. Obstacle sensor circuit is applied to sense the train on the railway track. L293D motor driver is to drive the DC motor for gate open and close control. Alarm unit is utilized for warning the road users. Figure above shows the proposed model of the system. The gate control system consists of two obstacle sensors. The sensors are fixed at the certain distance on both sides of each gate, that is before the train arrive and after the train departure. In this system we have used 8 sensors for 4 gates. When the obstacle sensor1 senses the train, sensors are on state. Then obstacle sensor1 senses the train, microcontroller can control the drive of the gate control motor. A buzzer gets activated when the train is crossing the gate and the railway gate is closed.

When the train passes through the obstacle sensor2, the railway gate is opened. In this time, obstacle sensors are off state. The timing condition for the railway gate control system must be set base on the speed and length of the train into the background algorithm for microcontroller.

For the gate control state, the gate will be closed when the motor move forward direction at certain time until the train has crossed the gate otherwise the gate is opened.
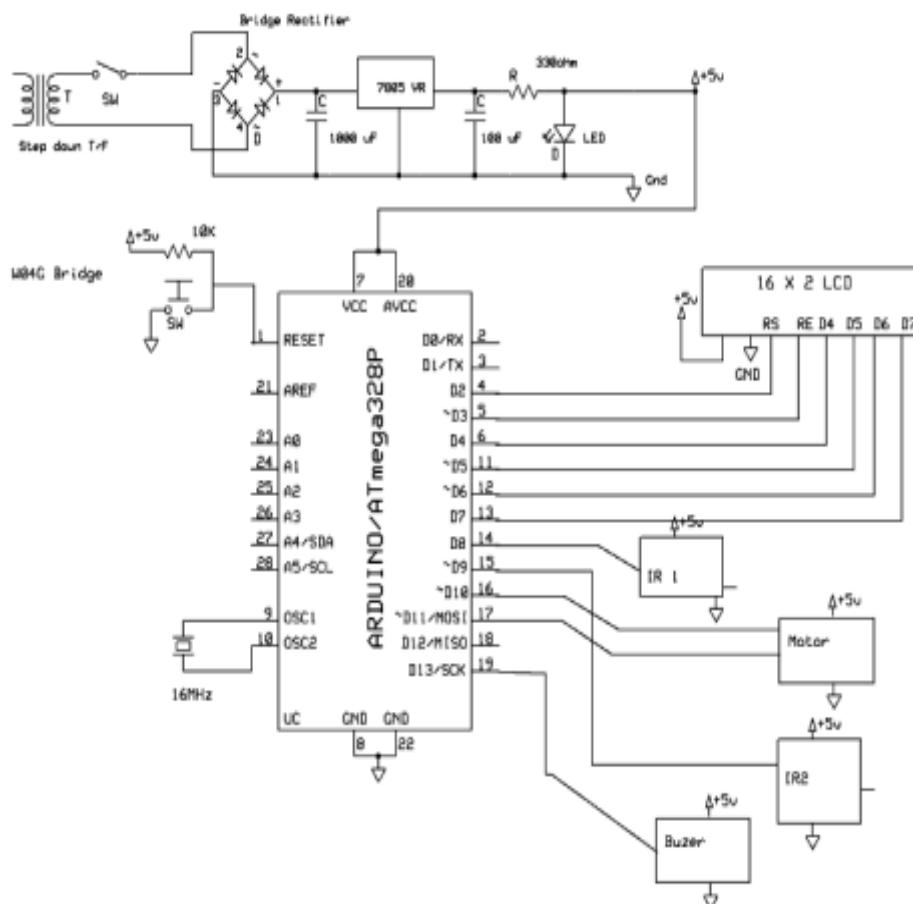

Fig. 3: Pin diagram of automatic railway gate using IR sensor.

4. RESULT

Working Module

5. CONCLUSION AND FUTURE SCOPE

Automated railway crossing system using IR is an effective and best solution to the problems occuring in the manual system used by the Indian railways. This System provides high benefits to the road users and railway management. This system reduces the accidents which are occured at railway crossings and reduces the waiting time of vehicles at railway crossing to maximum extent. As this system does not need any human resources it can be implemented in any remote areas and rural areas where there is no railway gate keeper. The proposed system uses the servo motors to lift the gates and these are very reliable and accurate to lift or down the gate by the specified angle rotation. Finally, we will conclude that the proposed system will have high reliability, high performance and low cost compared to the existing system which is presently in use.

The proposed work has many major advantages it will reduce the accidents occurring at the railway level crossing, it will increase the accuracy and reduce errors occurring due to manual operations. It will reduce the collision of train and will also manage the route of a particular train to avoid any delay in reaching its destination. Train will always be on time at the station no delay will be caused which occurs in manual operation. Security can be implemented by placing tracker in the train in order to

monitor the location of the train in case of any issue. Solar panels can be used to generate power for the system there by increasing the efficiency of the system. As the system is completely automated, it avoids manual errors and thus provides ultimate safety to road users.

Future Scope

By using this project, we can save manpower.

- Here, there is no need of man. The circuit itself checks the presence of vehicle and automatically closes the gate by rising an alarm.
- Once we switch on the circuit, it automatically performs all these actions without mandling.
- It is the most advantage of this project.
- For this reason, in future, this project may be used in railways and also in apartments, military, etc.

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