Fabrication of Automatic Railway Gate Controller

S. Suresh[1], G . Tharachand[2], S. Saravana[2], G. Naresh[2]
[1.] Assistant professor, [2.]UG scholar
Department of Mechanical Engineering,
Hindustan Institute of Technology, Coimbatore.

Abstract:- In everywhere at level crossing between railroad and highway there are so many railway accidents happening due to the carelessness in manual operations or lack of workers. So, this paper describes the automatic railway gate control system using PIC microcontroller for saving precious human lives and preventing major disasters in railway track. Railway gate may be saved for the road users to prevent accidents in terms of train speed at level crossing. This system uses PIC 16F877A microcontroller with the help of sensors. It can divide into two parts. The first part is concern on the hardware development where all electronic components have included. IR sensors, inductive sensors are the input components while buzzer, light indicator, 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 input signal will active LCD display and alarm and indication light circuit was provided as additional part of this system. The first inductive sensor and IR sensor are fixed at a certain distance from the gate and the second sensors are fixed at the same certain distance after the gate. The gate is closed, when the train crosses the first IR sensor and the gate is opened, when the train crosses the second IR sensor. This system deals about one of the efficient methods to avoid train accidents. The second part is based on software programming to operate the hardware structure. Program for railway gate control system is based on PIC microcontroller with PIC basic Pro language. Keywords – Automatic Railway Gate, Level Crossing, Sensors, PIC 16F877A, DC motor.

INTRODUCTION:

Railroad is one of transition mode, which has an important role in moving passengers and freights. However, railroad-related accidents are more dangerous than other transportation accidents. The 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 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. This system is designed using PIC 16F877A 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 sensors 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 and light indicators. This system also can be used in parking gate controlling and sliding door system. The abstraction of this system is to provide the advanced control system available to everywhere.

Hardware Implementation:
The materials and components that are used in automatic railway gate control system will be discussed in the following. As in normal control design, system can be roughly divided as input, output and processing sections. The main components of system are: 1. Microcontroller PIC 16F877A microcontroller is used as a main control unit to control the process of the whole system. 2. Railway Sensors They are placed at two sides of gate. It is used to sense the arrival and departure of the train. 3. Motor Driver The H-Bridge uses the four transistors motor driver circuit that are used to rotate forward or reverse direction of DC motor for opening and closing the gate. 4. LCD Display It displays the railway gate open or close section and warning message for road users. 5. Buzzer and light signal They are used to warn the road user about the approach of train. 6. Power Supply.

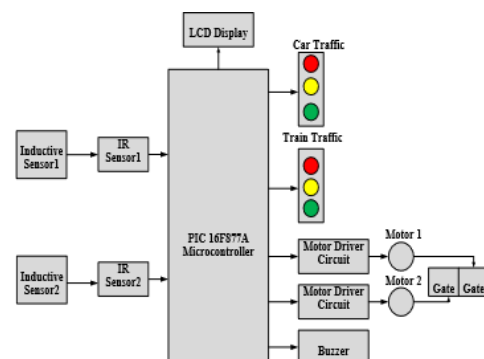## III. OVERVIEW OF THE SYSTEM A. BLOCK DIAGRAM DESCRIPTION:

Fig.1. Block Diagram of Railway Gate Control

Fig. 1 shows over all block diagrams for railway gate control system by using microcontroller (PIC 16F877A). So, one PIC 16F877A microcontroller is used to operate the following function of the railway gate control system:

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1. To sense the arrival and departure of the train 2. To open and close the railway gate automatically by using two dc motor 3. Buzzer and light signal for warning the road users 4. Display the status of the railway gate system with LCD modules A motor driver circuit is used to drive the gate motor for opening and closing gate. This system uses buzzer and light signal for warning the road users. The PIC microcontroller controls all the system. The main program of the railway gate control system is written in PIC 16F877A microcontroller and which is created by PIC Basic Pro Programming Language.
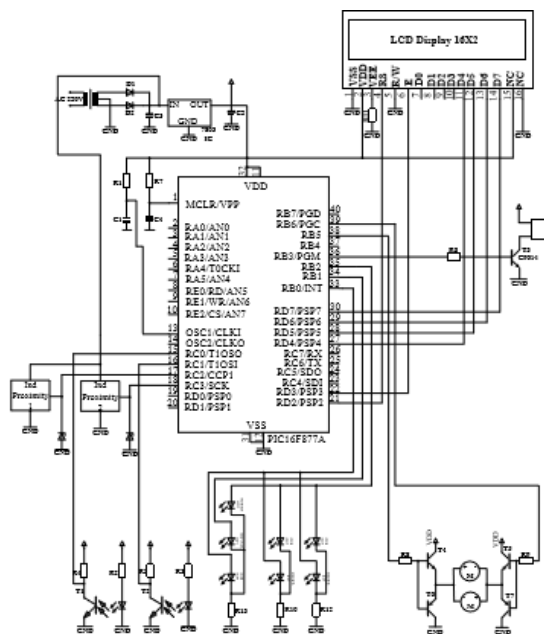
IV. CIRCUIT DESCRIPTION:

Fig.3 Overall Circuit Diagram of the System

Figure 3 shows the Automatic Railway Gate Control by using PIC 16F877A microcontroller. Automatic railway gate control system is accomplished to use various electronic components. This system can be simply divided into three main categories: the input, the processing and the output units. The detail circuit diagram of the railway gate control system is shown. This system composed of sensor circuits, microcontroller, motor driver, LCD display, alarm system, light signal system and power supply.

The main control unit of this system is PIC 16F877A microcontroller and it can manage the control process of all input and output units. Infrared sensor circuit is applied to sense the train on the railway track. The LCD display is used to show the arrival and departure messages of the train. H- Bridge motor driver is to drive the DC motor for gate open and close control. Alarm unit is utilized for warning the road users. Figure 4 shows the proposed model of the system. The gate control system consists of two infrared sensors and two inductive sensors. The sensors are fixed at the certain distance on both sides of the gate, that is before the train arrive and after the train departure. When the inductive sensor1 senses the train, IR sensors are on state. Then IR sensor1 senses the train, microcontroller can

control the drive of the gate control motor. At the same time, the light signal of the car traffic is changed from Green color to Red color and the train traffic is changed from Red color to Green color. A buzzer gets activated when the train is crossing the gate and the railway gate is closed. When the train passes through the IR sensor2, the car traffic is changed from Red color to Green color and the train traffic is changed from Green color to Red color. At the same time, the railway gate is opened. And then, train passes through the inductive sensor2. In this time, IR 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 material.
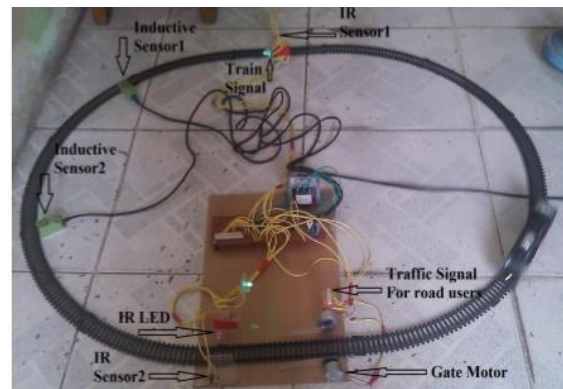
Working:

Fig.4 Proposed Model

An H-Bridge allows bidirectional control of a DC motor. To achieve this, it uses four transistors. Each transistor acts as a simple on-off switch as shown in fig.7. This circuit is called an H-Bridge because the transistors are arranged in an H pattern. When the transistors Q1 and Q4 are closed, the motor rotates in one direction for closing the railway gate. When the transistors Q2 and Q3 are closed, the motor rotates in opposite direction for opening the railway gate. When all the transistors are opened, the motor is stopped. The PIC

microcontroller controls an H-Bridge made of four transistors which consists of two NPN transistors, two PNP transistors and resistors. V. Advantages ☑ Reduces chances of human error. ☑ Less time consuming. ☑ No human resource is required. ☑ Safety and quality of services Accident avoidance

VI. Discussion The sensors sense the input and sends to the microcontroller, where if responds and gives command to the particular component with predefined algorithm. 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 which can be easily changed and modified using microcontroller. The DC motor is controlled by the microcontroller for rotations by calculating the code of proper delay in to the microcontroller. This system, a scaled down model attempts to mimic the real time Railway Gate control. This can be realized in real time with the higher horse power

motors, controlled by Programmable Logic Controllers and through several Distributed Control Systems (DCS). Employing the automatic railway gate control system at the level crossing may offer several advantages for public. Since, the operation is automatic; error due to manual operation is prevented. VII.

CONCLUSION:

Automatic gate control system 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. Since the design is completely automated it can be used in remote villages where no station master or line man is present. Railway sensors are placed at two sides of gate. It is used to 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. The LCD display shows the status of the railway gate control system. The system can also generate buzzer and light indicators while the train passing through the level crossing. In this system, this is controlled by using PIC 16F877A microcontroller. Now a day's automatic system occupies each and every sector of applications as it is reliable and accurate.

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