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Microcontroller Based Automatic Railway Gate Control System for Unmanned Level Crossing

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Abstract— In the rapidly flourishing country like ours, accidents in the unmanned level crossings are increasing day by day. No fruitful steps have been taken so far in these areas. Our paper deals with automatic railway gate control at a level crossing which replacing the gatekeepers, It deals with two things, First it deals with the reduction of time for which the gate is being kept closed and secondly, to provide safety to the road users by reducing the accidents. By employing the microcontroller based automatic railway gate control at the level crossing, the arrival of the train is detected by the sensors placed near to the gate. Hence, the time for which the gate is closed is less compared to the manually operated gates. As the operation is automatic; error due to manual operation is prevented. This microcontroller based automatic railway gate control is designed for almost all the unmanned level crossing.

Keywords: Railway gate, level crossing.

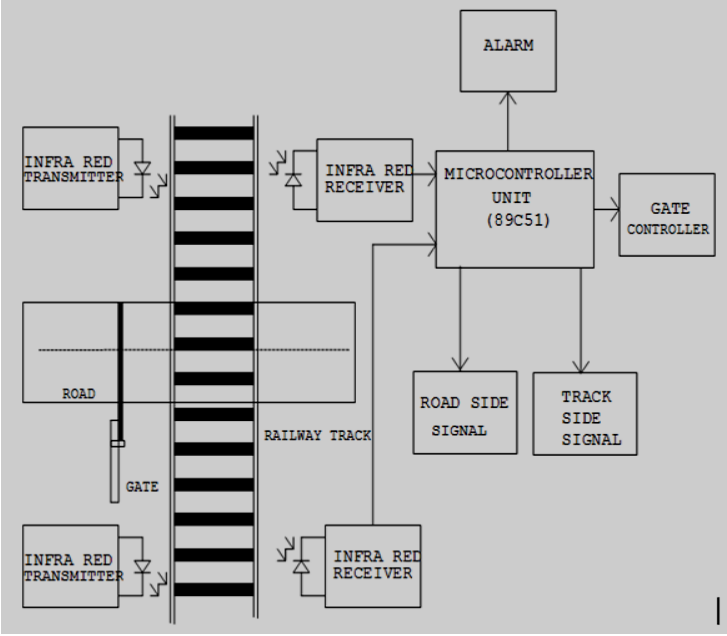
I. INTRODUCTION

According to the statistics from 2009-2015, there were about 800 railway accidents and more than 30% of these accidents were due to unmanned level crossing. About 1800 people were injured and more than 500 were dead. In mostly cases the crashes occurred when the driver do not pay attention to the warning devices. The main problem around railway crossing is that the motorists drive around the crossing the gates while they are down.So, more efforts are required for railway crossing safety. In India over thousands of trains are running on tracks every day.There are many unman railway crossings on the tracks which are susceptible to accidents.In this project we detect the arrival of train and warn the road users about the arrival of train .If no obstacle is found a green signal is given for the train to pass, otherwise a red signal is given to slow down. After the obstacles are cleared, the gate is closed and train is passed. We will make sure that the train is passed and reopen the gate[4].

II. PROJECT DESCRIPTION

Our project is designed using 8051 microcontroller to avoid railway accidents happening at unattended railway gates. This project utilizes two IR trans-receiver pair; one pair of IR trans-receiver is fixed at one side of the railway gate and similarly the other pair is fixed at the other side of the railway gate. Whenever a signal from any of the transmitter- receiver is detected a buzzer is sounded for say five seconds and then the gates are closed we will be using DC geared motor to open and close the gates. Now when the train is again detected at other IR trans-receiver the gates are opened. We will be using L293 driver IC to control the motor i.e. open and close the gates.

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. Automatic railway gate control is highly economical microcontroller based arrangement, designed for use in almost all the unmanned level crossings in the country.



III. BLOCK DIAGRAM DESCRIPTION

The block diagram consists of six major blocks,they are IR sensors, Microcontroller, L293D, dc motor, gate and power supply

A. IR TRANSMITTER

In this circuit IC555 is used as an astablemultivibrator mode, producing continuous waveform for transmission. The output from this IC is given to the amplifier circuit and connected to the IR LED. Here the electrical signal is converted into light energy.

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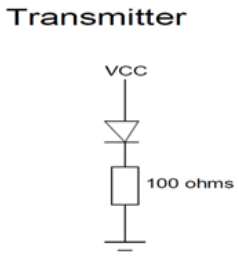
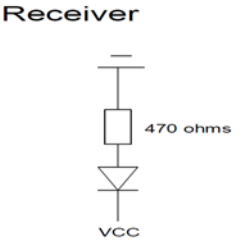


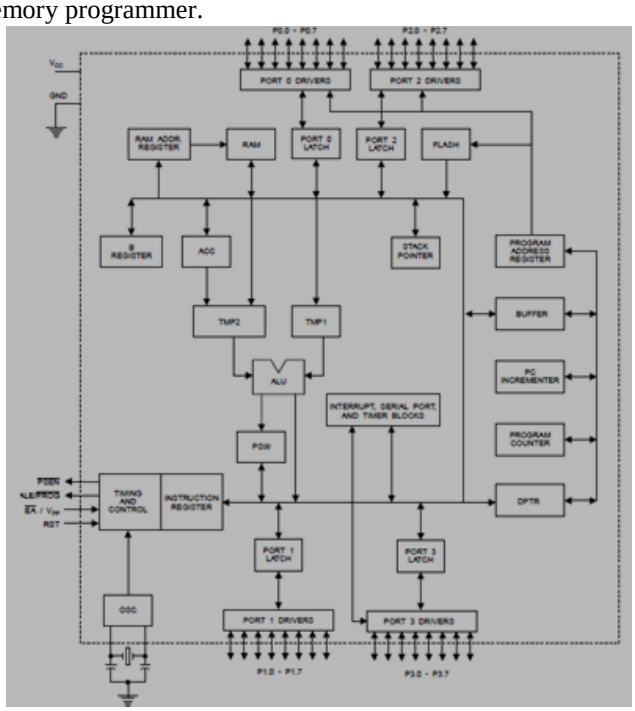
B. IR RECEIVER

In this circuit the IC 555 is used as a monostablemutivibrator. The light signal from the IR transmitter is directly focused towards the IR receiver Photo Diode and given to the preamplifier section formed by the transistors. The output from the 555 is interfaced with micro controller. The receiver receives the signal directly. Any interruption will be sensed by cutting the signal.



C. MICRO CONTROLLER

Microcontroller used here is an ATMEL 89C51. The AT89C51 is a low power high performance CMOS 8 bit microcomputer of flash programmable and erasable read only memory. The on-chip flash allows the program memory to be reprogrammed in system or by a conventional non-volatile memory programmer.



FEATURES:

- Compatible with MCS-51™ Products
- 4K Bytes of In-System Reprogrammable Flash Memory
- Fully Static Operation: 0 Hz to 24 MHz
- Three-Level Program Memory Lock
- 128 x 8-Bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-Bit Timer/Counters
- Six Interrupt Sources
- Programmable Serial Channel
- Low Power Idle and Power Down Modes

D. LIMIT SWITCH

A mechanical limit switch interlocks a mechanical motion or position with an electrical circuit. A good starting point for limit-switch selection is contact arrangement. The most common limit switch is the single-pole contact block with one NO and one NC set of contacts. It is used to detect the gate position and the signal is given to the microcontroller.

E. GATE CONTROLLER CIRCUIT

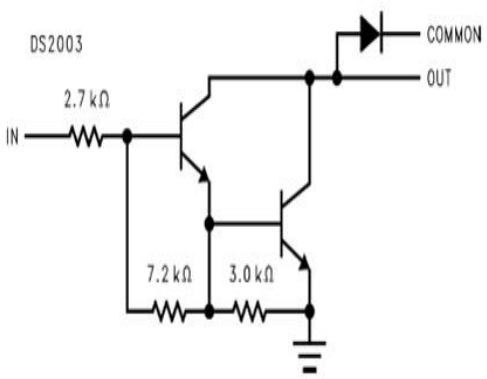
The motor control unit controls the direction of rotation of the DC motor, when is mechanically coupled to the shaft. The signal output from the optocoupler circuit s given to the motor control unit through CMOS bilateral CD4066 switch.

F. DRIVER CIRCUIT:

The ULN2003 is comprised of seven high voltage, high current NPN Darlington transistor pairs. All units feature common emitter, open collector outputs. To maximize their effectiveness, these units contain suppression diodes for inductive loads and appropriate emitter base resistors for leakage. The ULN2003 has a series base resistor to each Darlington pair, thus allowing operation directly with TTL or CMOS operating at supply voltages of 5.0V.

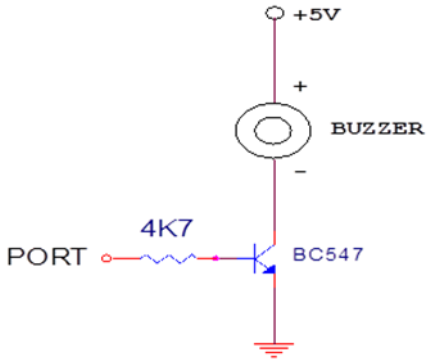
FEATURES

- Seven high gain Darlington pairs
- High output voltage (VCE = 50V)
- High output current (IC = 350 mA)
- TTL, PMOS, CMOS compatible
- Suppression diodes for inductive loads



G.ALARM UNIT:

The buzzer is used in the alarm circuit; it includes one switching transistor to switch the buzzer when the train is crossed.



H. POWER SUPPLY:

A power supply circuit is very essential in any project. This power supply circuit is designed to get regulated output DC voltage. 7805 IC is used to give the constant 5v supply. Bridge rectifiers using diodes is used for rectifying purposes. The power supply section is for supplying voltages to the entire circuit unit.

I. MOTOR SUPPLY:

A power supply circuit is very essential in any project. This power supply circuit is designed to get regulated output DC voltage. The mains voltage ac 230v is step down to 9 volt, using 9v step down transformer. Bridge rectifiers using diodes is used for rectifying purposes. The rectified unidirectional DC is smoothed by filter capacitor. This fed to the supplying voltages to the motor circuit unit.

APPLICATIONS

1. It is used to Avoids major accidents in the track.
2. It is used for Saves the human life.
3. It is used to avoid the manual operation.

IV. CONCLUSION

The project work" Automatic Railway Gate Control", Now a days so many accidents are happen at railway gate because of manual control. To avoid this severe accidents we have to change manual work to this latest technology (Automatic Railway Gate Control), we can avoid maximum number of accidents.

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