International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE) Vol 2, Issue 10, October 2015

Automatic Railway Gate Control System

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***Abstract:*— In India casualties due to road as well as rail accidents predominates. When we look at a single road mishap ,only a few succumbs but ,in a single rail accident hundreds to thousand tombs are laid. The objective of this paper is to provide an automatic railway gate at the level crossing ,thus replacing the present technique of manual operation done by humans. Also this type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is needed. Since, the operation is automated, mortal accidents can be prevented . This proposed system uses Adriano Uno microcontroller and IR sensors .**

I. INTRODUCTION

The paper deals with a topic of much contemporary relevance. It proposes a unique and economical method for improving the safety and agility of our level crossings.Today the road commuters have to wait for a very long time, before the train arrives and even after the train shunts away. Careless gatekeepers are humans,with low profile job and thus tend to make offences . Automated railway gate control system ,firstly deals primarily with the reduction of time for which the gate is closed and secondly provides safety to the road users by reducing the accidents. In this design, at level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which the gate remains closed is less compared to the manually operated gates .It also reduces the human labour. The whole point of using Arduino is to provide user friendly platform and fast prototyping. In simple words being able to hook up an LCD and being able to display messages on it, in a matter of few minutes, instead of hours is the main objective

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II. PROPOSED METHODOLOGY

Using Arduino simplifies the amount of hardware and software development you need to do in order to get the system running.

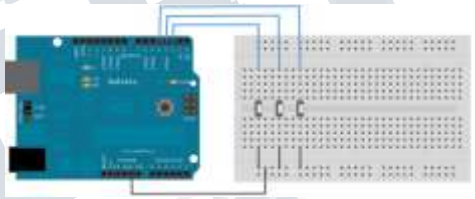


Fig (a)

A.Arduino Uno

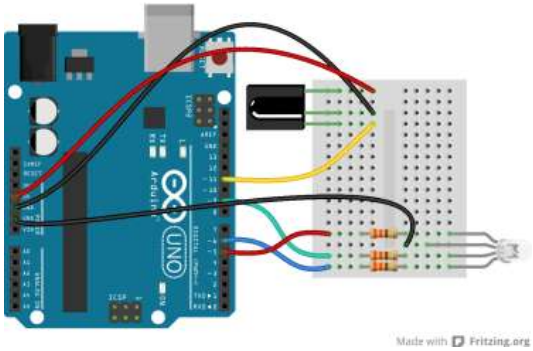
Arduino Uno is a microcontroller board based on the ATmega328. It contains 14 digital input/output pins ,of which 6 can be used as PWM outputs, 6 for analog inputs,a 16 MHz ceramic resonator, a USB connection, a power jack, an a ICSP header, with a reset button. It contains everything required to support the microcontroller. The microcontroller is connected to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started,that's it!

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features theAtmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

B. IR CIRCUIT

This circuit has two stages: a transmitting unit and a receiving unit. In the transmitter consists of an infrared LED and its associated circuitry.

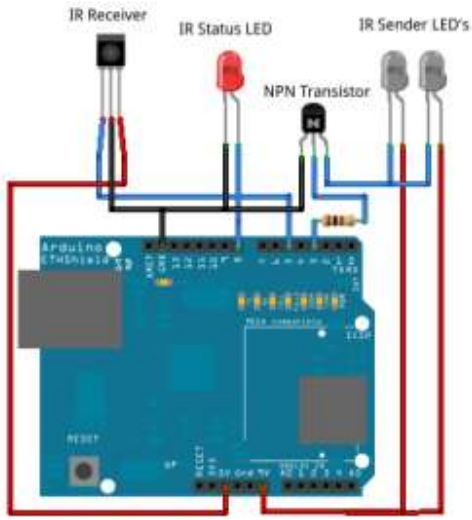
C.IR TRANSMITTER



Fig(c)

An electroluminescent IR LED is a product which requires care during use. IR LEDs are fabricated from narrow band hetero structures having energy gap from 0.25 to 0.4ev. Also Infra red transmitter emits IR rays in a planar wave front manner. property of IR is used here.

D.IR RECEIVER:

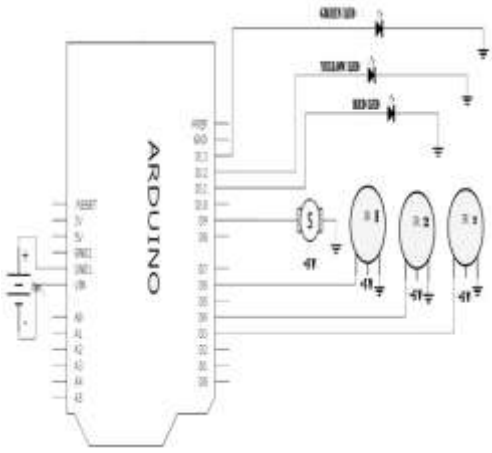


fig(d)

Infrared photo receiver is a two terminal PN junction device, operating in the reverse bias. It contains a small transparent window, which permits light to strike the PN junction. The photodiode is a type of photodetector which converts light into either current or voltage, (depending upon the requirement). Most photodiodes look similar to LED's.They have two wires, coming from the bottom. The shorter end of the two is the cathode, while the longer end is anode.

A photodiode consists of a PN junction. When a photon of sufficient energy strikes the diode, it excites the electron thereby creating ,a mobile electron and a positively charged electron hole. If the absorption takes place in the depletion region of junction, or one diffusion length away from it, these carriers are brushed from the junction by the built-in field of the depletion region. Thus holes move toward the anode, and electrons toward the cathode, and a photocurrent is produced.

III. CIRCUIT DIAGRAM



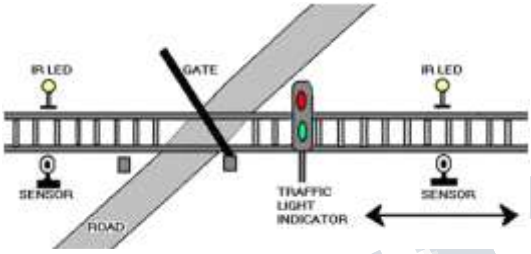
fig(e)

One of the major advantages of this system is that it has simple circuit and working principle. The circuit is divided into three major parts. With the first one being the microcontroller section ,and second being the IR sensor section kept on rail and the third is the servo motor which is used for operating the gate . All of them have been discussed in detail in coming sections. The figure shows the detailed circuit diagram . By employing the automated railway gate control at the level crossing, the sensor placed on either side of the gate at about 4-5 km from the level crossing detect the arrival of train. Once the arrival is sensed, the sensed signal is transmitted to the microcontroller .Then it checks for possible presence of vehicle between the gates, again using sensors. Simultaneously, buzzer indication and

light signals on either side are provided to the road users indicating the closing of gates. When no vehicle is sensed in between the gate the motor is activated and the gates are shut.

Even then if we consider the worst scenario of any obstacle being sensed inside the gates later, it will be indicated immediately to the train driver by signals (RED) placed at about 2km, so as to bring it to halt well before the level crossing.

Animated diagram of working



fig(e)

Track switching: Considering a circumstance , where an express train and a local train are on the same track in opposite directions. The express train runs on the same track and the local train switches on to the other track. Indicator lights have been used to serve this purpose i.e. to avoid collisions. In this, switching operation is performed using a stepper motor. In practical situation this can be achieved using electromagnets.

IV. CONCLUSION

The circuit of this project was designed and was worked out on a breadboard. It was found to be reliable and stable. Also by using Arduino we were able to achieve a quick response. Our project is a mandatory advancement to be employed for today's railway crossings due to the increased number of fatal mishaps .And also due to the problems faced by the road commuters as they wait for a longer time during the passage of train unnecessarily.

ACKNOWLEDGMENT

We express our gratitude to the Head of the Department of Information And Telecommunication Engineering for providing us with the necessary arrangement and requirements. We also thank our faculty advisor N.Showme for her valuable guidance. We express our sincere gratitude to our guide Asst. Professors, Department of Information And Telecommunication Engineering as without her valuable guidance and support the project would not have been a success. We thank her for the encouragement and guidance extended to us.

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