

# AUTOMATI RAILWAY GATE CONTROL SYSTEM USING ARDUINO

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**ABSTRACT-** The railway gate is to be controlled so that the road traffic is to be predicted the railway gate is to be closed when a train is passing by the way. The opening and closing of the gate is to be done using stepper motors and this stepper motor is controlled by micro controller. The signalling of the train is also controlled depending upon the gate position. Only when gate is closed the green signal is otherwise red signal. So, in this project the railway signalling includes the gate control is done using microcontroller. The automatic opening and closing of the gate and also the signalling which depending on the gate position that will be controlled by the microcontroller.

**KEYWORDS-** Ultra sonic sensor, Arduino UNO,

Servomotor, LED, LCD, Buzzer, Gate.

## I. INTRODUCTION

This paper deals with a topic of much contemporary relevance. It proposes a unique and economical method for improving the safety of our level crossings. Road accidents at railway gate are a leading cause of death and injury worldwide. Surveys conducted by Indian Railway found that about 17% of total railway accidents in India is crossing accidents of which majority occurs at passive railway crossings. The operation of railway gates at level crossings is not so reliable nowadays. Primarily the road users have to wait a very long time before the arrival of train and even after the train are left. And secondly the chances of accidents that usually made by the carelessness of the road users or due to the time errors made by the gatekeepers is more. Here comes the importance of automatic railway gate control system. 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. The system deals with two things. Firstly, it deals with the reduction of time for which

gate is being kept closed. And secondly, to provide safety to the road users by reducing the accidents. In the automatic railway gate control system, at the level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also reduces the human labour.

Present project is designed using 8051 microcontrollers to avoid railway accidents happening at unattended railway gates, if implemented in spirit. We have considered 5 seconds for this project. Sensors are fixed at 1km on both sides of the gate. We call the sensor along the train direction as 'foreside sensor' and the other as 'aft side sensor'. When foreside receiver gets activated, the gate motor is turned on in one direction and the gate is closed and stays closed until the train crosses the gate and reaches aft side sensors. When aft side receiver gets activated motor turns in 5 opposite direction and gate opens and motor stops. buzzer will immediately sound at the fore side receiver activation and gate will close after 5 seconds, so giving time to drivers to clear gate area in order to avoid trapping between the gates and stop sound after the train has crossed.

The same principle is applied for track switching. Considering a situation where in an express train and a local train are traveling in opposite directions on the same track; the express train is allowed to travel on the same track and the local train has to switch on to the other track. Two sensors are placed at the either side of the junction where the track switches. if there's a train approaching from the other side, then another sensor placed along that direction gets activated and will send an interrupt to the controller. The project is simple to implement and subject to further improvement.

## II. PROBLEM STATEMENT

The main intention is to control the railway gate using microcontroller at the same time providing the signalling to indicate the position of the gate i.e., open or close. It means when train is passing gate is closed and green signal indicates its position to the railway crossing vehicular and when the train pass over the railway crossing gate is open indicating by red signal.

## III – METHODOLOGY

Based on our problem statement, we have created a prototype to implement an automatic railway gate control system using Arduino considering all aspects of assembling the hardware components. This project utilizes two powerful ultra sonic transmitters and receivers; one pair of transmitter and receiver is fixed at upside (from where the train comes) at a level higher than a human being in exact alignment and similarly the other pair is fixed at down side of the train direction. Sensor activation time is so adjusted by calculating the time taken at a certain speed to cross at least one compartment of standard minimum size of the Indian railway. All the devices such as ultra sonic sensor, servomotor, LED, LCD, buzzer, and power supply are connected to microcontroller.

## IV. COMPONENTS USED

### A. ARDUINO UNO

Arduino board consist of the USB connection port used for providing connection to the computer, A port for power supply, Micro-Controller for programming-based analysis of system, Analog as well as Digital pins for connection as per requirement which can be done by using male to male or male to female connecting wires, Ground, Rx/Tx which is receiver and transmitter LEDs are also available within the Arduino board.

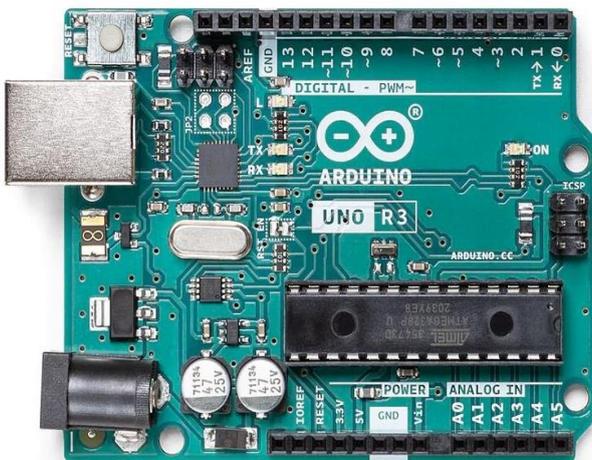


Figure 1: ARDUINO UNO

### B. ULTRA SONIC SENSOR

Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception.



Fig 2: Ultra Sonic Sensor

### C. SERVOMOTOR

Servo motor is nothing but a part of closed-loop system. It consists of various parts like shaft (for rotation), an amplifier, a control circuit (for controlling the rotation mainly) and an encoder or resolver. A servo motor has the capability of rotating the parts of machines with high efficiency and precision on its own that's why it is self-contained electrical device.

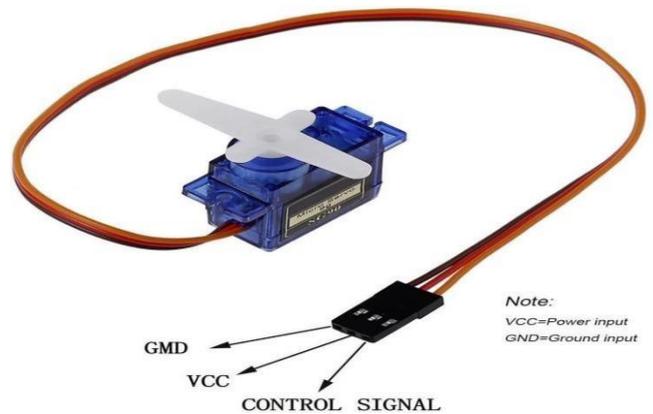


Fig 3: Servo motor

### D. BUZZER

A buzzer is a device which is used to make a beeping noise. The most commonly used buzzer is piezoelectric buzzer. A piezoelectric buzzer is just made up of a flat piece of piezoelectric material which is having two electrodes. This type of buzzers requires an oscillator or something else like microcontroller to derive. If D.C supply is given, it will give a click. The buzzers are used where we want something which gives an audible noise.



Fig 4 : Buzzer

### E. LIGHT EMITTING DIODE

LED is nothing but Light emitting diode. LED is a two-lead semiconductor light source. It is a p-n junction diode emitting light when it gets activated. On applying suitable voltage to the leads, electrons are able to recombine with minority charge carriers producing current which help in conducting light.

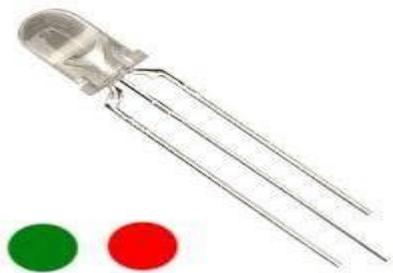


Fig 5: Light Emitting Diode

### F. DC POWER SUPPLY

A DC power supply provides direct current (DC) voltage to power and test a device under test such as a circuit board or electronic product. A DC power supply typically sits on an engineer's work area or bench and is often referred to as a bench power supply.

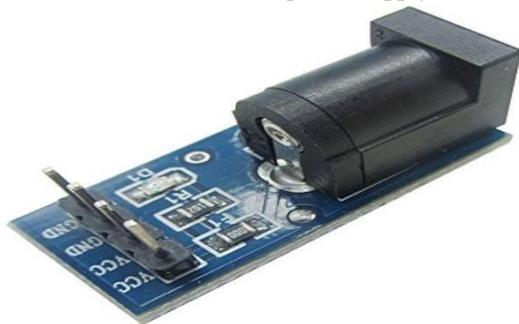


Figure 6: DC Power Supply

### G. LIQUID CRYSTAL DISPLAY

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

- The declining prices of LCDs.

- The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.



Figure 7: LCD

## V. Block Diagram

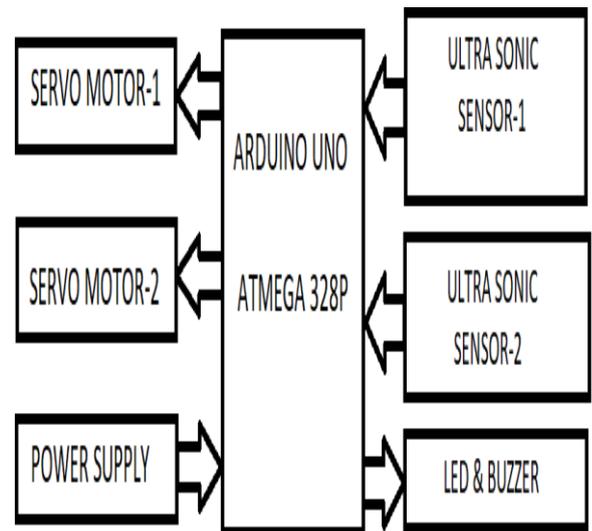


Figure 9: Block Diagram

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## CONCLUSION

Automatic gate control system offers 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 8051 microcontroller. Now a day's automatic system occupies each and every sector of applications as it is reliable and accurate.

## RESULT

The automatic railway gate control system using ultrasonic sensors and Arduino uno. The sensors detect the train arrival and gives the signal to the Arduino uno through wired connection. The Arduino uno will work through the code and gives the signal to the servo motors. The two servo motors is connected to the 2 gates and rotate the gates in 180 or 90 degrees. When the train detected by the sensor 1 the gates will be closed and when the train detected by the sensor 2 the gates will be opened. The LCD display will display the opening and closing of the gate and also distance of the train and sensor. When train is detected by the sensor the LED will on and buzzer will sounds as beeping.



Fig 10: Complete Project Kit

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