AUTOMATIC RAILWAY GATE CONTROLLER

ABSTRACT

Automatic Railway Gate Control System is a simple but very useful project, which help is automatically opening and closing the railway gate upon detecting arrival or departure of the train. In general, Railway gates are opened or closed manually by a gate keeper. The information about arrival of train for opening or closing of door is received from nearby station. But some railway crossings are totally unmanned and many railway accidents occur at these unmanned level crossings. To avoid the human intervention at level crossings completely, we need to automate the process of railway gate control. The railway gate automation aims to deal with two things. It reduces the total time taken for the gate operation at the level cross and also ensures the safety of the passengers at the level cross during when the train passes. The reduction in the direct human intervention during the gate operation in turns helps to reduce the collisions and accidents at the level cross. Since the gate operations are automated based on the sensors, the time for which the gate closed is less.

INTRODUCTION

The railway gate or level crossing is opened or closed by a gateman who was informed from the nearest railway station about the arrival of a train. There're also many level crossings in India which are unmanned. So, they are potentially dangerous for road users. In India we must develop a prototype to be implemented to automatically control railway gate upon arrival as well as departure of train. The project should not be too much expensive but must be reliable. So, we used Arduino uno R3 which is quite reliable as well as affordable. We started to develop our project based upon 8051 microcontroller which is also cheaper than Arduino. But in terms of reliability and implementation of future featured we upgraded to Arduino uno. Railway gates are opened or closed manually by a gate keeper. To avoid human intervention at crossroads completely, we need to automate the method of railway gate control. Automation basically means to devise a method to reduce or eliminate human efforts or intervention. This project represents a unique and economical method for improving the security of our crossing road accidents at railway. The gate is the leading reason for death and injury worldwide. Automatic railway gate control is extremely microcontroller-based based arrangement, designed to be used in an area where chances of accidents are high, and safety plays important role rather than economic aspects.

NEED FOR THE PROJECT

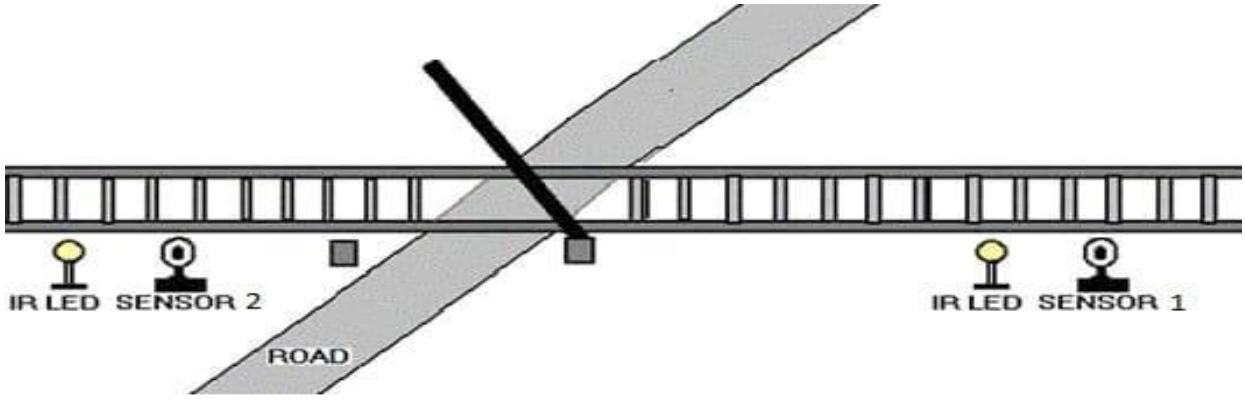
Automatic railway gate control system is centered on the idea of reducing human involvement for closing and opening the railway gate which allows and prevents cars and humans from crossing railway tracks. The railway gate is a cause of many deaths and accidents. Hence, automating the gate can bring about a ring of surety to controlling the gates. Human may make errors or mistakes so automating this process will reduce the chances of gate failures. Automation of the closing and opening of the railway gate using the switch circuit reduces the accidents to a greater extend. The obstacle detection system implemented reduces the accidents which are usually caused when the railway line passes through the forest. Most of the times greater loss has been caused when animals cross the tracks. The limitation of this project is the use of IR sensors. Hence, any obstacle in the way of the sensor will be detected. Another important limitation is that this project does indeed close and open the gate but it cannot control the crossing of cars and vehicles. It only controls the gate. To combat this problem pressure sensors can be used as extension to the present work. We are using IR sensors but it is better to use load sensors. We have not used load sensors because it was not economically feasible. As a future scope of work, our system can be implemented in real time by fixing the current limitations using new technologies.

PROPOSED WORK

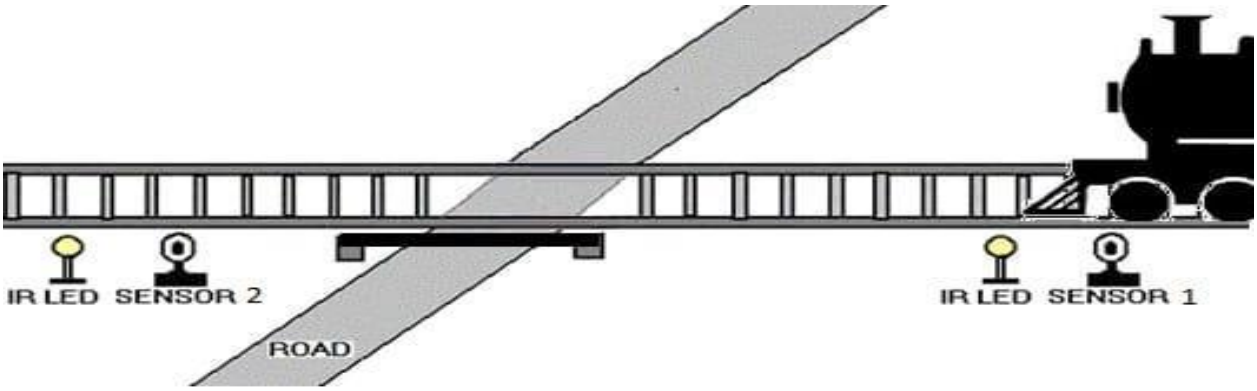
Automatic Railway Gate Controller system with high-speed alerting system is an innovative circuit which automatically controls the operation of railway gates detecting the arrival and departure of trains at the gate.

It has detectors at the far away distance on the railway track which allows us to know the arrival and departure of the train. These detectors are given to microcontroller which activates the motors which open/close the railway gate correspondingly. 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. Security can be implemented by placing tracker in the train in order to monitor the location of the train in case of any issue.

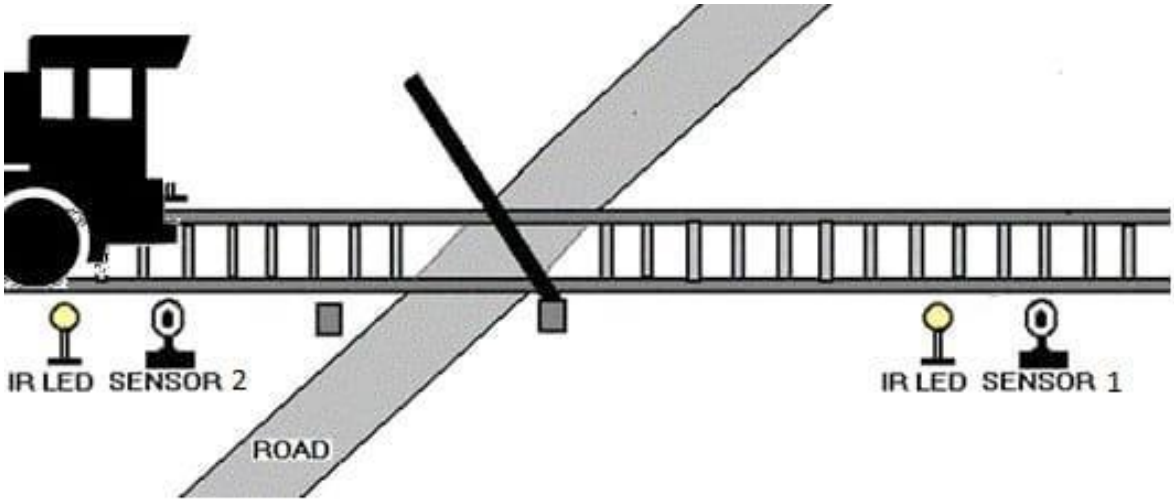
SENSOR 1 DETECTS:



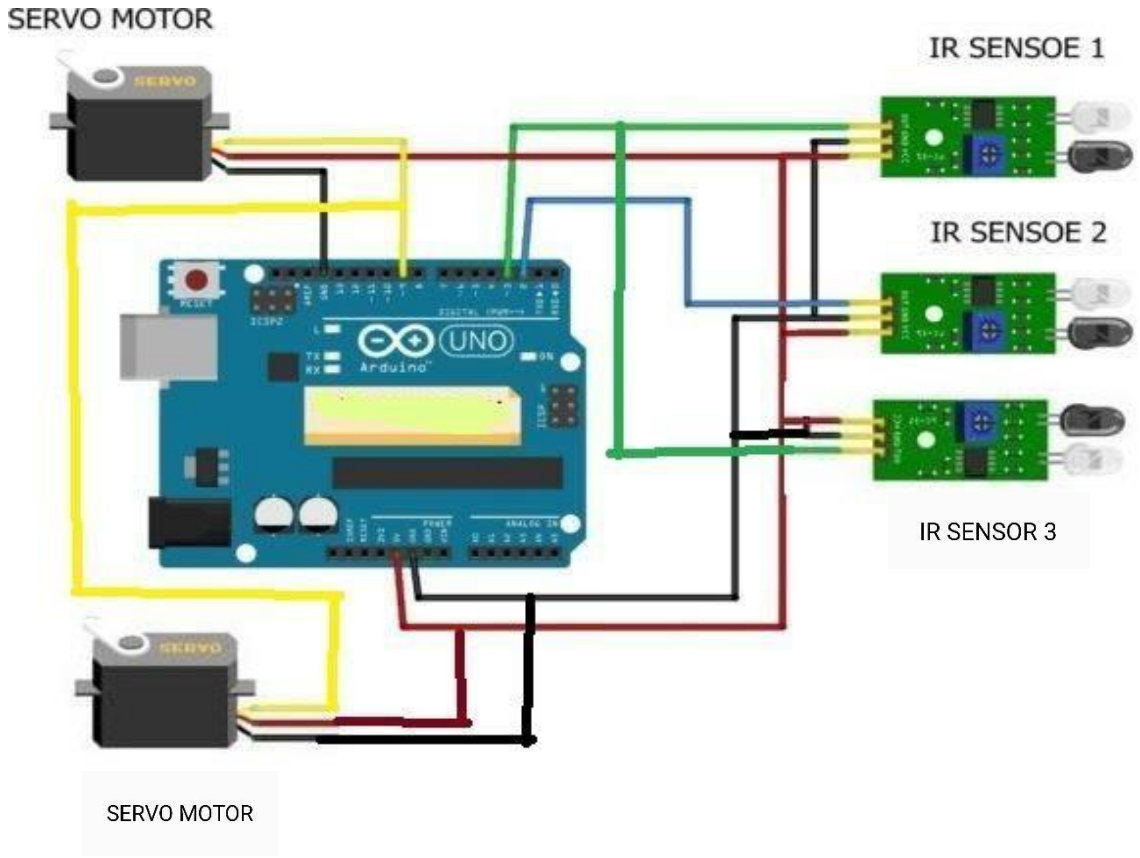
THE GATE REMAINS CLOSED AS THE TRAIN PASSES THE CROSSING:



WHEN TRAIN CROSSES THE REACHES THIRD SENSOR AND DETECTS TO OPEN THE GATE:



BLOCK DIAGRAM:



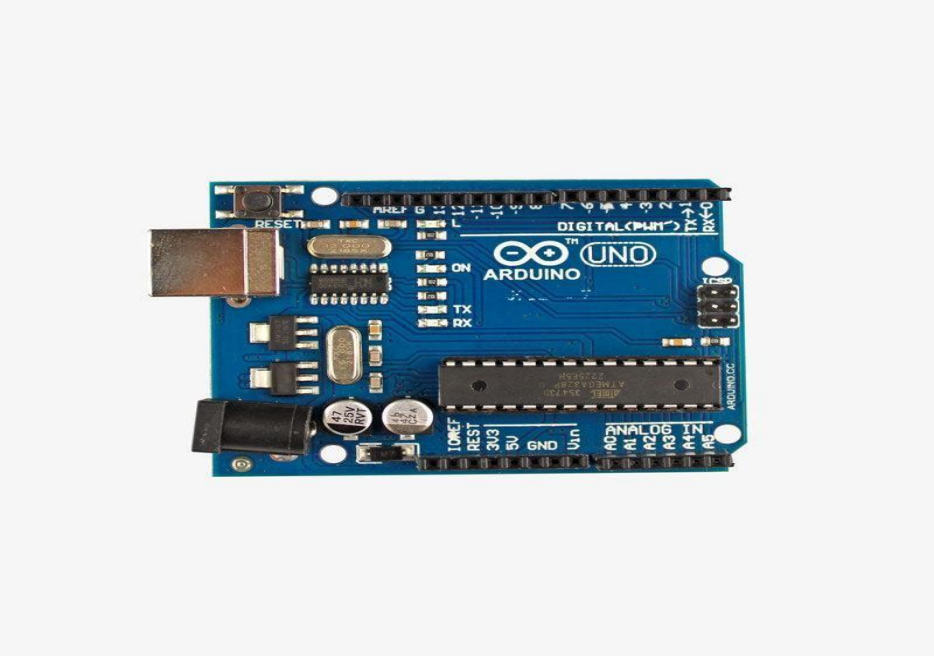
COMPONENTS USED:

- Arduino UNO
- Servo motor
- IR Sensors
- Breadboard
- Jumper wires

HARWARE DETAILS:

Arduino UNO:

Arduino is basically a development board which is open source and primarily utilizes the Microchip ATmega328P microcontroller and is manufactured by Arduino.cc. The board comes with a set of input/output pins comprising of digital and analog which can be interfaced to different expansion boards and external circuits. The board comes with 14 digital pins along with 6 analog pins which are utilized or made programmable with the help of an IDE (Integrated Development Environment) that comes along with it which is Arduino IDE. The programmed is burned via a USB cable type B. Powering up methods for the board can be either by the USB cable or by connecting 9 volts dc supply. Acceptable voltage range varies from 7 to 20 volts.



Servo motor:

These are a special kind of motors which are employed for very specific movement at a particular angle. It is a rotary or linear actuator that permits precise control at certain angular or linear positions. Servo Motor is not a single entity but a combination of a suitable motor along with a sensor which gives the feedback of the current position of the motor. In order to use this servo-motor several other advanced modules are to be used as it is not similar in terms of ease to use the DC motor. These motors have a little similarity to the stepper motors which represent the open-loop control. A dedicated controller module is generally provided with the servo motor by the manufacturer.

Mechanism

It is basically a closed-loop servomechanism that utilize the feedback system for updating the motion and the ultimate position of the rotor. The input to the control of the motor can either be analog or digital in.

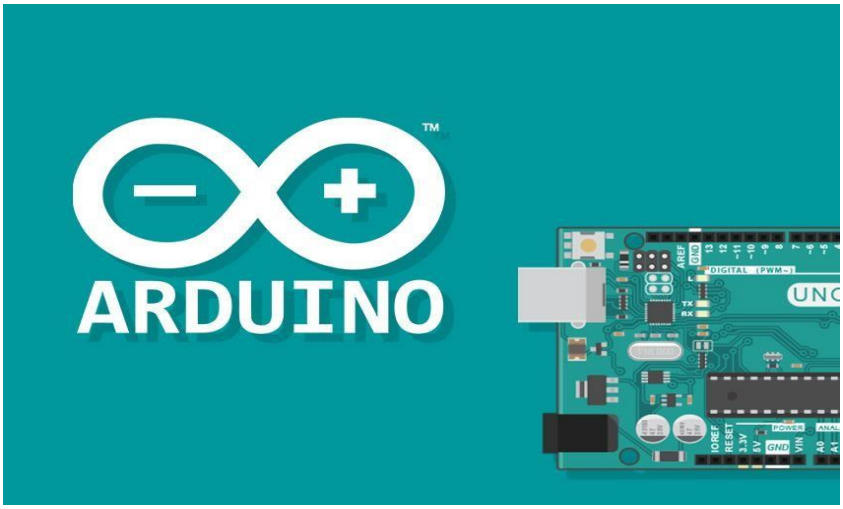
IR Sensors:

An IR sensor is used in this project to sense the arrival and departure of the train. An IR Sensor generally comprises of two components: an IR Transmitter and an IR Receiver. An IR Transmitter is a device that emits IR Rays. Similarly, an IR Receiver is a device that detects the IR Rays. Photo Diodes are the most commonly used IR Receivers. IR sensors detect the train using infra-red receiver and transmitter. Infra-red sensors are capable of detecting the presence of an object by sensing the heat being emitted by the object. It emits or detects the radiations to detect the motion of an object surrounding it. The most commonly used sensors for the automatic railway gate system are vibration sensors and IR sensors.

SOFTWARE DETAILS:

ARDUINO IDE:

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-biT ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the wiring project, which provides many common input and output procedures. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple *one-click* mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.



APPLICATIONS:

- Automatic railway gate control systems reduce the time for which gate remains closed.
- This type of gates can be employed in an unmanned level crossing where the chances of accidents is higher and reliable operation is required.
- Automatic operation prevents errors due to manual operation.
- An Automatic Railway Gate Control is implemented with very simple hardware and easy control. Human intervention at level crossings can be removed with the help of this project.

LIMITATIONS

- The system can be implemented more efficiently by incorporating more efficient sensor network.
- A combination manual wireless control and sensors-based control can be used for better operation.

ACCIDENT AVOIDENCE DETAILS

When the train arrives in a particular direction the transmitter IR senses and generates appropriate signal, then at the same time the receiver IR receives the signal and generates an interrupt. When the interrupt is generated the stepper motor rotates in clockwise direction. When the interrupt ends the stepper motor rotates in anti-clockwise direction. Also, during this process, intruder-circuit, alarm circuit, LCD timer circuit will be in ON state, so that total safety can be ensured.

CONCLUSIONS

As the system is completely automated, it avoids manual errors and thus provides ultimate safety to road users. By this mechanism, presence of a gatekeeper is not necessary and automatic operation of the gate through the motor action is achieved. This project performs the complete operation i.e., sensing, gate closing and opening operation is done by software coding written for the controller. The mechanism works on a simple principle and there is not much of complexity needed in the circuit. Thus, the automatic railway gate control using Arduino and IR sensor is work efficiently and it reduces the human work and time. This is the easy to control the railway gate operation and it reduces the occurrence of faults.

REFERENCE:

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PHOTOS OF PROJECT: