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Automatic railway gate controller with high-speed alerting system with IoT based

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Abstract: Automatic Railway Gate Control System is a simple but veritably useful design, which help is automatically opening and closing the road gate upon detecting appearance or departure of the train. In general, Railway gates are opened or closed manually by a gate keeper. The information about appearance of train for opening or ending of door is entered from near station. But some road crossings are completely unmanned and numerous road accidents do at these unmanned position crossings. To avoid the mortal intervention at position crossings fully, we need to automate the process of road gate control.

Keywords: IoT, Motor Driver, Microcontroller, Speed detection, AVR

Introduction of System:

The ideal of this paper is to give an automatic road gate at a position crossing replacing the gates operated by the doorkeeper. It deals with two effects. Originally, it deals with the reduction of time for which the gate is being kept unrestricted, and secondly, to give safety to the road druggies by reducing the accidents. By the presently being system Formerly the train leaves the station, the stationmaster informs the doorkeeper about the appearance of the train through the telephone. Once the doorkeeper receives the information, the closes the gate depending on the timing at which the train arrives. Hence, if the train is late due to certain

reasons, also gate remain unrestricted for a long time causing business near the gates[1]. By employing the automatic road gate control at the position crossing the appearance of the train is detected by the detector placed near to the gate. Hence, the time for which it's closed is less compared to the manually operated gates and also reduces the mortal labour. This type of gates can be employed in an unmanned position crossing where the chances of accidents are advanced and Dependable operation is needed. Since, the operation is automatic; error due to homemade operation is averted[2][3]. Automatic road gate control is largely provident microcontroller grounded arrangement, designed for use in nearly all the unmanned position crossings in the country We've two different Automatic Railway Gate Control circuits mentioned in this composition using 8051 and AVR.

System Principal:

The principle of operation behind the working of this design lies in the functioning of IR Sensor. A Reflective type IR Sensor is used in this design.

In Reflective Type IR Sensor, the IR transmitter and receiver are placed side by side. When there's no handicap in front of the detector, the IR shafts transmitted by the IR Transmitter will travel undetected as there are no shafts falling on the IR Receiver.

Still, the IR Shafts gets reflected off from the face of the handicap and are incident on the IR Receiver, If there's an handicap in front of the IR Transmitter and Receiver brace[4].

This setup can be configured to descry an object like a Train and in turn can be used to switch ON or OFF the loads like motors with the help of microcontroller. The Unborn X armature harnesses technologies similar as Industrial Internet of Effects, edge computing, pall, artificial intelligence, machine literacy, stoked and virtual reality, and high- performance networking- including 5G-to drive dramatic productivity advancements across a wide range of artificial sectors. with the Unborn X armature for railroads, you can begin a digital metamorphosis that leads to lower functional costs, faster time to delivery for freight and a better client experience for your passengers[5].

Connect people, detectors, trains, videotape observers and automated train control systems with the loftiest security and trustability. Get the fast response times you need to support safety outfit, coming- generation signaling, IoT operations and videotape analytics. Increase network capacity where it's demanded to address passenger surges, rush-hour traffic or high demand for on- board connectivity Use data processing and analytics systems to boost effectiveness or enable new services Produce value with open platforms that can apply analytics, functional systems and robotization to any rail operation.

Proposed Architecture:

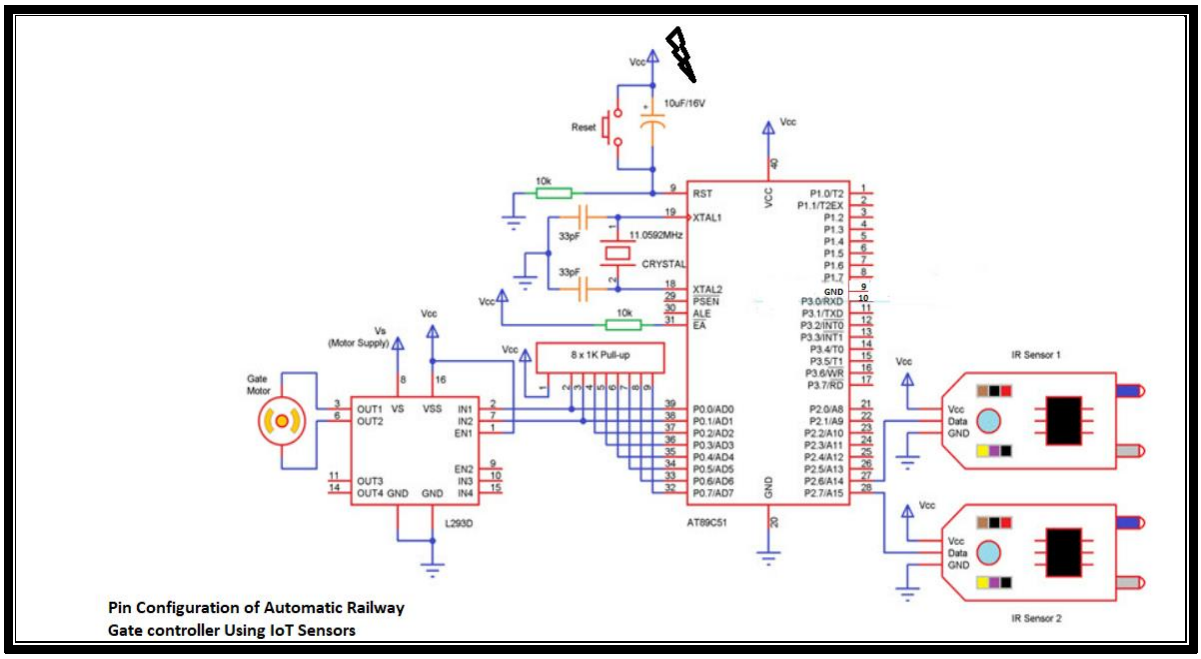

Fig1: Automatic Railway Gate Control using Controller 8051

System Components

Microcontroller Section

- AT89C51 MCU
- 11.0592 MHz Quartz Crystal
- 2 x 33pF Ceramic Capacitor
- 10µF / 16V Electrolytic Capacitor
- 10KΩ Resistors x 2
- AT89C51 Programmer Board

Sensor and Load Section

- 2 x Reflective Type IR Sensor
- 2 x 1KΩ Resistor
- L293D Motor Driver IC
- Motor

Element Description

IR Detector

An IR detector is used in this design to sense the appearance and departure of the train.

An IR Sensor generally comprises of two factors an IR Transmitter and an IR Receiver. An IR Transmitter is a device that emits IR Shafts.

Also, an IR Receiver is a device that detects the IR Shafts. Photo Diodes are the most generally used IR Receivers.

The following image shows the circuit of IR Sensor used in this design.

L293D Motor Driver

L293D is a motor motorist IC used in this design to control the gate motor. L293D Motor Drive IC is a binary H- ground type motor motorist and is available in 16- leg Binary in- line Package. With the help of this motor motorist IC, we can control two motors at a time with both forward and rear direction control for individual motors. Motor driver are generally used to drive high current delineation bias like DC Motors, stepper motors, high intensity lights, etc. They act as simple current amplifiers as their input is a low current signal generally from a microcontroller and their affair is a high current signal to drive the loads.

Circuit Design

Major Factors of our design are 8051 microcontroller (AT89C51), Reflective Type IR Sensor, L293D Driver IC and a Motor.

The obligatory connections for 8051 MCU include oscillator circuit, reset switch and EA Pin.

A clear oscillator of over to 20 MHz can be used as a source of external timepiece. In this design, an11.0592 MHz quartz demitasse oscillator is used. To complete the external oscillator circuit, two 33pF capacitors are used. Eventually, the EA leg is pulled high using a 10KΩ resistor. Now, let us see the factual connections needed to apply the design. In that, first is the L293D Motor drive. The inputs (IN1 and IN2) to the motor motorist (Legs 1 and 2) are given from Port 0 of the microcontroller. (Leg consider as Pin connector of IC) But before connecting them, two 1KΩ resistors are used to pull the Port 0 legs grandly[8].

A motor is connected to OUT legs of the motor motorist.

Eventually connect two IR detectors to the microcontroller one for detecting the appearance of the train and one for detecting the departure of the train. So, connect the data labors of the IR detectors to the legs P2.6 and P2.7 of the microcontroller.

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Working Step wise:

The working of the design is veritably simple and is explained then.

Virtually, the two IR detectors are placed at left and right side of the road gate. The distance between the two IR detectors is dependent on the length of the train. In general we've to consider the longest train in that route.

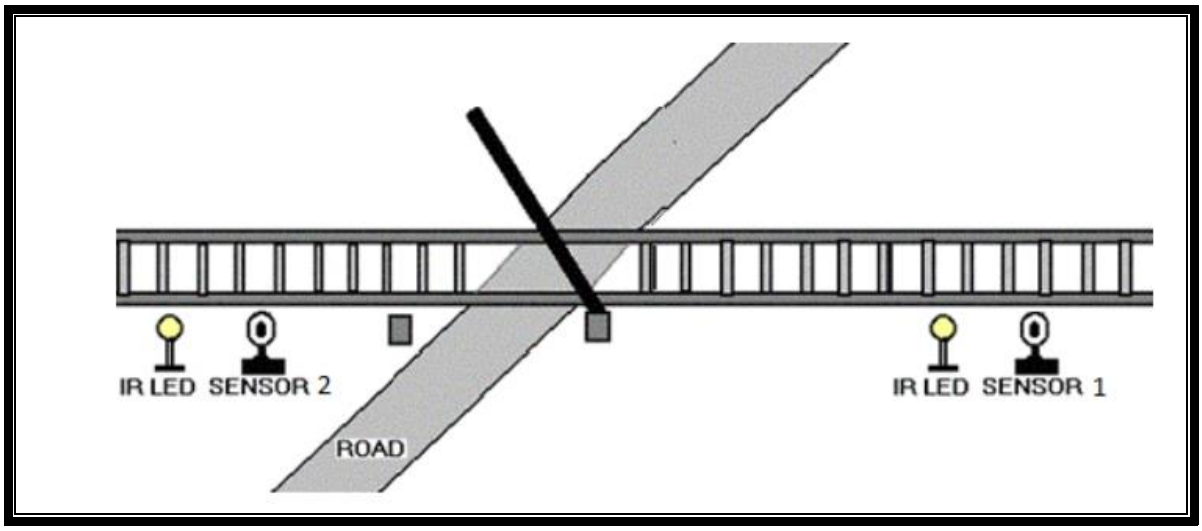

Fig 2: Simple arrangement of Track and sensor

Now we ’ll see how this circuit actually works in real time. In this image, we can see the real time representation. However, microcontroller starts the motor with the help of motor motorist in order to close the gate, If the detector 1 detects the appearance of the train.

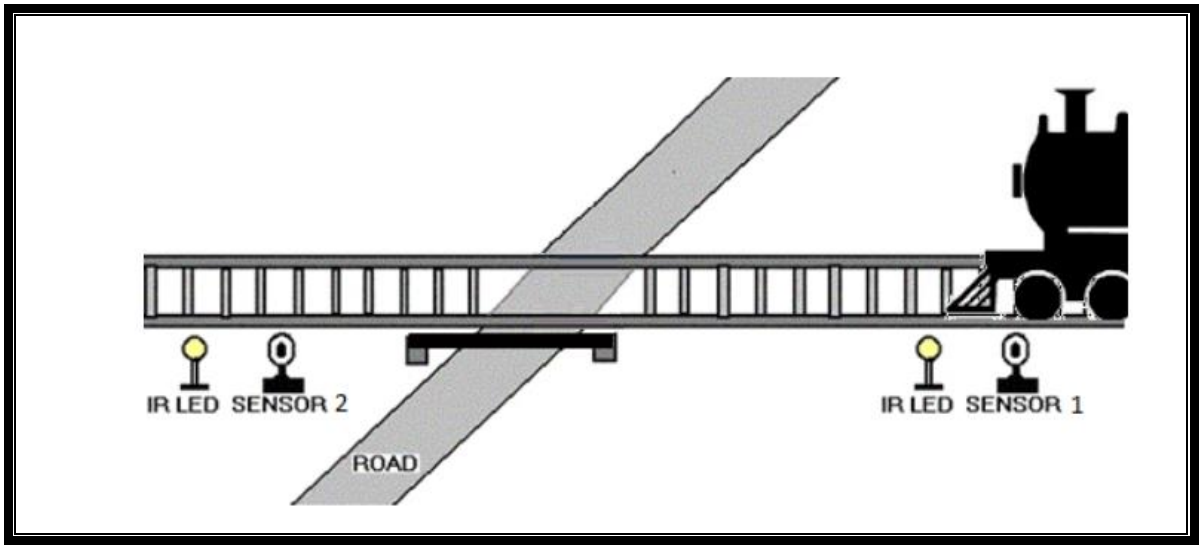

Fig 3: Detection of Train Arrival By sensor 1(Open gate)

The gate remains closed as the train passes the crossing.

When the train crosses the gate and reaches alternate detector, it detects the train and the microcontroller will open the gate.

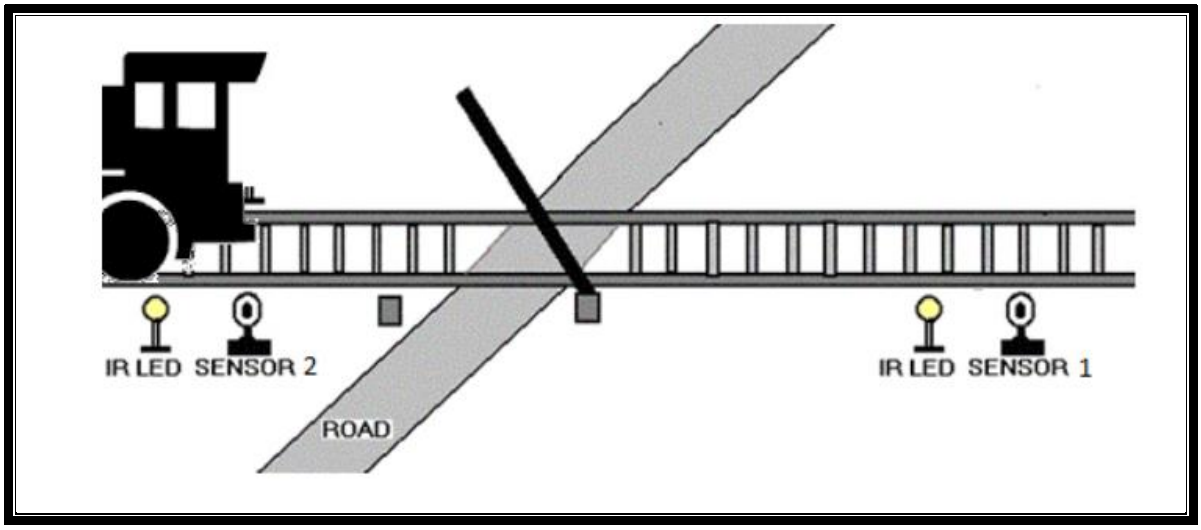

Fig 4: Detection of train passes by sensor 2 (Close gate)

Advantages and Operations

An Automatic Railway Gate Control is enforced with veritably simple tackle and easy control.

Mortal intervention at position crossings can be removed with the help of this design and numerous road position crossing accidents can be averted.

Limitations

The system can be enforced more efficiently by incorporating more effective detector network.

A combination homemade wireless control and detectors grounded control can be used for better operation.

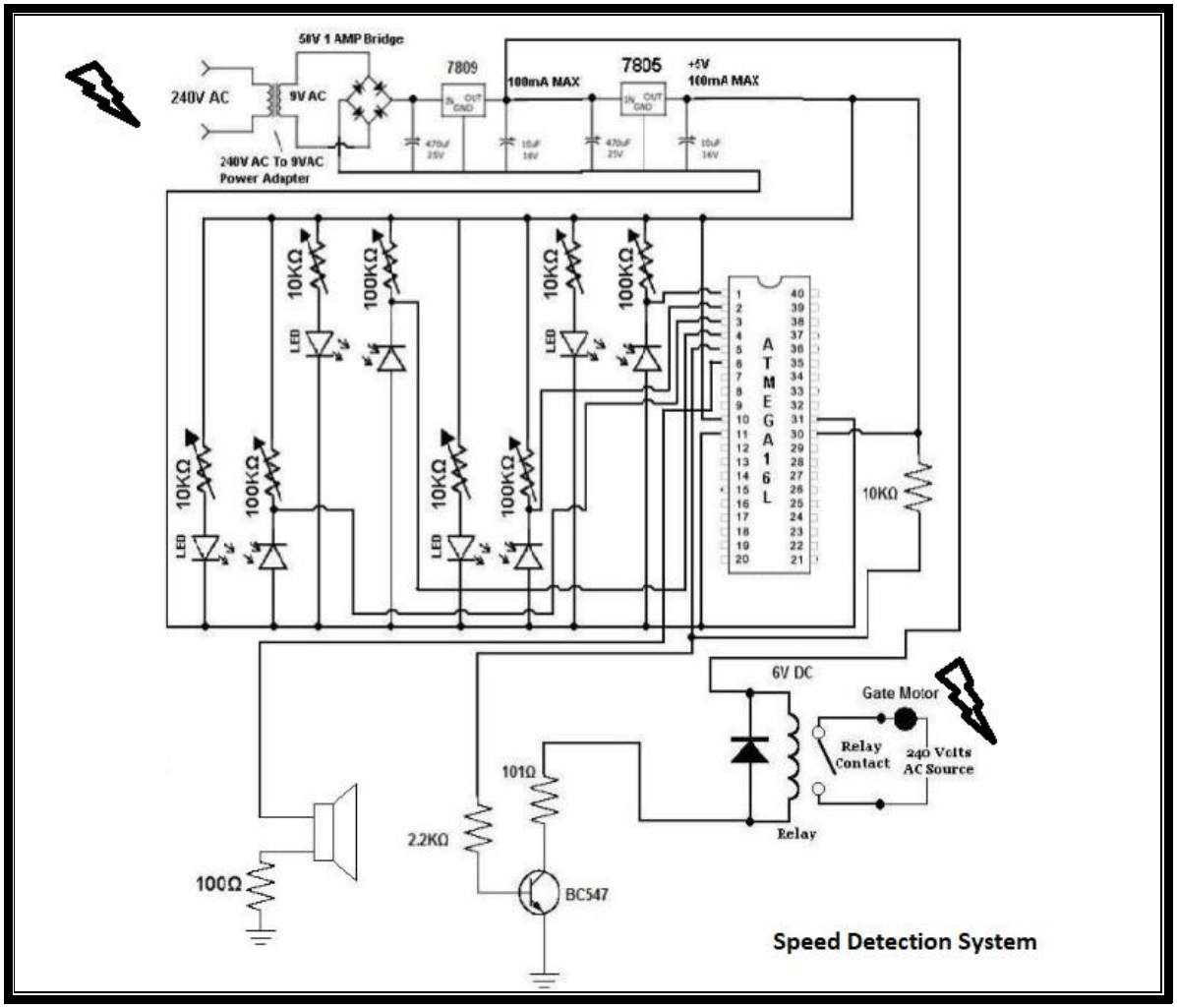

Fig 5: Automatic Railway Gate Controller with High-Speed Alerting System

Automatic Railway Gate Control System with High Speed Alerting System is an innovative circuit which automatically controls the operation of road gates detecting the appearance and departure of trains at the gate. It has sensors at the far down distance on the road track which allows us to know the appearance and departure of the train. These sensors are given to microcontroller which activates the motors which open/ close the road gate similarly.

Another point of this circuit is that it has an intelligent waking system which detects the speed of the train that's arriving. However, also the microcontroller automatically activates the alarm present at the gate, If the speed is plant to be advanced than the normal speed.

This cautions the passengers at the road crossing on the road about this. Also This circuit has the point for Identification of train from other interferers i.e, creatures etc. This can be enforced in manned position crossings also, as homemade crimes can be excluded by robotization.

Circuit Operation- High Speed detection

The operation of the circuit can be easily explained as follows. Principally the circuit consists of four IR LED- Print diode dyads arranged on either side of the gate similar that IR LED and photodiodes are on either side of the track as shown in the figure below.

initially transmitter is continuously transmitting the IR light which is made to fall on the receiver. When the train arrives, it cuts the light falling on receiver. Let us assume the train is arriving from left to right, now when the train cuts the 1st detector brace a counter is actuated and when it crosses 2nd detector brace the counter is stopped. This counter value gives the time period which is used to calculate the haste of the train. The sensor2 affair is transferred to microcontroller which makes the relay spark which causes the gate to be closed. Now when the last carriage of the train cuts the sensor4 microcontroller de-activates the relay and gates are opened.

How does the detector know the last carriage?

Then as preliminarily mentioned the counter value is used to calculate the haste of the train, which means that every wheel of the carriage cuts the detector brace within small bit of time grounded on its haste. After the last carriage is passed there's no handicap to the detector brace within that bit of time hence it knows that the train has left. One further point of this circuit is detecting a train directlyi.e, there may be a chance that some handicap (fore.g some beast) may cut the detector also in such a case the counter is made to run for certain period of time (this time period is set considering the possible smallest speed of train) if the handicap doesn't cut the 2nd detector before this predefined time also this handicap isn't considered as train and gates remain opened[14]. Another advantage of calculating the haste of train is, if the speed of the train crosses a limit i.e, if it's traveling at an over speed also the passengers are advised using a by cranking a buzzer.

Conclusion:

The system principally comprises two IR LED – Photodiode dyads, which are installed on the road track at about 1 cadence piecemeal, with the transmitter and the photodiode of each brace on the contrary sides of the track. The installation is as shown in the block illustration. The system displays the time taken by the train in crossing this distance from one brace to the other with a resolution of0.01 second from which the speed of the vehicle can be calculated as follows **Speed(kmph) = Distance/ Time**

As distance between the detectors is known and constant, the time is counted by the microcontroller and from this information, we can calculate the speed.

References:

[1] Natwar Singh, A complete reference of Micro Controllers.

[2] Railways overview- a technical magazine.

[3] Muhammad Ali Mazidi, The 8051 microcontroller and embedded systems

[4] 8051 Microcontroller: An Applications Based Introduction by "David Calcutt, Frederick Cowan, and Hassan Parchizadeh"

[5] ATMEGA16 microcontroller datasheet. [

6] Der Keil C51-Compiler by Michael Baldischweiler.

[7] San Francisco s "Advanced automatic warning signal system" in Proc. CERIE 2010, paper.

[8] Krishna, Sashi Yadav et.al, Automatic Railway Gate Control Using Microcontroller, Oriental Journal of Computer Science & Technology, Dec'13.

[9]. Ajay.V. Deshmukh, Microcontrollers (Theory and Application), Tata McGraw-Hill Publication, 2005. [10]. Ahmed Salih Mahdi, Al-Zuhairi, Automatic Railway Gate and Crossing Control based Sensors &Microcontroller, International Journal of Computer Trends and Technology (IJCTT), 2013, 4; (7). 2013.

[11]. Banuchandar J, Kaliraj V, Balasubramanian P, Deepa S, Thamilarasi N, Automated Unmanned Railway Level Crossing System, International Journal of Modern Engineering Research (IJMER), 2012, 2 (1); 458-463.

[12]. Fred Coleman, Young J. Moon, Trapped Vehicle Detection System for Four Quadrant Gates in High Speed Rail Corridors, Transportation Research Record, 2011.

[13]. Fred Coleman, Young J. Moon, Design of Gate Delay and Gate Interval Time for Four Quadrant Gate System at Railroad-Highway Grade Crossings Transportation Research Record, 2010.

[14]. Krishna, Shashi Yadav and Nidhi, Automatic Railway Gate Control using Microcontroller", Oriental Journal Of Computer Science & Technology, 2013, 6; 4