

Controlling Railway Gate Using Arduino

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Abstract – The aim of this paper is to develop a prototype that control the railway gate using the micro-controller. Whenever train touches base at the sensor, caution is activated at the railway crossing so that the general population get instruction that entryway will be shut. At that point the control module initiates and shuts the gates on either side of the track. Once the train crosses, this module naturally lifts the gate. For mechanical operation of a gate DC adapted engines are utilized. We are utilizing an installed controller worked around the 8051 family(AT89C52) for the control. As per the instructions produced at the microcontroller, the proper action (i.e., shut or lift) will be made. This logic was implemented in Embedded C and dumped to the Arduino Board. This prototype was tested and successfully shuts the gate at the time of train arrival and lifts after train crosses other end.

Index Terms – Railway Gate, Internet of Things, Railway Crossing, Micro Controller, Arduino, Sensors, Stepper Motor

1. INTRODUCTION

Railway is life saver of India and it is being the least expensive methods of transportation are favored over every other mean of transportation . When we experience the day by day daily papers we run over numerous mishaps in railroad railings . Railroad-related accidents are more unsafe than other transportation accidents as far as seriousness and demise rate and so forth. Hence more precautions are fundamental for enhancing railway security. The train accidents are more destructive than any other sort of vehicle. Train accidents make serious harm to the life and property. To overcome the above issues, in this work an efficient prototype is proposed based Internet of Things (IoT).The Internet of Things (IoT) is the system of physical objects like gadgets, vehicles, buildings and different things which are connected with electronics, programming, sensors, which empowers these objects to gather and exchange information . The Internet of Things permits objects to be detected and controlled remotely over existing system structure.

Making open doors for more straight forward combination of the physical world into computer based frameworks leads to enhanced productivity, precision and financial advantage.

When IoT is expanded with sensors and actuators, the innovation turns into a case of the more broad class of digital -physical frameworks. Everything is particularly identifiable through its embedded control system however is capable to inter operate inside the current internet networking framework. In future all the cell phones might be associated

with the home appliances like windows, doors, electrical outlets, etc., This paper presents a framework mainly used to prevent railway accidents by using the IoT technology. The accidents can be prevented while crossing railway gate without human power. The sensor senses the arrival of a train and sends a signal to the micro-controller. Upon receiving that, the microcontroller closes the railway gate.

2. RELATED WORK

Traditionally, whenever a train leaves the station, the station master make a telephonic call to the gatekeeper about the arrival of the train. Once the gatekeeper gets the data, he shuts the gate based on calculating the approximate time from station to the gate. However, the gate remain closed for long time even if the train is late for some reasons. This can be avoided by using an automatic railway gate control which uses a sensor near to the railway gate that detects the arrival of a train and closes the gate. Note this requires very less time compare to manual operation of the gates and reduces the manpower.

Hence, this can be utilized in an unmanned railway gate where there is a chance of accidents [5]. Note this is also reduces the human errors in operating the gate. Hence, the automatic railway gate control is a necessary and cost effective framework to use in all the unmanned railway gates in the nation.

There exist different railway gate control systems in the literature. Automated railway gate at a level crossing is generally used to replace a gatekeeper who operates it's manually. It manages two operations. First, it reduces the gate closing time. Second, it provides safety to the users and prevents accidents.

Proposed an automatic railway gate control system using IR sensor and Microcontroller for avoiding the accidents. However, this system suffers from a serious limitation that, IR sensor is not a good choice in high lighting conditions which results in low accuracy. Proposed pressure sensor based accident avoidance framework for an automatic railway crossing system.

3. METHODOLOGY

In the proposed framework, different sensors are used to detect the train arrival and departure. This framework uses three different sensors to control the rail arrival and departure. We programmed different sensors and motors using Arduino and

AT89C52 micro-controller. The functional diagram of the proposed framework is shown in Fig. 1. The following materials and components are used in the proposed automatic railway gate control system.

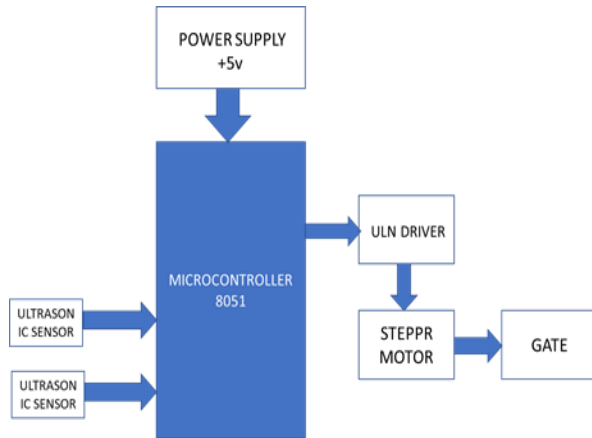


FIG 1. FUNTIONAL BLOCK DIAGRAM

A. Microcontroller

AT89C52 microcontroller is used in this framework. The micro-controller is a small computer on a single integrated circuit. Generally, a micro-controller is a System on a Chip i.e. SoC and one or more CPUs are embedded along with memory and programmable input/output peripherals.

B. Sensors

The sensor recognizes and responds to events from the physical environment. They are placed at both ends of railway crossing and senses the arrival and departure of the train. The input a sensor can be a light, heat, motion, moisture, pressure, or etc. Sensors that detect the arrival of a rail can be classified into the following types.

- I. Wheel detecting sensors depends on the principle of magnetic inductive. The output which is DC current from the wheel detectors are used for the detection of train arrival.
- II. Vibration sensor: This sensor uses the piezoelectric effect of the vibration in the track and detects the train arrival and departure. The vibration sensor output is given into the micro-controller which operates the gate.
- III. Ultrasonic sensor operates on the principle of the sound waves being emitted by the train.

C. Arduino board

The Arduino version is 1.0.5 used to send the information about the train status with the help of sensors. It consists of the Arduino code in c programming. The system should contain certain software to run and accept the code.

D. Stepper motor

The stepper motors are used for mechanical control of the gates that rotate forward or reverse direction. The multiple coils in the motor which are get activated in sequence, the motor will rotate one step at a time. With the automated stepping we can achieve an accurate positioning and/or speed control.

E. Arduino integrated development environment

Arduino software is different from windows to windows. The software should be downloaded the code of arduino is encrypted as shown in the fig 1. The task that should be done is given to the arduino software. The code is in c program. Ip address and password should be entered and saved according to the internet source we using. The saved changes should be uploaded.

“the arduino integrated development environment (i.e., arduino ide) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the arduino and hardware to upload programs and communicate with them”.

The flowchart of the proposed prototype. In this work, one at89c52 microcontroller is used to operate the following function of the railway gate control system:

- [1] To detect the train arrival and departure
- [2] To open and close the railway gate automatically by using the stepper motor
- [3] Buzzer and light signal for warning the road users regarding the train arrival
- [4] Display the status of the railway gate system with lcd modules

Following are few of the advantages of the proposed secure railway crossing system

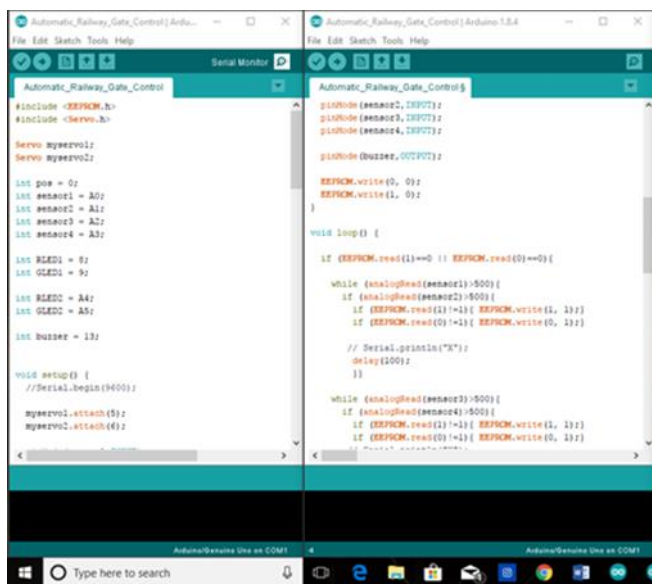
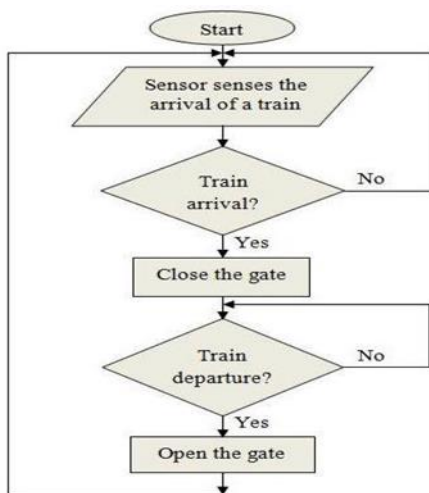
- Accident avoidance
- Less human intervention.
- Safety and quality of services.
- Accurate gate open/close.
- Using the artificial intelligence.

Problem statement:

The existing system is using GPS (Global Positioning System) system if the connection is lost the railway gate system will also not work. Another system is using GSM it is impossible to install such system at each and every places. Some of the systems are using many gadgets which let to consumption of very high energy which is also not affordable. Most of the systems are using man power which is very time consuming and can also occur many human error.

4. EXPERIMENTAL RESULTS

This section explains the results observed from this project. We written the code using code bender dumped to the Arduino as shown in Fig 1. Smart railway gate technology we have used Ultrasonic sensors. When a train arrives these sensors send an input signal to the micro controller. Then the micro controller will activates the railway gates when train arrives and passes without any delay. Programs are written in Embedded C for opening and closing of the railway gate and code is dumped into the Arduino board using Arduino IDE.



5. CONCLUSIONS

In this work, a smart railway crossing system is proposed based Internet of Things. We developed a prototype for this and successfully verified the opening and closing of the gate during train arrival. It is user friendly, and has required options, which can be utilized by the user to perform the desired operations. The goals that are achieved are: 1. less human involvement 2. Efficient management of railway gates 3. Cost effective 4. Easy construction of the sensors on the track 5. Reduced errors due to human intervention 6. Portable and flexible for further enhancement. This work offered a very quick and enhanced working model of a SMART RAILWAY GATE. This is very helpful to the people living in the remote areas with unmanned railway gates.

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