Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 8, August 2019

AUTOMATIC CONTROLLING OF RAILWAY GATE

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Abstract

Automatic railway gate and track switching system is used to avoid accidents in railway systems. The main causes of accidents are due to not proper working of the railway barrier due to mistakes in track changing & collision with trains coming from the opposite side of track. This paper uses IR digital communication systems to automate railway systems to avoid accidents. In railway gates an IR transmitter is connected at one side of the track and paired with an IR receiver at the other side of the track. Two IR TX-RX pairs are placed at a certain distance at each side from the railway gate. Switches which are fitted on the railway track at an appropriate distance on both sides of the railway gate also. By the help of IR circuit and switches the MCU can detect the position of the trains and the railway gate control motor is managed by the MCU. An anti-collision system is also attached to our project to avoid head to head collision. A laser torch and LDR based technology is used here to stop the train and avoid accidents.

Keywords: *GSM technique, Ultrasonic Sensor, Stuck, Detection, Level Crossing, RFID technique, Alarm generator.*

I. INTRODUCTION

Railways being the cheapest mode of transportation are preferred over all other means. When people go through daily newspapers, we get a lot of news about railway accidents at an automated railway crossing, which typically happens because of the carelessness or error of staff in manual operations. We have replied to this undertaking by using simple electronic components for the same job. We've developed an idea of flipping the track using the same concept as that for gate manipulation, which can minimize the total time taken by the long route train. As a primary concern over this idea, bidirectional wireless RF communication and siren locomotive devices are preferred in a real performance railway. This concept is used as a subordinate in real automatic level crossing gates. In practical situations they prefer a weighing sensor and the weight parameters are decided according to the weight of the train [1].

Road accidents at railway gates are the world's leading cause of death and injury. Surveys conducted by Indian Railways found that about 17% of India's overall rail accidents are crossing accidents, the majority of which occur at passive railway crossings. Nowadays, the operation of railway gates at level crossings is not that effective. In particular, road users have to wait a very long time until the train arrives, and even after the train leaves. And secondly, the risks of accidents that are normally caused by the carelessness of road users or by the gatekeepers' time mistakes are greater. Here comes the meaning of the device of automatic railway gate control. To 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 [2]. 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. There are two aspects the device deals with. First of all, it deals with the reduction of the time that the gate is held closed for. And secondly, to provide road users with protection by reducing incidents. In the automatic railway gate control device, the sensor mounted near the gate can detect the arrival of the train at the level crossing. Therefore, relative to the manually operated door, the time during which it is locked is less and therefore lowers human labor.

II. DESIGN OF AUTOMATIC GATE

The location where the track and the highway/road converge at the same level is referred to as a "level crossing." Two types of level crossing are primarily manned level crossing and unmanned level crossing. Manned level crossing is graded as spl. Class, "A" Class, "B" Class, "C" Class. Class. The C "Class, D" Class is graded as unmanned level crossing. Railways are favored over all other methods, being the cheapest mode of transportation. We go through the daily newspapers on the other hand, while many railway accidents occur at manned railway crossings. This is largely because of the carelessness or lack of staff in manual operations. A solution for the same has come up in this project. We also attempted to automate the control of railway crossing gates using successful electronic components. When a train from either side approaches the railway crossing, the sensors mounted at a certain distance from the gate detect the approaching train and monitor the activity of the gate accordingly. Both tracks are shortened to the ground as the wheels of the train pass over, and this serves as a signal to the microcontroller signaling train arrival [3].

Also, for safety procedures, some new applications are added like, IR sensors will be placed near to the crossing, which can detect any intrusion of human beings or any animal, and if any intrusion occurs, like it generally happens in India, after the crossing gates are closed. So, it will be detected by the sensor, and the alarm will buzz, so any interference will be stopped by this. Another application is that another sensor can be mounted at some distance from the railway crossing, so that a sensor can detect the coming train, which is about 10 km away from the crossing, when the train is expected to arrive, and an alarm can be buzzed to warn the locals about the coming train with the aid of an alarm and an LCD monitor that will indicate how far the train is. Also according to the project, if the speed of every train is prohibited to the average of 90-100 km/hr. when it comes in the range of 10km of any crossing, then the timing circuit can be fixed according to it and this project will work at its best to ensure safety [4].

A servo is a mechanical motorized device that can be instructed to move the output shaft attached to a servo wheel or arm to a specific position .Inside the servo box is a dc motor mechanically linked to a position feedback potentiometer, gearbox, electronic feedback control loop circuitry and a motor drive electronic circuit. Servos are managed by sending a variable-width pulse to them. To transmit this pulse, the control wire is used. For this pulse, the parameters are that it has a minimum pulse, a maximum pulse, and a repeat rate. Considering the rotation Neutral servo constraints are defined as the location where the servo in the clockwise direction has exactly the same amount of possible rotation as it does in the counter clockwise direction [5]. It is important to note that the various Servos have numerous rotation constraints, but they all have a neutral position, and that position is always around 1.5 milliseconds (ms). Every 20 ms, the servo expects a pulse to be seen. The pulse length will dictate how far the motor turns.

For example, the motor will switch to the 90 degree position (neutral position) with a 1.5 ms pulse. When these servos are ordered to move, they will move to and maintain that position. If an outside force moves against the servo when a position is occupied by the servo, the servo may resist moving out of that position. The torque rating of the servo is the maximum amount of force the servo can exert. However, the servos cannot maintain their position forever; to instruct the servo to remain in position, the position pulse must be repeated. The servo rotates to a position when a pulse is sent to a servo that is less than 1.5 ms, keeping its output shaft a number of degrees counterclockwise from the neutral point. The reverse happens when the pulse is greater than 1.5 millisecond. The functions of each servo are the minimum width and the maximum pulse width that will order the servo to turn to a valid location. There will be different maximums and minimums for various brands, and also different servos from the same manufacturer. The minimum pulse will usually be approximately 1 ms wide and the maximum pulse will be 2 ms wide. Another parameter that varies from servo to servo is the turn rate. This is the time it takes from the servo to change from one position to another. The worst case turning time is when the servo is holding at the minimum rotation and it is commanded to go to maximum rotation. This can take several seconds on very high torque servos [6].

One of the major advantages of this system is its simple circuit and working principle. The circuit is divided into three parts. First one is the microcontroller section second is the IR sensor section kept on rail and third is the servo motor which is used to operate the gate . All of them are discussed in detail in coming sections. The sensor mounted on either side of the gate at around 5 km from the level crossing senses the arrival of the train by using the automatic railway gate control at the level crossing [7]. The sensed signal is sent to the microcontroller once the arrival is identified, and it checks for the potential presence of the vehicle between the gates, again using sensors. Subsequently, the road users are supplied with buzzer signs and light signals on either side signaling the closing of gates.

Once the motor is triggered between the gate and the gates are locked, no vehicle is detected. When the obstacle is pushed away from the rail, the red signal switches to a green one. The sensor mounted 2 km from the rail crossing detects the train's departure [8]. The sensed signal is sent to the microcontroller once the train is left and the motor is triggered and the gate is reopened. For the arrival of the train from either direction, the steps described above repeat themselves. It is found to be very stable and reliable. The circuit was able to precisely regulate the railway doors. The circuit was tested and functioned perfectly in both directions. We were able to achieve a rapid response by using ATMEGA 16. Due to the increased number of incidents and also due to the problems that occur to road passengers when waiting for a longer period unnecessarily during the transit of the train, our project is a critical tool for today's railway crossings [9].

III. CONCLUSION & DISCUSSION

An improvising system for Indian Railways that can be utilized to account for the problems with the level crossing gates operated manually by a gate keeper. About 43.6 percent of railway accidents have occurred in our country at level crossings. So far, no fruitful steps have been taken. The arrival or departure of the train near the level crossing in the proposed system automatically decides the opening or closure of the level crossing gate by means of an IR sensor and a warning signal at level crossings. But there could be a risk that a vehicle may be trapped between the crossing gates during this automation phase. At this situation, the obstacle between the crossing gates could be detected with the help of ultrasonic sensor and it will be intimated to the train through GSM module. Thus, the man power could be reduced and at the same time accidents at level crossings can be avoided into maximum extent.

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