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IMPLEMENTATION OF AUTOMATIC RAILWAY GATE CONTROL

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Abstract

India one of the most train transportation adaptable countries. Most accidents occur while crossing, due to manual operation or negligence of people. Train incidents are based on the operation of railway gates, the track switching system, the collision system, and communication protocols. Owing to manual switching procedures and accidents on railway lines, head-on collisions are the most troublesome problems. The incidents result in substantial organizational property damage, financial losses, and losses to individuals. Every person's life is very important. This paper presents an implementation of Arduino's Automatic Gate Control for Railroad Switch and Anti-Collision System; it largely prevents accidents when crossing and provides railroad switching techniques.

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

I. INTRODUCTION

More populated country like India railway is most convenient system for travelling. The major role of the railways is to serve the public in transportation and for carrying the tones of goods every day. Railways provide a best alternative to other transport medium in case of energy efficient. As a result, the number of people using it increases day by day from last few decades. Hence it plays a major role in changing Indian economy and one of the more revenue departments. In Madras, the first railway plans were planned in 1832. It was organized by the Indian Railway Department from relative literature surveys and about 17 percent of railway accidents occurred while crossing. Accidents, the bulk of which are at passive railway crossings. The traditional method of producing signals and operating systems often causes incorrect decisions that cause individuals and organizations major problems [1].

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Indian Railways is one of the world's largest railways, running on gigantic dimensions covering over 63,000 kilometres of route with 1.6 million tonnes of freight being loaded daily and 14 million passengers being transported daily by logging more than 2 million kilometres of train every day. As per Mckinsey, one of the Indian sun rising industries is that of Indian Railways. The modernization of Indian Railways has always been a priority concern for the
The growth of India's basic infrastructure. Since railways are one of the best modes of transport available to ordinary citizens, it would be difficult to continue to raise tariffs to cover the costs of maintenance, huge workforce and expansion. Therefore, for greater performance and cost savings, the railways should consider upgrading themselves to cutting-edge technology [2]. Improvisation means automating the operation of the railway gate and reducing manpower to the full degree. Level crossing gates are usually operated by a gate keeper manually. The station in charge gives this information to the closest gatekeeper to get ready when the train begins to leave the station. The gates stay shut for long periods in cases where the train is delayed, creating dense traffic jams at the level crossings.

The rate of manual error that could occur at these level crossings are high because they are unsafe to perform without actual knowledge about the train time table. By automating the process, these human interventions can be avoided. About 43.6 percent of railway accidents have occurred in our country at level crossings. So far, no fruitful steps have been taken. In the proposed scheme, there might be a risk that a vehicle may be trapped between the crossing gates when automating the operation of the railway gates. Using an ultrasonic sensor and GSM, this barrier could easily detect and intimate this information to the train device [3].

In fact, the level crossing gates are manually operated by the gatekeeper. The station in charge gives this information to the closest gatekeeper to get ready when the train begins to leave the station. The gates remain locked for long periods in cases where the train gets delayed, creating dense traffic jams at the level crossings. At these level crossings, the rate of manual error that could occur is high because they are insecure to execute without actual knowledge of the train time table. These human interventions can be avoided by automating the process and it doesn’t degrade the existing safety level [4]. The average maximum speed at which a train travels in India is 91,82 km/hr and the minimum speed of a train for passengers/goods is 59 km/hr. Therefore, the optimal distance at which the sensors should be located to detect the train's arrival and departure is 3 km from the level crossings, so the gate is not closed for more than 5 minutes. The proposed technique uses two IR sensors (IR1, IR2), one 16x2 LCD, an ULN driver, a relay, a DC motor and one Buzzer (B) for the automation process of railway gates operation. In real time, the IR sensors are placed behind the track at a distance of 3 Km on both sides of the level crossing. If IR1 detects the arrival of the train, it sends the signal to the microcontroller. Then the microcontroller activates the buzzer for warning the level crossing users that the railway gates are yet to be closed and the arrival of the train within a stipulated time [5].

Two sets of IR sensors, a pair of IR sensors are positioned near the level crossing to monitor the railway gate, the sensors are placed at a certain distance from each other, the sensor that detects the train's arrival can be referred to as the upside sensor and the sensor that detects the train's departure can be referred to as the downside sensor. In our case, the light emitting diode (led) is used as a transmitter and a p-n junction photodiode is used as a receiver. Each pair of sensors consists of a transmitter and receiver. Whenever the upside receiver is triggered, the motor of the gate rotates in a specific direction and closes the railway gate and stays close until the downside receiver is activated, the motor rotates again and the gate is opened until the downside receiver is activated. We can now easily monitor the track and generate track switching if necessary by implementing the same principle of operation of IR sensors used in gate control for track switching [6]. A pair of sensors is mounted near the track switching junction inside the track switching system. A pair of sensors is mounted near the track switching junction inside the track switching system. Considering a case in which there is a train carrying goods on the main line track and assuming that a local or express train is taking the same path as a train carrying goods, the track is switched to the bypass line track for the train to travel in order to prevent any delay to the local train. The reed switch is used to monitor the movement of the trains, because the reed switch is a magnet sensor consisting of an on and off switch, the switch stays on until some magnet is detected until a magnet is sensed [7].

When the IR2 senses the train's departure after the train has passed the level crossing, it sends a signal to the controller. Then the microcontroller triggers the buzzer again to inform the railway gates that they are not yet locked. Then the controller triggers the DC motor pair in the backward direction again for 5 seconds to perfectly open the railway gates. The current status of the process was visualized through the LCD. There could be a risk that a vehicle may be trapped between the crossing gates when automating the operation of the railway gates. Thus, the device has taken some fruitful measures in order to save them. An Ultrasonic sensor was located crosswise on one side at the level crossings. On the other side of the level crossing, a persistent barrier has been put in place. The sensor for ultrasound, the transmitter and receiver are in-built. The transmitter continuously transmits the ultrasonic waves and this could be reflected by the constant obstacle. Only when the railway gates were closed was the ultrasonic sensor triggered. If any obstacle is locked between the railway gates, the distance between the sensor and the locked obstacle is determined by the ultrasonic sensor. The calculated distance differed from the threshold distance when the barriers were identified. The ultrasonic sensor then transmits this information to the Power [8].

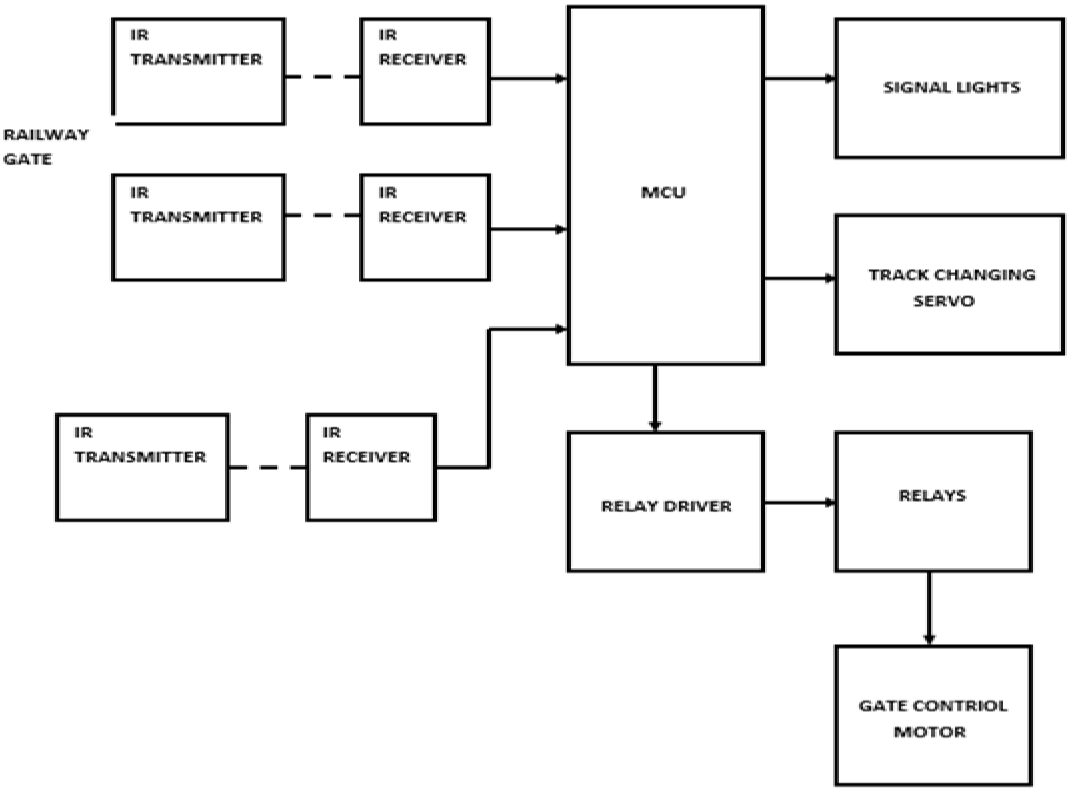

Fig. 1 Block diagram of an automatic control railway system

In this case, the Global System for Mobile (GSM) triggers the microcontroller. The GSM then sends the barrier information to the locomotive pilot running the train via the warning SMS. The SMS was sent by collecting contacts from the revised Indian Railways database. The time table of the trains for each level crossing will be loaded into the device until synchronized with the server's database system. A block diagram of an automatic control of the railway system is shown in figure 1. By using this system at the railway crossing the train arrival or train departure can be observed by using an Ultrasonic sensor. The opening or closing of the railway crossing gate automatically with the help of microcontroller & servo motors. Buzzer sounds produce a Warning signal near roads [9].

II. CONCLUSION & DISCUSSION

Automatically control the railway gate at the level crossing, to automatically control the railway track switching mechanism and to automatically control the movement of the train (i.e.,)to start and stop the train automatically. As the number of rail-related accidents increases day by day, the automation mentioned above will minimize these accidents to a far greater degree. Two pairs of infrared (IR) sensors are used for the project, one pair of IR sensors is used to control the railway gate, and the other pair of IR sensors are used to turn the railway track automatically. Such IR sensors are used to sense the train's arrival and departure. To regulate the train's motion, a reed switch is used. Reed consists of an on-off switch that, when in contact

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with a magnet, flips. As the entire system is automated errors occurring due to manual operation are prevented because the accuracy of automated operation is more than the manned operation.

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