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AUTOMATIC CONTROLLING AND MONITORING OF RAILWAY GATE

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Abstract

At the level crossing, an automated railway gate replaces the gates controlled by the gatekeeper by detecting the train and stuck at the level crossing, producing the appropriate warning signal and controlling the gate. The solution will be to create a train tracking module, a fixed detection module, a signal light module, an alarm module, a railway gate controller and a controller module. There are only four ultrasonic sensors and one ultrasonic sensor in the stuck detection module in the train detection module. Both the train detection and the stuck detection module create a high frequency signal via the ultrasonic sensors and detect the object's presence if the sensors receive the echo back. Then the controller unit determines whether the obstacle is train or stuck and takes necessary steps by controlling the gate, alarm generator and signal lights. Experimental studies show that the proposed methodology provides a more cost effective, reliable and simpler railway gate controller than existing dominant work.

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

I. INTRODUCTION

Railways being one of the safest and cheapest modes of transportation are preferred over all the other means of transport. So, it is essential to maintain and improve the current level of safety. A secure railway is more effective and also a more desirable option for transport, helping society to tackle the environmental and economic challenges of the 21st century. Railway safety is a critical feature of the world's rail operations. There are occasional newspaper accounts of train incidents at various railway crossings, and many people have lost their lives in such accidents. While the development of railways has taken place rapidly, the course of its steady growth still poses enormous problems. The key issue that Indian railways face is that the tracks are old and outdated. Many significant train accidents are caused by these

old tracks [1]. This has also resulted in limits on speed. Virtually, the running time of all trains has been increased in virtually every new schedule, while railways in other advanced countries are dramatically reducing it. Another problem faced in India is that a large number of passengers travel without buying tickets. The incidence of railway accidents in India is greater as compared to other countries of the world. Accidents also occur due to the errors and negligence of the employees [2].

As railways have failed to provide sufficient incentives for attracting appropriate talent, there is a shortage of modern management. In addition, economic analysis of the viewpoint planning tariff could not be carried out. The technology for rolling stock is completely outmoded. The system is plagued by excessive personnel and the growth of manpower has not kept pace with the upgrading of technology. This has made railways incapable of dealing with the increased demand for transport and of rising and enhancing the volume and flow of traffic at lower unit operating costs [3].

Most of the railway lines are single lines which create great inconvenience to the railway organization and passengers. The railway transport has lagged behind the requirement due to inadequate investment. Different bodies, the National Transport Policy Committee, the Rail Tariff Enquiry Committee and the Rail Reform Committee, have highlighted the weakness. Road transport rivalry is rising in strength, both in the case of passenger transport and in the case of freight transport. The lack of cooperation between railways and road transport has reduced the railways' earning ability. This has also caused delays in the flow of traffic and inconvenience for travellers. It is reported in daily newspapers that many rail accidents occur at unmanned railway crossings. This is mainly due to the carelessness in manual operations or lack of workers, unnecessary pulling of chain and long waiting at the railway crossing [4].

II. CONTROLLING AND MONITORING OF RAILWAY GATE

A vandal-proof warning system has been developed by Indian Railway for unmanned level crossings that have been functioning satisfactorily on the Coimbatore-Mettupalayam section for the last three months. There are a total of 28,607 level crossings on Indian railways across the country, of which 19,267 are manned and 9340 are unmanned. According to the action plan, in the next 3-4 years, the railways are concentrating on removing almost all the unmanned level crossings. With this emphasis, it is beneficial to research different techniques to monitor the operation of gates at level crossings. There are several journal articles available that suggest an automated system of railway gates. Different options are discussed in these articles, such as the automatically operated railway gate at level crossing, the railway track switching system and train movement using sensors, the railway accident prevention microcontrollers and the stepper motor controller controlling the opening and closing of railway gates at railway crossings [5].

A system that uses ultrasonic sensors to locate artifacts on the track and, accordingly, produces a control signal and, via communication protocol, transfers it to the control room to control the movement of trains on the railway track. Using the PIC microcontroller, the automated railway gate control device saves precious human lives and avoids major railway track disasters. An Arduino-based railway gate opening and closing control system with IR sensors for train detection. In order to reduce accidents in unmanned railway crossings it is proposed to have an automatic gate control system at the crossings. The arrival of the train at the crossing in terms of distance is calculated and informed to the staff of railways through GSM which enables lesser closing times of the railway gates for the road transport users. In addition to this, the fault in railway track as well as a message is carried to the station master when there is another train on the same track [6].

The system developed has the following features:

Distance calculation between arriving train and crossing platform in kilometres using magnetic readers positioned a few kilometres from each other, notifying station master of arriving train status using GSM technique so that prior information can be given for the opening and closing of the gate in order to cause the public less inconvenience, automatic operation of the railway gate at the crossing Using this a record of the person who is pulling the chain is kept in case of emergency. Most of the railway accidents took place because of broken railway track, this result in loss of property and humans which can be identified by means of sensors .Also an anti-collision module is developed to avoid head on collision on railway tracks [7].

The main block diagram of the developed automatic railway system is given in figure 1. The main components of the overall system are power supply unit, microcontroller, magnetic reader, relays, IR sensors, RFID module, GSM module and anti-collision modules.

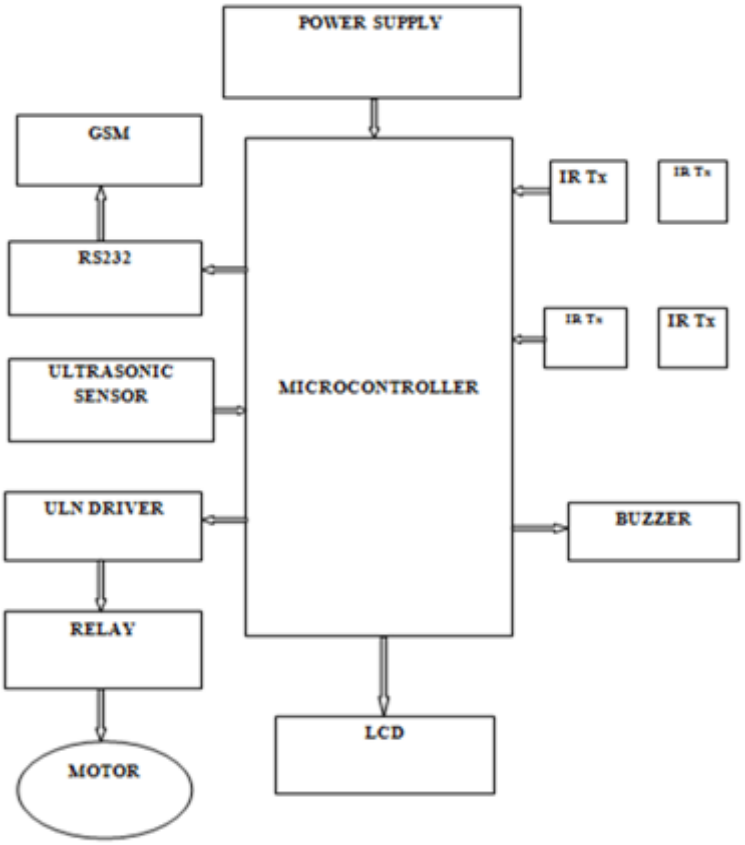

Fig 1: Block diagram of automatic railway system

Automatic railway gate control system is an arrangement of physical components which sense the arrival of the train and make the gate pull up and pull down automatically [8]. As a train approaches at the railway crossing from either side, the sensors placed at a certain distance from the gate detect the approaching train and accordingly control the operation of the gate. Sensors mounted at a certain distance from the gate detect the departure of the train to prevent accidents. The departure signal is sent to the microcontroller, which controls the motor and opens the gate in turn [9]. Thus, because the gate is closed based on the telephone call of the previous station, the duration during which the gate is closed is less than the manually operated gates. Reliability, since it is not prone to human errors, is also strong. Research on automatic gate controller systems has historically been performed for the railway industry. It concentrated on two main areas: the transmission of information and gate control. Problems related to the transmission of information include the identification of trains and the quick transmission to the control unit of this information. Problems related to the operation of the gate are very sophisticated and complicated. They include train appearance, immediate closing and gate opening. There are several complexities in the current solutions and they need study to help railways [10].

III. CONCLUSION & DISCUSSION

The proposed system solves the problems of head to head collision of trains, an anti-collision with the help of a system which is used with the trains. The proposed system is referred to as an advancement of the present system of railway by changing the unmanned as well as manned railway gate into an automatic railway gate controlling system. Automatic switching between railway tracks & running the train smoothly & automatically. The system has many advantages: it will reduce the accidents occurring at the railway crossing, by removing manual operations it will increase the accuracy & reduce errors. It will reduce the collision of trains & also manage the route of a particular train to avoid any delay in reaching its destination. Trains will always be on time at the station no delay will be caused which occurs in manual operation. Security can be implemented by placing a tracker in the train in order to monitor the location of the train in case of any issue. Solar panels can be used to generate power for the system thereby increasing the efficiency of the system.

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