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RAILWAY GATE EFFICIENT CONTROLLING SYSTEM USING RADIO FREQUENCY MODULES AND OPTOELECTRONICS DEVICES

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ABSTRACT

Today railway crossing are everywhere without dedicated railway gate keepers. So accidents in the crossing are increasing day by day. No fruitful preventive steps have been taken to avoid such the accidents. According to statistics from Sri Lanka Railways, there are an increasing number of accidents at level crossings due to increase in human population and vehicles. The number of fatalities from these accidents also increased dramatically. This research study attempts to find out convenient solutions using the knowledge of the microcontroller based automation, optoelectronics and RF devices. This research deals with automatic railway gate at a level crossing replace the gate keepers thus minimizing human mistakes. Also project deals with two things, firstly it reduces the time for which the gate is being kept closed. Secondly, to provide safety to the road users with reducing the accidents. By employing the automated railway gate control at the level crossing hence the signal for arrival of the train is transmitted on that signal is detected by the receiver which is fitted in the gate. Then gate is closed after checking whether the road is clear or not, pass another signal to the train informing the road condition. The gate controlling system will further developed for minimizing almost all the risky. The proto type experimented system with optoelectronics and RF devices based sensing and signaling successfully operated. This system is cost effective and it can be further reduced by using available devices and components.

Keywords: *Rail gate, Transmitter, Receiver, Half duplex, Optoelectronic devices*

1.0 INTRODUCTION

At present scenario, in Sri Lanka level crossings, the railway gate is operated normally by a gate keeper after receiving the information about the train's arrival. When a train starts to leave a station, the station master of a particular station delivers the information to the nearby gate.

The above said procedures are followed for operating the railway gates. This project deals with automatic railway gate operation implemented in unmanned level crossing at remote areas. Detecting techniques of train approaching the gate is Radio Frequency (RF) modules. In this one set of RF modules is used for transmit the data which indicates, train enter the relevant area then the other set of RF module is used for transmit the data which indicates the gate is open or closed. The microcontroller based automation is used for controlling the gate operation of opening or closing. The optoelectronic devices (laser diodes) are used for road condition sensing, clear or not purposes[1].

2.0 METHADOLOGY

2.1 Data transmitting and receiving system

In this railway gate simulation platform radio frequency (RF) transmission module employs Amplitude Shift Keying (ASK) with transmitter and receiver[2]. The transmitter module takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed away from the source of transmission[3]. The system allows half duplex communication between two nodes, called transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The RF receiver is detected the signal which transfer from transmitter and send it to the decoder. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs

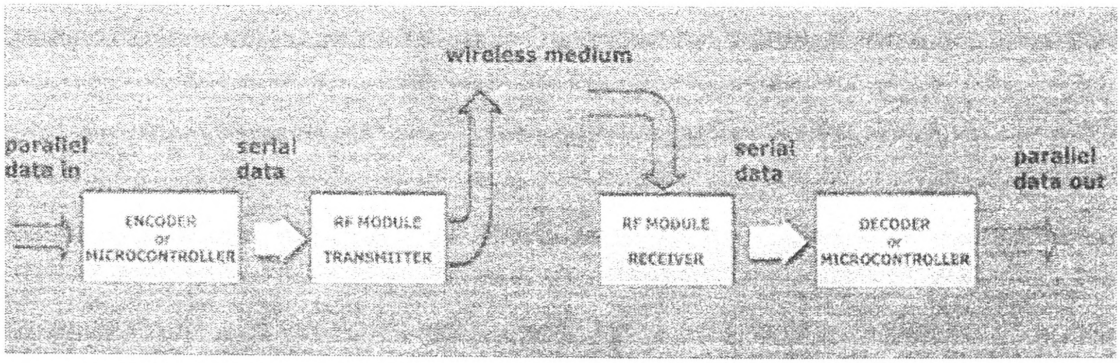

Figure 1: The overall data transmission system[4]

2.2 The railway gate controlling system

When RF receiver received the train arrival indicating signal, it transfers to decoder. Decoder gives the parallel output data to the microcontroller. Microcontroller check whether road is clear or not and if road is clear then pass another signal to the servo motor for close the gate. Also it transfers signal to the train informing the gate is closed and railway path is clear. If road is not clear another signal is sent to the train indicating the information of gate is not close and that the railway road is not clear.

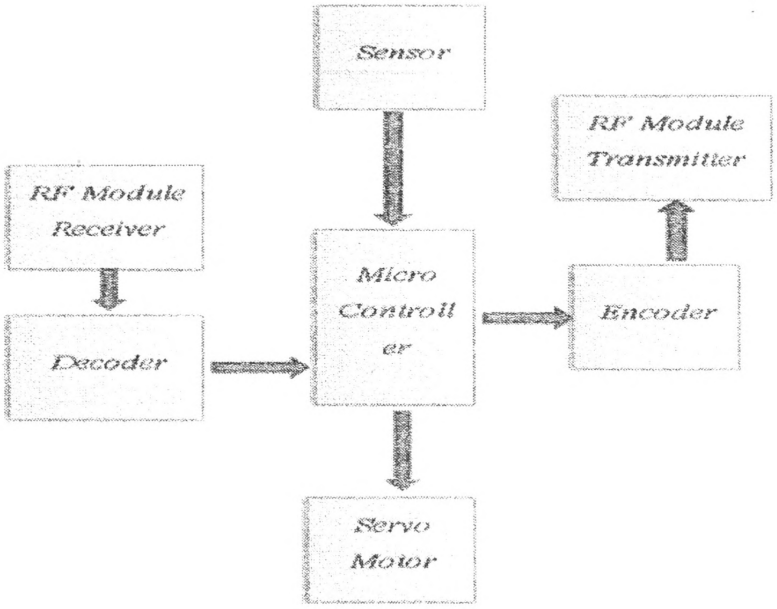

Figure 2: Gate control system

2.3 Complete view of the railway gate efficient controlling system

This Railway Gate Controlling System controls the gate automatically by detecting the relevant signal. When train arrives in a particular direction RF transmitter generate appropriate signal and then RF receiver detect that signal. At the same time after detecting the signal, the condition of the road is checked whether road is clear or not. If road is clear then the gate is automatically closed and another signal is sent to the train indicating the gate closer. If road is not clear RF transmitter which is at the railway station, transmit the signal to the train by indicating the gate is not closed. In such instance the train driver should stop the train manually. Accidentally sometime auto car drivers may enter the vehicles to the rail road when gate is closed. At such instance was be immediately passed a wrong signal from the station transmitter to the train indicating the condition. In such a case railway driver should stop the train before entering the dangerous zone.

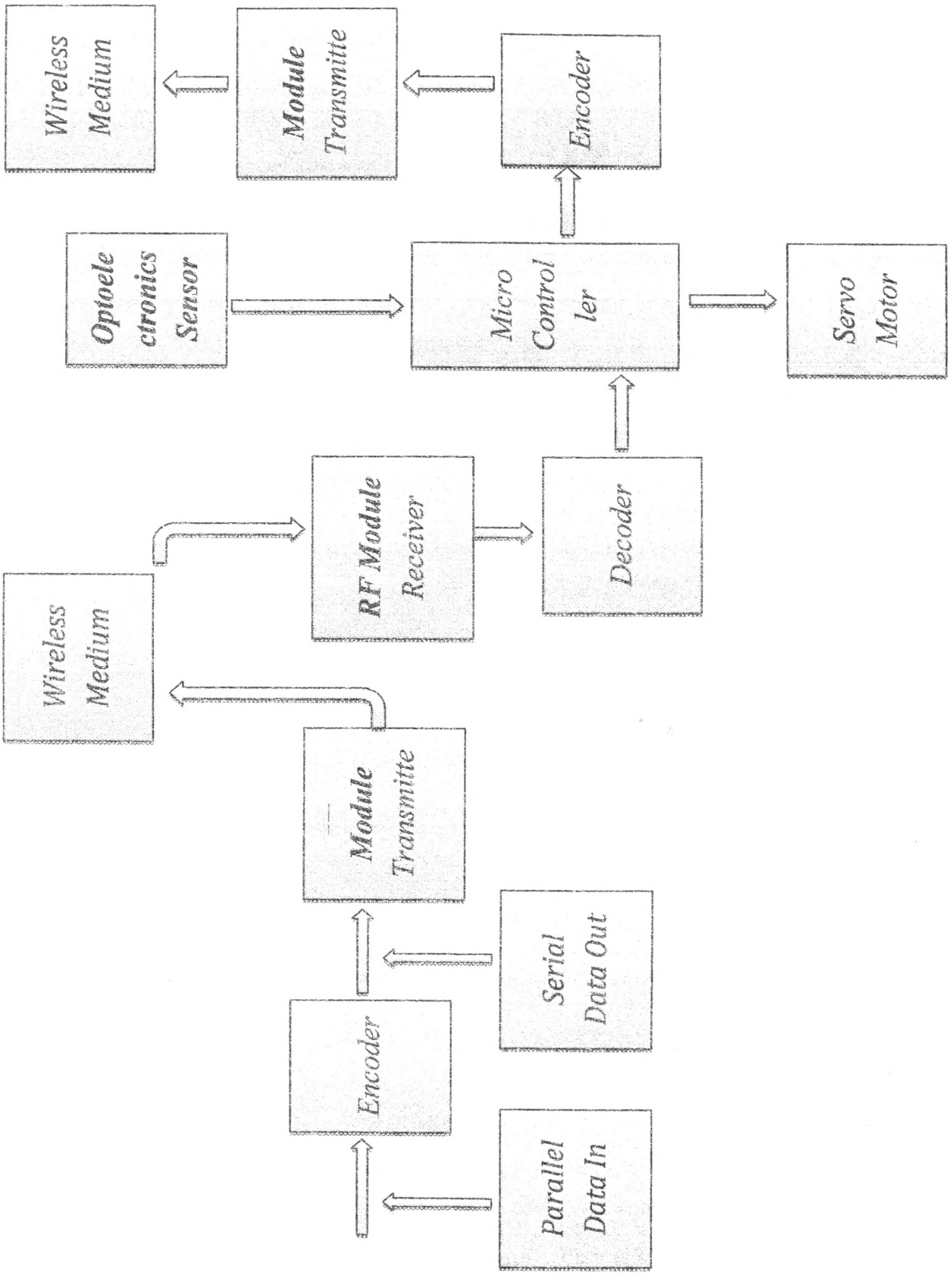

Figure 3 : Overall railway gate controlling system block diagram

3.0 OBSERVATIONS AND DISCUSSION

In this proposed railway gate controlling system, when train reaches to the gate then gate is automatically closed. This process was done by using the data transmission system. When design the Railway Gate Controlling System, the safety and reliability of the system must be considered in first place. Hence this system was designed by considering the safety. In the constructed proto type system one sensor part for one side of the road was included for checking whether the vehicles are on the road or not. In order to further increase the safety, the two pair of beams crossing sensor part for each side of the road can be included.

By employing the proposed automatic railway gate controlling system at the level crossing, the gate closing and opening reaction time can be minimized compared to the manually operated gates. Also it reduces the human labor. This type of gates can be employed in level crossing without keepers where the chances of accidents are higher and also reliable operation is required. Since, the operation is automatic; error due to manual operation is prevented. And the implementation railway gate operation system can be centralized. Intern thus well minimizes the train collision accidents.

4.0 CONCLUSION

Nowadays, in Sri Lanka the railway gate is operating by human based manual operation. It is operating in the areas where the railway line junctions with the roads. The railway gate management has to employ gate keeper on duty for controlling the operation. Often the gate keeper has to manually open and close the gate where under his supervision specially. The accidents have to be avoided at places where there is no gate keepers managing the railway crossing gates.

By implementing this prototype system will introduce as a real world. The automatic railway gate operation controlling yet under human supervision the problems occurred while this system was operated can be minimized. Two RF modules were used for transmitting and receiving the data. Laser diode source and LDR sensor were used for sensing the vehicles that are reaching the railway gate. Also the stepper motor was used to open and close the gates automatically when it is rotated clockwise or anticlockwise direction. This is the more economical and reliable solution which could be found to minimize the accident at railway road crossing gates in Sri Lanka.

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