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Auto Pilot Security System for Railway Gates using LabVIEW

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ABSTRACT: The objective of this paper is to replace the railway level crossings which are operated by the gatekeeper with an automatic system by using myRIO with LabVIEW. The system consists of two proximity sensors placed before and after the level crossing which is used to detect the arrival and leaving of train. The IR sensor is used to detect the presence of obstacle in the level crossing. The system reduces the risk of accident and need to employ a gate keeper. This type of gates can be implemented in an unmanned level crossing in rural places and reliable operation is provided by these automated systems.Since the operation is not manual, errors are prevented. The system works on myRIObased control by using LabVIEW. The proposed system uses the IR sensors to detect the arrival anddeparture of trains and the gate is opened or closed accordingly. The gate is operated by Servo motors. This project has a better future scope and will help in the economic improvement of the society.

KEYWORDS:IR Transceiver, myRIO, LabVIEW, Automatic railway gate control system.

I.INTRODUCTION

This paper deals with a topic of preventing major accidents by implementing an automatic control. This provides a safe and efficient method for improving the safety levels of level crossings. Accidents at railway crossings are due to negligence and unreliability of manual operation leads to death and trauma worldwide. A survey by Indian Railway reveals that about 17% of total railway accidents in India occurs at level crossings among them majority of them occur at passive level crossings. The operation of railway gates at level crossings is not that efficient nowadays. Primarily the passengers who use road transport have to wait long time before the arrival of train and even after the departure.

Secondly the accidents that usually occurred are due to the carelessness of the passengers or due to the improper schedule followed by the gatekeepers. Therefore the automatic railway gate control has become a necessity. In this project we detect the arrival and departure of the train by a standalone system. If no obstacle is detected a clear signal is given to the train, otherwise a halt signal is provided remotely. Once the obstacles are cleared, the gate are closed and train is allowed to pass. The system makes sure that the train is allowed to pass and reopens the gate. The system has two advantages. First, it reduces the time the gate is closed. Secondly, safety to the passengers using the road is increased by reducing the accidents. In this automatic railway gate control system, at the level crossing the arrival is detected by the IR sensor prior to the gate. Hence, the time for which the gate is closed is reduced compared to the manual gates.

II.INTERFACING THE SERVO MOTOR

A servo is a mechanical motor which can be instructed to move forward or reverse to a specific position. The servo box is a dc motor which is mechanically linked to a position feedback potentiometer and a gearbox along with an electronic feedback control circuitry and drive electronic circuit.

Servos are controlled by pulse width modulation. The parameters controlled are Duty cycle and Frequency. The rotation constraints of the servo it has a neutral position or default position and this position has exactly the same potential both in clockwise and anti-clockwise direction. Different servos have different values based on their rotation

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but have a common neutral position of 1.5ms(milliseconds) (approx.).The angle is determined by the duty cycle and frequency. This signal is called as Pulse width Modulation. Servo has a refresh rate of 20ms. The length of this pulse determines how long the motor is in on condition. For example, a 1.5ms pulse will make the motor reach neutral position. When the control signals are provided the motor is moved to the desired Position and hold that position. Servo remains in the same position and resists from moving out of the desired position. The maximum amount of force the servo can exert is provided by the torque rating for the specific servo. In order to remain in the same position the position pulse must be repeated to the servo to stay in position. Any value within the 1.5ms range makes the motor to move to that position and it moves in clockwise direction from the neutral point. Any value greater than 1.5ms the motor revolves in anti-clockwise direction. The duty cycle and frequency makes the servo to turn to the desired position. Different servos have different maximumand minimum ranges for all the parameters. Usually the minimum value is about 1ms wide and the maximum value is about 2ms.

III.IR TRANSCEIVER

IR transceiver is used to determining the arrival and departure of train. This is done by using IR Transceiver in which presence of train is detected as logical zero.

A. **Transmitter**

The Infrared Diode emits infrared waves and is a high intensity diode, it ismoulded in blue transparent package. The device is spectrally matched with phototransistor, photodiode and IR receiver module.it has a range of 10-15cms.it has an IR receiver which is inclined in an angle such that it can trap all the incoming signals. Some of its applications are smoke detectors, IR Transmitters free air transmission systems etc.

B. **Receiver**

The IR LED converts the incident IR radiations to an equivalent electric current which when passed through a Resistor results in a certain amount of voltage drop. This value of voltage will depend upon the intensity of incident IR radiations or in other words, the distance between IR transmitter and receiver. The receiver is connected in reverse bias in the circuit. The IR rays emitted by the transmitter get reflected back after hitting the target. Receiver coverts this Received radiations to a corresponding electric current.

C.**AMPLIFIER**

The amplifier unit helps to get the weak input signals and amplifies them into a strong signal with an increased amplitude and range. It doesn't alter the signals in any manner. It simply amplifies the signal. The amplifier used here is LM358 (Dual operational amplifier). The input provided for the amplifier is 5v and a ground signal.

IV.OPERATION

One of the major advantages of this project is its simple circuitry and its easy working nature. The circuitry is divided intothree parts. First one is the Arduino section.Second is the IR obstacle detection section kept on the tracks and third is the mechanical operation section which is used to operate the gate at the level crossing by using servo motors for opening and closing of the gates. By utilising this systeman automatic control is established at the unmanned level crossings remotely through the standalone system. The arrivalof the train is detected by the IR sensors placed on the tracks. These sensors are placed at a distance of 3km prior to the system. Once the first sensor senses the train a signal is generated, this signal is sent to the myRIO and the input is given to the LabVIEW. The program present in the system gets the input and processes it and provides the output in the form of pulse width modulation signals to theservo motors present at the gates. The red light and an alert signal through buzzer is given to the passengers on the road indicating them that the gates are going to be closed. Once this buzzer signal is given servo motor is operated andthe gates areclosed eventually. But, if any obstacle is detected then the alert signal is given to the system. The operator is alerted and the operator gives a remote signal to the train, it is also indicated to the train driver by signals (RED) placed at about 1.5km and the operator can control the train by applying the emergency brake from a remote location, so the train can be stopped before the level crossing.The red signal changes to a green one oncethe obstacle is cleared and the train is allowed to pass. The sensor which is placed 1km away from the level crossing detects the departure. Once the train is left, the generated signal is sent to the LabVIEW via the myRIO and the processor analyses the signal and provides the output signal to the servo motor to rotate in the opposite direction and eventually the gate is opened. The Passengers are allowed to pass safely.

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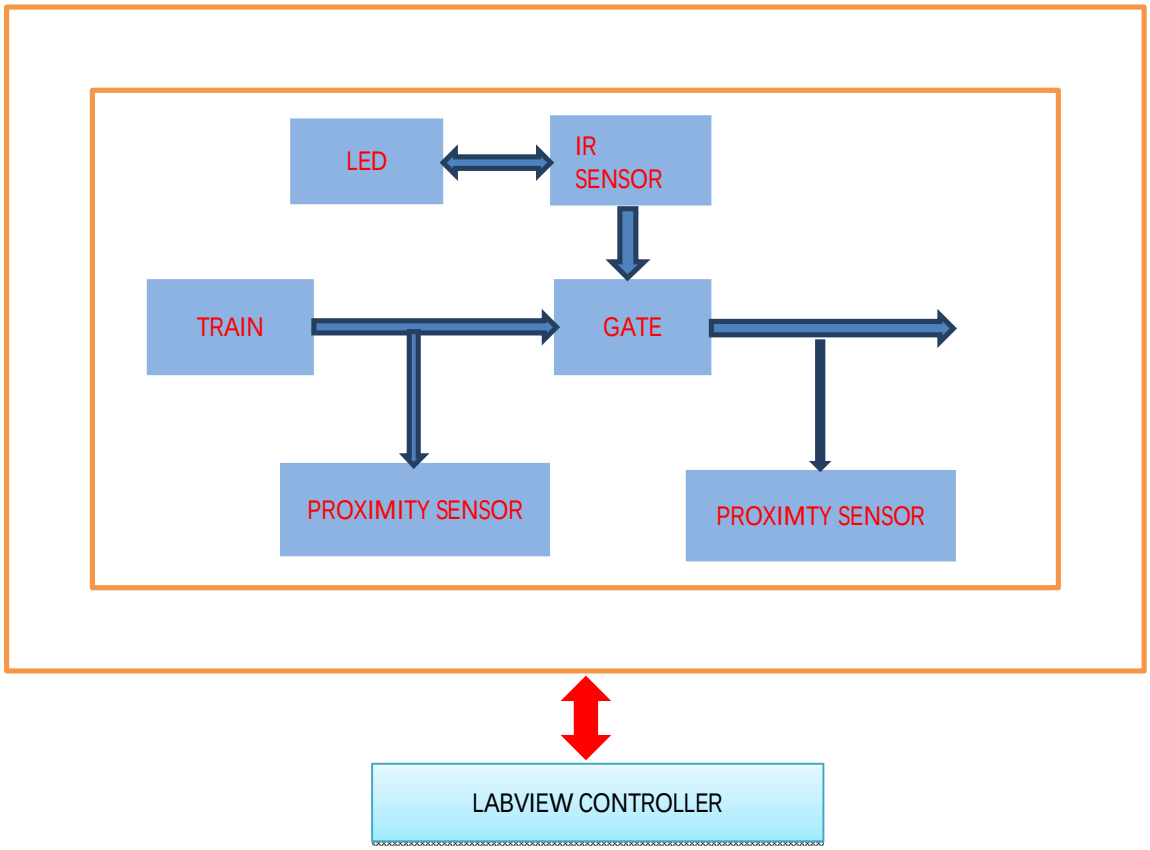

Fig 1 Block diagram

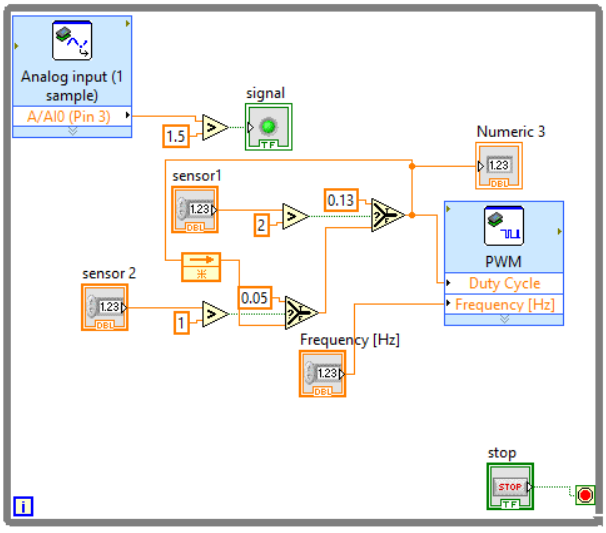

Fig 2 Simulation

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V.CONCLUSION

Thus when this process is implemented, automated train gates are possible at each and every place they are implemented. There is no need to appoint separate gate operators in each and every gates. The accidents can be drastically reduced. The time waiting near the gates are reduced. This project enables the operator to get the status of the gates from a remote location. Remote controlling of the train and gates are possible. This system is a standalone system so there is no need to control them each and every time. Monitoring the gates alone is sufficient. The locomotive driver can also be alerted about the situation ahead of him. This project is made with a futuristic approach.

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