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MICROCONTROLLER BASED AUTOMATIC RAILWAY GATE CONTROL WITH ZERO ACCIDENT

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Abstract:
The present work attempts to automate the opening and closing of gates at a railway level crossing. In general, level crossing gates are operated manually by a gate keeper. The gate keeper receives the information about the train arrival from a near station. When the train starts to leave the station, the station in-charge delivers this information to the closest gatekeeper to get ready. This human intervention can be avoided by automating the process. In situations where the train is late due to some reason, the gates remain closed for long durations causing dense traffic jam near the gates. This too can be prevented by automation. The proposed system uses infrared sensors to detect the arrival and departure of trains at the railway level crossing and Arduino to control the opening/closing of gates. The system uses two IR sensors to detect the arrival of the train and a third IR sensor to detect the departure of the train. When the arrival of the train is sensed, signals are provided to the traffic indicating the arrival of the train on the track. When the second sensor detects the train then the signal turns red and the motor operates to close the gate. The gate remains closed until the train completely moves away from the level cross. When the departure of the train is detected by the third sensor, the traffic signal turns green and the motor operates to open the gate. Thus automation of the gate operations at the railway level cross is achieved using sensors.

Index Terms— Automation, Obstacle detection, Railway gate, Sensor.

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INTRODUCTION:

The railway system is the most commonly used transportation mode in India. It is also one of those modes of transport that faces a lot of challenges due to human errors such as level cross accidents, collisions, etc. A level cross, an intersection of a road and a

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railway line, requires human coordination, the lack of which leads to accidents. Level crosses are controlled by manually operated gates. In order to avoid the human errors that could occur during the operation of gates, the proposed paper introduces the concept of railway gate automation. Level crossings are managed by the gatekeeper and the gatekeeper is instructed by the means of telephone at most of the level cross from the control room. But the rate of manual error that could occur at these level crosses are high because they are unsafe to perform without actual knowledge about the train time table. Delay in the opening and closing of the gate could lead to railway accidents. The present work attempts to develop a system which automates gate operations (opening and closing) at the level cross using micro-controllers and

detect collisions at the level cross using a laser beam and Light Dependent Resistor (LDR). The major challenge faced by the Indian railway system is the increasing accident rate at the level crosses. The existing system involves the manual gate operation by the gate keepers based on the signals received from the control room. The human errors such as delay in informing the gatekeeper about the arrival of the train, delay in the gate operation by the gate keeper, obstacle stuck in the level cross etc. leads to the increasing rate of accidents at the level cross. Thus the railway gate automation system aims to deal with two things. It reduces the total time taken for the gate operation at the level cross and also ensures the safety of the passengers at the level cross during when the train passes. The reduction in the direct human intervention during the gate operation in turn helps to reduce the collision and accidents at the level cross. Since the gate operations are automated based on the sensors, the time for which the gate is closed is less. The paper thus intends to develop an automatic railway gate control system which is reliable and secured than the existing manual systems. The rest of the paper is organized as follows. Section II gives a review of the previous papers that relate to our work. Section III describes the overview of the railway gate automation system. Section IV describes the system architecture, the gate operations at the level cross and methodology. The experimental results are discussed in Section V and the conclusion of the work is discussed in Section VI.

Objective:

To avoid an unwanted accident, occur at the railway level crossing due to less awareness of drivers and poor work of gate keeper and also saving the tunnel power supply.

Literature Review:

Xishi [2] discussed about the advanced train safety system. They defined that in the process of developing ATSS, a fault tolerance method is applied for both the hardware and the software components. The railway gate automation system is successively implemented since 2000 in Korea. The implementation of the system effectively reduced the accident rate at the level cross and the sensors used in the Korean railway gate automation system is magnetic sensors. Magnetic sensors placed underground are less affected by environmental changes and recognizes the direction of movement of vehicles [2]. Jeong [3] defined the railway auto control system using OGSi and JESS. The method by which the state of railway cross is estimated using JESS is described in their paper. The different methods with which the

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locomotive pilots can avoid the accident situations and the safety measures to be taken in the level crossings are also discussed. In [4], a detailed introduction about the present railway technology is presented. It discusses the disadvantages of manually activated railway signals and the railway warnings at the level cross. The train detectors act as the major component in the train automation system.

EXISTING SYSTEM:

Sensor based railway gate automation system is developed to automate the process of opening and closing of gate at the railway level crosses. The system detects the arrival and the departure of train for the gate operation using different types of sensors. The proposed system uses three infrared sensors to identify the arrival and departure of trains. The system also implements obstacle sensor which detects any obstacle on the track and controls the operation of the train. Sensors and servo motors are programmed using Arduino micro-controller. The major components used in the automation of railway gate at the level gates are sensors. Sensors that detects the train can be classified into different types such as: **Wheel detecting sensor:** Wheel sensors works on magnetic inductive principle. The DC current which is generated as the output signal from the wheel detectors are used for the detection of train arrival. **Vibration sensor:** Vibration sensors uses piezoelectric effect to detect the vibration in the track which detects the arrival and departure of the train. The output signal from the vibration sensor is fed into the micro-controller and it automates the gate operations. The major application of the vibration sensor is collision detection. **IR sensor:** IR sensors detect the train using infra-red receiver and transmitter. Infra-red sensors are capable of detecting the presence of an object by sensing the heat being emitted by the object. It emits or detects the radiations to detect the motion of an object surrounding it. The most commonly used sensors for the automatic railway gate system is vibration sensors and IR sensors [5]

DISADVANTAGES OF EXISTING SYSTEM:

- A level cross, an intersection of a road and a railway line, requires human coordination, the lack of which leads to accidents.
- Delay in the opening and closing of the gate could lead to railway accidents when vehicle is trapped inside.
- Where the train is late due to some reason, the gates remain closed for long durations causing dense traffic jam near the gates.
- Wire cost is high between sensor and controller due to large distance between them.
- Requirement of separate wires for each sensor increase the cost furtherly.
- IR sensors not only detect the train but also detect the crossing animals and human beings and it closes the gate.

PROPOSED SYSTEM:

To automate the opening and closing of gates the station in-charge delivers this information to gatekeeper. This human

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intervention can be avoided by automating the process. If the train is late due to some reason, The gates remain closed for long durations. This Causing dense traffic jam near the gates. Two IR sensors to detect the arrival of the train. Third IR sensor to detect the departure of the train. First IR sensor creating siren sound for alerting and Turn signal red. Second IR sensor close the gate. Third IR sensor turns the Traffic signal green and Motor operates to open the gate.

ADVANTAGES OF PROPOSED SYSTEM:

Two gate control system in both ways to prevent the vehicles trapped between two gets on the railway track.7 segment display that displays "THE TRAIN IS APPROACHING". This makes the drivers get aware of train arrival.Even now driver is less awareness the obstacle detector is used to avoid unwanted accident by making the train stop before it crash the vehicle.Siren sound at the railway level crossing furtherly provide more awareness for the drivers.Inductive sensors and Piezo electric sensor are used to confirm that the crossing object is train.Analog transmitter -- TXA15101E and Analog receiver -- RXA15101E are used to reduce wire cost.Multiplexer and Demultiplexer is used to avoid individual wires for each sensor.

Conclusion:

The paper proposed above deals with the safety of railways. The various features mentioned and described in the paper intend to provide secure and safe commutation. The features include anti-collision and automatic gate control lessens the manual interference and hence increases the accuracy and precision to avoid accidents occurring due to more negligence. Accident detection provides emergency assistance needed if an accident occurs.
It shows that it is possible to improve the overall safety of the railway system in India. The result depends on both the railway industry and the regulator working together for effective security. The proposed system provides the means for real time inspection. The purpose of maintenance on the movable and fixed facilities for the guarantee of operation safety and maintenance efficiency.

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