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Automatic Railway Gate Control System Using Arduino Uno

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ABSTRACT: The present work attempts to automate the opening and closing of the gates at railway level crossing. In general, level crossing gates are operated manually by a gate keeper. This human intervention can be avoided by automating the process. The proposed system uses infrared sensors to detect the arrival and departure of trains at particular distance from railway level crossing and Arduino to control opening and closing of gates. HC-12 transceiver module is a wireless serial communication module is capable of making a long range wireless communication between two microcontrollers, with distances up to 1.5 km. When the arrival of train is detected by the infrared sensor which is placed 3 km away from the gate the input is given to the Arduino, which communicates with the other Arduino at gate end using a HC-12 transceiver module present in between the gate and train (At 1.5 km). Once the information received by Arduino at the gate end, closes the gate using motor. When the train reaches the second IR sensor which is placed near gate, the sensor detects the train and once the detection stops, the input is passed to Arduino at gate, which opens the gate using motor. Thus automation of the gate operation at railway level cross is achieved using sensors and HC-12.

KEYWORDS: Arduino UNO, HC-12 Transceiver, Infrared (IR) sensor, DC Motor, Liquid Crystal Display(LCD).

I. INTRODUCTION

Railways being the cheapest mode of transportation are preferred over all the other means. But there are so many accidents happening at the manned control level crossings. This is mainly due to the carelessness in manual operations or lack of workers. The main objective of this paper is to avoid the railway accidents happening at the level crossings. In India, railway is the major mode of the transportations and it is the cheapest way for travelling. So there are more numbers of rail users. And it is not easy to stop railway anywhere to prevent accident or for any other reason. Due to that there are major drawbacks of that. At present manned system is available at level crossings. Hence, many accidents occur at such crossings, since there is no one to take care of the functioning of the railway gate when a train approaches the crossing. The objective of this paper is to manage the control system of railway gate using the microcontroller.

II. COMPONENTS REQUIRED

HARDWARE REQUIREMENTS:

- Arduino UNO
- HC-12 Transceiver
- LCD
- Buzzer
- IR sensor

SOFTWARE REQUIREMENTS:

- Embedded C
- Arduino IDE
- Proteus

III. MODELLING ANALYSIS

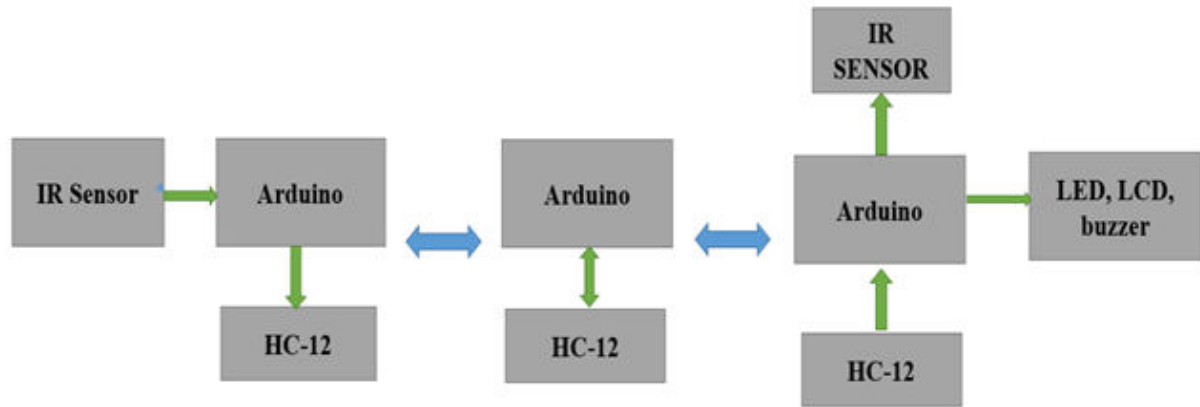


Figure 1: Block Diagram

POWER SUPPLY UNIT:

Power Supply unit consist of three units: Rectifier, capacitor, voltage regulator. A rectifier is an electrical device that converts alternating current, which periodically reverses direction, to direct current, which flows in only one direction. The ripple can be reduced by smoothing capacitors which converts the ripple voltage into a smoother dc voltage. A voltage regulator is a component of the power supply unit that ensures a steady constant voltage supply through all operational conditions. It regulates voltage during power fluctuations and variations in loads.

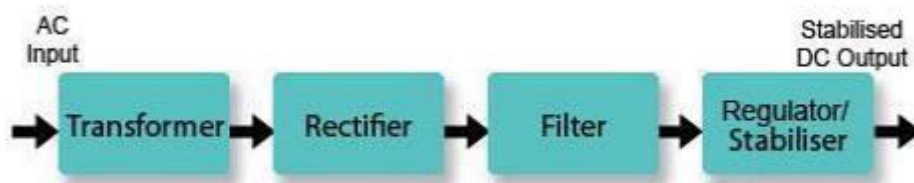


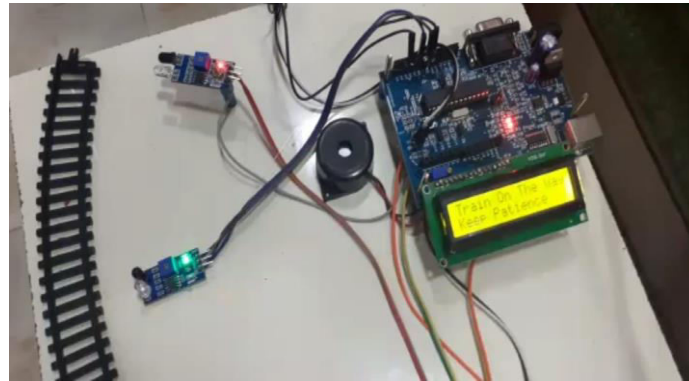
Figure 2: Power Supply unit

IV. METHODOLOGY

In proposed system attempts to automate the opening and closing of the gates at railway level crossing. In general level crossing gates are operated manually by a gate keeper. This human intervention can be avoided by automating the process. The proposed system uses infrared sensors to detect the arrival and departure of trains at the distance from railway level crossing and Arduino to control opening and closing of gates. HC-12 transceiver module is a wireless serial communication module is capable of making a long range wireless communication between two microcontroller boards, with distances up to 1.8 km. When the arrival of train is detected by the infrared sensor which is placed 3 km away from the gate the input is given to the Arduino, which communicates with the other Arduino at gate end using a HC-12 transceiver module present in between the gate and train (At 1.5 km). The information received by Arduino at the gate end, closes the gate using motor. When the train reaches the second IR sensor which is placed at the other end, the sensor detects the train and the input is passed to Arduino which communicates with the Arduino at gate end using HC-12 module, which opens the gate using motor. Thus automation of the gate operation at railway level cross is achieved using sensors and hc-12.

V. RESULT

1 : LCD displays the message “Train on the way” “Keep patience” and buzzer sounds to make passers by alert.



2: The Gate closes and Green signal is given to the train which is proceeded from danger once the gate is completely closed.



VI. CONCLUSION

We have constructed a prototype for wireless railway level crossing. This research work mainly deals with the process of replacing manned railway system to an unmanned railway system and life is protected by occurrence of unexpected train accidents which is a challenge of the era of modern science and technology. By using the system we can be able to avoid maximum number of collisions. The proposed prototype via this research paper can be used for improving the railway system and the advancing technology in the railway system.

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