A Review Paper on, Arduino Based Automatic Railway Gate Control

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Abstract— From this project we'll know how to implement the automation in railway gate control using Audrino. Application of this project is the direct implementation in real world. Some components will be required more but the main working principle will be same. Now, other alerting systems can also be developed by using Audrino. The main aim of this project is to reduce accidents at railway level crossings to the minimum. The proposed system uses infra-red sensors to detect the arrival and departure of trains at the railway level crossing, ultrasonic sensor to detect the obstacle on the track, and Arduino to control the opening/closing of gates. This motivated us to take up this project.

Keywords: Audrino, Automatic Railway Gate Control

I. INTRODUCTION

Level crossing is that area where the rail line intersects with the road which is used by transportation or other vehicles. To prevent accidents a system named "Level Crossing" has been developed. But in early days all the level crossings are operated by humans. So human interference was mandatory. But, manual control is not errors free. The railway gate or level crossing is opened or closed by a gateman who was informed from the nearest railway station about the arrival of a train. There're also many level crossings in India which are unmanned. So they are potentially dangerous for road users. In India we must develop a prototype to be implemented to automatically control railway gate upon arrival as well as departure of train. The project should not be too much expensive but must be reliable. So we used Audrino uno R3 which is quite reliable as well as affordable. We started to develop our project based upon 8051 microcontroller which is also cheaper than Audrino. But in terms of reliability and implementation of future featured we upgraded to arduino uno.

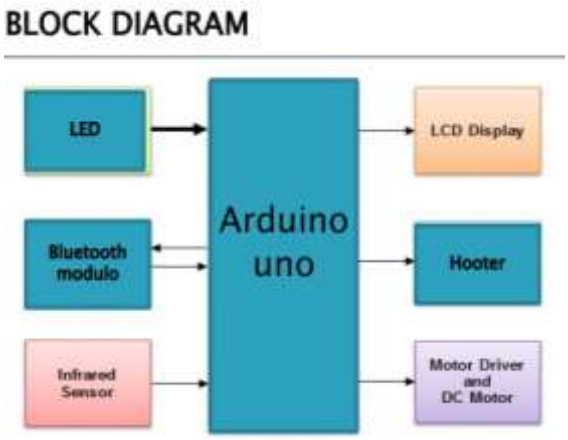

Fig. 1: Block Diagram

The main component of this system is Arduino Uno. The infrared sensors is used to sense arrival and departure of the trains at railway crossing. When the train will arrive, it will be sense by infrared sensors. Function of Arduino is to control the opening/closing of gates through servo motor and also to convey the obstacle message and indication signals to the road users by LED and Buzzer. When the arrival of the train is sensed, signals are sent to the traffic post indicating red light for the arrival of the train and at the same time gate remains closed until the train completely moves away from the level cross. When the departure of the train is detected by the second sensor, the traffic signal in the post turns green and the servomotor operates to open the gate. hence automation of the gate operations at the railway level cross is achieved using sensors.

The hardware components used in this system are as follows:

A. Arduino UNO
B. IR Sensor
C. Servo Motor
D. Buzzer
E. Motor Driver

A. Arduino UNO

Fig. 2: Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller.[12]

B. IR sensors:

Fig. 3: IR Sensor

Active infrared sensors both emit and detect infrared radiation. ... When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems.[2]

C. Buzzer

Fig. 4: Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric type device. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is widely used in alarms, computers, printers and other electronic products as sound devices.[8]

D. D.C Servo Motor:

Fig. 5: D.C Servo Moter

A DC motor is any of a class of rotary electric motors that converts direct current electrical energy into mechanical energy. Servo motors control position and speed very precisely. Now a potentiometer can sense the mechanical position of the shaft. Hence it couples with the motor shaft through gears. The current position of the shaft is converted into electrical signal by potentiometer, and is compared with the command input signal.

We give command input according to the position of shaft. If the feedback signal differs from the given input, an error signal alerts the user. We amplify this error signal and apply as the input to the motor, hence the motor rotates. And when the shaft reaches to the require position, error signal become zero, and hence the motor stays standstill holding the position.

The command input is in form of electrical pulses. As the actual input to the motor is the difference between feedback signal and required signal, hence speed of the motor is proportional to the difference between the current position and required position.

Usually a servomotor turns 90 degree in either direction hence maximum movement can be 180 degree. However a normal servo motor cannot rotate any further to a build in mechanical stop.[3]

E. Motor Driver:

Fig. 6: Motor Driver

DC servo motor drive DCS-3010 is a microcontroller based PWM drive for permanent magnet DC (PMDC) motors with supply voltage up to 115 VDC and current up to 30 A. Drive is based on a 16-bit microcontroller with implemented PID control algorithm.

As the feedback of DC motor position an incremental encoder with phase-shifted square signal is used. Encoder interface enables 1x, 2x and 4x incremental encoder resolution.

Adjustment of all DC servo drive DCS-3010(-HV) parameters is performed by using the free configuration software ServoTune3. ServoTune3 software has implemented PID auto tune algorithm.

DC servo drive for driving DC motors with high supply voltage DCS-3010-HV is supported by ServoTune3 versions V3.10 and later.

II. CIRCUIT DIAGRAM:

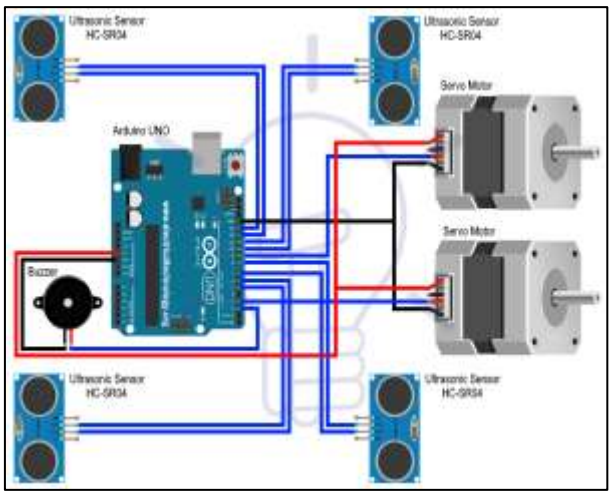

Fig. 7: Circuit Diagram

III. CONCLUSION

To save the human life and vehicles from miserable train accidents is a challenge of the era of modern science and technology. The working model was fabricated within the laboratory premises. The results exhibit that it is one of the expedient approach for secure railway system. The IR sensors detect the train and stuck on the level crossing very quickly and communicate with the control unit. The control unit takes proper steps which lead the train and vehicles movements either to move forward or to stop to avoid collision.

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