

Automated River Bridge Control Using Arduino

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Abstract— In this project, it presents automation on controlling the movement of the bridge. The main objective is to allow passage of large ships because we cannot build bridge according to the size and shape of the bridge. So, we are developing the prototype of bridge system which consists of two main systems i.e., toll gate control system and bridge plate system. We are using Arduino Nano, servo motors, DC motors and motor driver to develop the prototype of automatic bridge system. Arduino Nano is used to mechanize the system Our main idea is to automatically make the ship detection, opening or closing of a bridge, control the road barriers. Motive of this project is to replace the manual system with automated system and to replace the needs of today for low-cost transportation.

Index Terms: Arduino Nano, Servo motor, DC motor and Motor driver, Automation

I.INTRODUCTION

Nowadays, growing visitor quantity increases which leads to congestion, normally across the toll gate of highway. Therefore, the new method is urgently required to reform the trouble of congestions. The Automated River bridge device is composed of numerous subsystems. Automated bridge device can deliver the numerous sectors for toll gates as saving time and lowering the human workers. Develop the prototype model, which reproduces the operation states of numerous toll gate systems passing time and ready time. The fundamental goal is to put in force a low-price acquisition device supposed for manipulate programs the usage of the Arduino prototyping platform.

Arduino is the main part of the system. Arduino monitors inputs, and will make decisions according to its program, and controls outputs to automate a process. IR sensor detects the ship which is placed on the either side of the bridge. Sensor output provides

input to the Arduino and it will control opening and closing of bridge tollgate using Servo motor and road barrier according to the code done in arduino. The Automatic Bridge Control System consists of three important parts. The first part is the Arduino controller and second part is hardware. These practically comprise of motor actuator for controlling bridge opening and closing, of bridge. The third part is the sensor. The sensor checks the ship and level of water.

II.LITERATURE REVIEW

M. Kottalil et.al [1] has carried out the opening and closing of railway gate according to the information given by the sensors of about arrival and leaving of train. The main objective is to replace the gate keeper who operate the gates with automatic railway system. According to Muhammad Arshad Khattak [3], he expressed his idea of interfacing sensor with PLC. In this paper, he proposed the bridge controlling using PLC thereby replacing the manual system which is currently used. The main objective of this paper to design an intelligent traffic control system on bridge. To solve the problem of traffic congestion, he used the mathematical functions to calculate the appropriate time for traffic signal to on and off. From the literature review, we have considered the idea of Muhammad Arshad Khattak in implementing the automated river bridge control. But we use Arduino Nano instead of PLC. The Automated River bridge can be raised to allow the smooth passage of ships and boats.

III.HARDWARE MODULES

The main components used are:

1. Arduino Nano Board
2. DC motor

- 3. Servo motor
- 4. IR sensor

1. Arduino Nano Board

Arduino Nano is cheap, small and breadboard friendly and it can be easy to programmable. This board consists of 8 analog inputs, 14 digital I/O pins. Out of 14 pins, 6pins are used as PWM output pins. The board is based on ATmega328P microcontroller. Microcontroller is having 28 pin configuration in which there are three ports such as port B, port C and port D. And this board consists of type-B USB port.



Figure 1: Arduino Nano Board.

2. DC motor

DC motor is a rotary electrical machine that converts electrical energy which is in the form of DC into mechanical energy. The main principle of DC motor is based on the Fleming’s left-hand rule. When a conductor is on left side encounters a force in the direction upwards whereas on the other side it encounters force on downwards. Thus, a torque is developed in single direction in DC motors. In this project, two DC motors are used for opening and closing of bridge plates.



Figure 2: DC motor

3. Servo motor

Servo motor is which helps in the toll gates opening and closing based on the signal it gets from IR detector. It basically works on Pulse Width Modulation which means its angle of rotation can be controlled by the duration of pulse as its control pin. Typically, 1 ms to 2 ms is the range of width of the pulses. Therefore, the servo motor rotates high until

180 degrees and cannot rotate continuously. Servo motor can rotate 90 degrees from its own position to either of its direction. Here two servo motors are used to lift the tollgates.



Figure 3: Servo motor

4. IR sensor

The IR sensor measures the intensity of reflected radiation. The main components of IR sensor are IR transmitter and IR receiver. It works based on when the IR emitter emits the radiation, it reaches the object(target) and some of the radiation reflected back to the IR receiver. If the ship is detected by the sensor, it sends a signal to the arduino nano for opening of the bridge and if the ship is not detected by the sensor, it sends the signal to the arduino nano for closing the bridge.

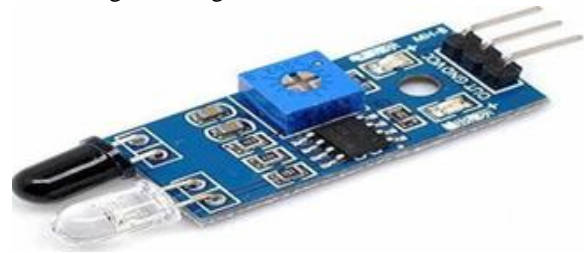
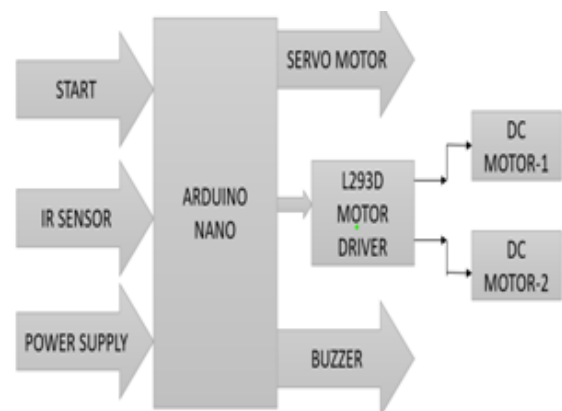
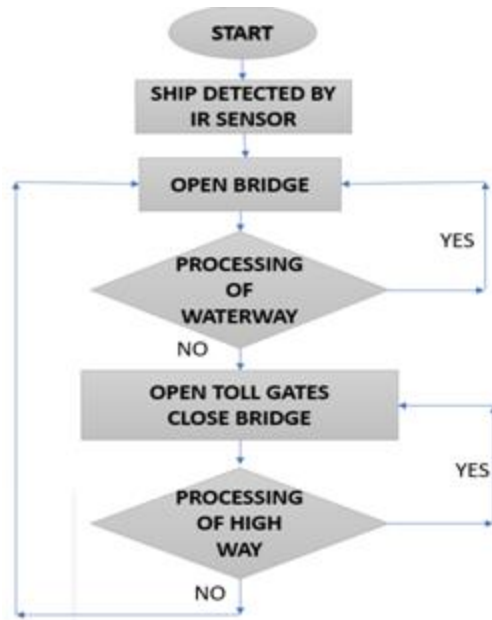


Figure 3: IR sensor

IV.BLOCK DIAGRAM



V.FLOW CHART



VI.WORKING

The Automated River Bridge control deals with automatic control of the process i.e., opening and closing of bridge with the help of Arduino Nano. The arrival of the ship is detected by the IR sensor-1 placed at the front side of the bridge. The buzzer will sound and DC motor will open the bridge and tollgate is closed with the help of servo motor, then vehicles are not allowed to go on bridge. The ship crosses the river and it is detected by the IR sensor-2 placed at the back side of the bridge. DC motor is used to close the bridge and tollgate is opened with the help of servo motor, then the vehicles are allowed to go.

VII.OUTPUT



VIII.ADVANTAGES

- Bridge can balance with counter weights making it easy to open and close.
- It has safe and easy operations.
- The bridge can carry varying loads.
- Provides smooth and accurate acceleration.
- It opens the water way for ships and vehicles with considerable speed.
- Quantity of materials can be reduced to construct bridge.

IX.CONCLUSION

We have developed the Arduino based automated river bridge control system for open and close of river bridge. This automated process able to reduce the man power required in this process. The objective of this project is to develop the automated river bridge control system to reduce the congestion of city highways and in waterways. We successfully implemented a functioning prototype of opening and closing of bridge for movement of bridge and also lifting up and down of tollgate for entry and exit of vehicles.

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