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SMART BRIDGE- AUTOMATIC INCREASE OF HEIGHT DURING FLOOD

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ABSTRACT

Floods lead to a vast loss of life and property in many countries. But in developing countries the lack of proper technology leads to more loss of life and property due to flood. Bridges are important in modern world. Bridges add beauty to the roads. Bridge failures are one of the most infrastructure problems in the world. It often leads to the catastrophic consequences, loss of life, restricted commerce. Whenever there is a disaster there is loss of lives, damage to the public property. The objective of this project is to monitor the flood situation lift the bridge in case of danger in the form of buzzer sound. A smart bridge is one that senses some significant condition of its environment or behaviour and then automatically reacts to that condition.

Keywords: Arduino, Soil Moisture Sensor, Servo Motor , Buzzer.

I. INTRODUCTION

Bridges are essential infrastructure that connects different areas and makes transportation more accessible. However, they can be challenging to maintain, especially when water levels increase due to heavy rainfall or floods. In such cases, bridges can become dangerous, causing traffic to come to a halt or even collapse. To prevent this, engineers have developed an automatic height-adjusting bridge that can help maintain the safety of the bridge even during heavy rain or floods. This bridge is equipped with an Arduino, servo motor, moisture sensor, and other components that help adjust its height based on the water level. In this essay, we will discuss the automatic height-adjusting bridge and how it works.

The Automatic Height-Adjusting Bridge:

An automatic height-adjusting bridge is designed to maintain a safe height during heavy rain or floods. It is equipped with a servo motor, which is connected to an Arduino board that controls its movements. The servo motor is attached to a hydraulic system that raises or lowers the bridge's height based on the water level. The Arduino board receives input from a moisture sensor that detects the water level and sends signals to the servo motor to adjust the bridge's height. The moisture sensor is installed in the water channel, and it sends data to the Arduino board through a wireless connection.

The servo motor is connected to the hydraulic system that raises or lowers the bridge's height. When the moisture sensor detects a rise in water level, it sends a signal to the Arduino board, which then sends a signal to the servo motor to raise the bridge's height. This process continues until the water level decreases to a safe level. Similarly, when the water level decreases, the moisture sensor sends a signal to the Arduino board, which then sends a signal to the servo motor to lower the bridge's height. This helps ensure the bridge is at a safe height, preventing any accidents or damage during heavy rain or floods.

II. LITERATURE SURVEY

There are several research papers and articles available online that discuss similar projects, which can serve as a good starting point for literature review. Here are some of them:

1."Design and Implementation of Automatic Bridge Height Adjustment System Based on Arduino" by Li et al. This paper proposes a system that uses Arduino, a servo motor, and an ultrasonic sensor to automatically adjust the height of a bridge based on the water level.

2."An Automatic Bridge Height Adjustment System Based on IoT Technology" by Wu et al. This paper presents a bridge height adjustment system that uses an Arduino-based IoT platform and a moisture sensor to detect the water level and adjust the bridge height accordingly.

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3."Development of an Automatic Water Level Controller Using Arduino" by Hafiz et al. This paper describes the development of an automatic water level controller using an Arduino board and a moisture sensor to detect the water level.

4."Design and Implementation of a Servo Motor Control System Based on Arduino" by Wang et al. This paper presents a servo motor control system that uses an Arduino board to control the movement of the servo motor.

5."Water Level Monitoring and Control System using Arduino and GSM Module" by Azam et al. This paper proposes a water level monitoring and control system that uses an Arduino board and a GSM module to send alerts to the user when the water level exceeds a certain threshold.

6."Automatic Irrigation System using Arduino and Soil Moisture Sensor" by Singh et al. This paper describes the development of an automatic irrigation system that uses an Arduino board and a soil moisture sensor to control the water supply to the plants.

Overall, these research papers can provide you with valuable information on the design, implementation, and testing of automatic height-adjusting bridges using Arduino, servo motor, moisture sensor, and water level increase detection.

III. PROPOSED SYSTEM

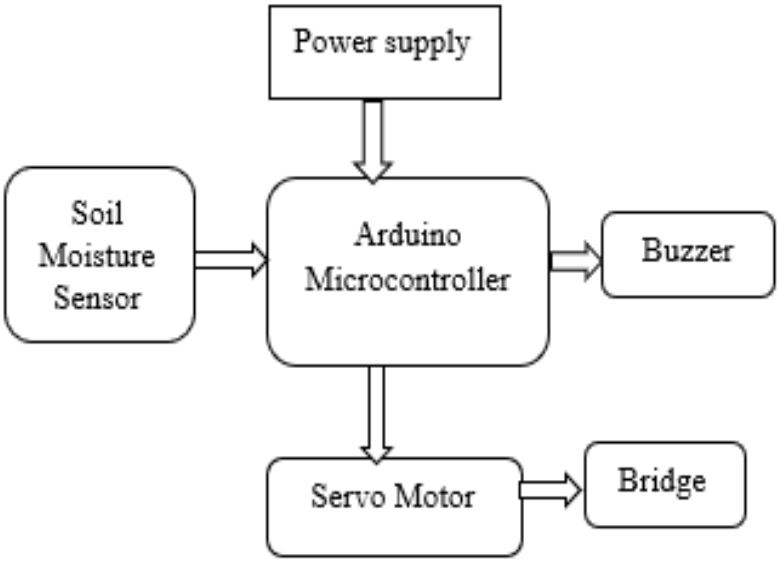

Fig 1: Block Diagram.

IV. WORKING

Here are the basic steps to create this project:

1.Build the bridge: Construct the bridge using appropriate materials and make sure it can move up and down based on the input from the servo motor.

2.Install the servo motor: Install the servo motor on the bridge and connect it to the Arduino.

3.Connect the moisture sensor: Connect the moisture sensor to the Arduino and position it near the water to detect changes in water level.

4.Write the code: Write a program for the Arduino that will read the moisture sensor data and control the servo motor to adjust the height of the bridge accordingly.

5.Test the system: Test the system by increasing the water level and making sure that the bridge adjusts its height automatically.The basic idea is that the moisture sensor will detect when the water level increases, and the Arduino will control the servo motor to adjust the height of the bridge. As the water level decreases, the bridge will move back down to its original position.Note that the specifics of the project will depend on the size and design of the bridge, as well as the type of servo motor and moisture sensor used. It is also important to consider safety measures, such as waterproofing the components to protect them from water damage.

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V. RESULTS

The testing result of the SMART BRIDGE system is shown below. Hardware implementation of overall SMART BRIDGE is in below figures:

A. Implementation of the setup Initially

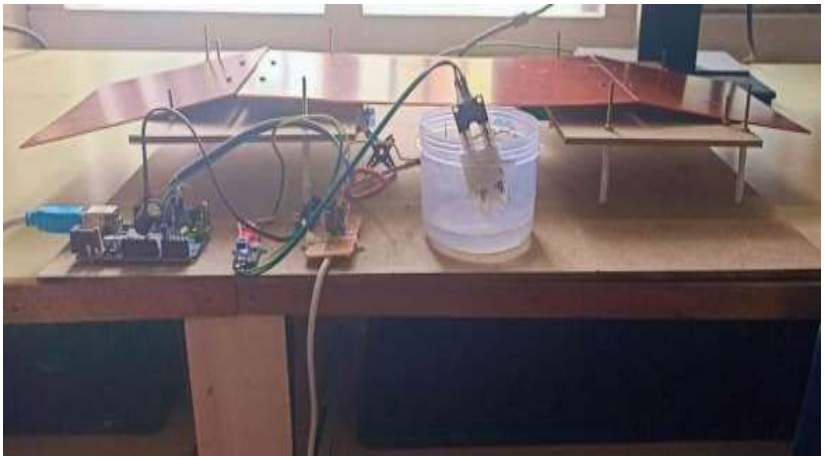

Fig 2: SMART BRIDGE in its Normal Position.

Fig 3: SMART BRIDGE –Top view in Normal Position.

From above two figures 2 and 3 the bridge structure is in normal position. As discussed from above chapters the Soil moisture sensor detects the water level and activates the servo motor. As shown in the above figures the detected water level by the sensor is in its normal level and the bridge is in its normal position.

B. When Increased water level is detected by Soil Moisture Sensor

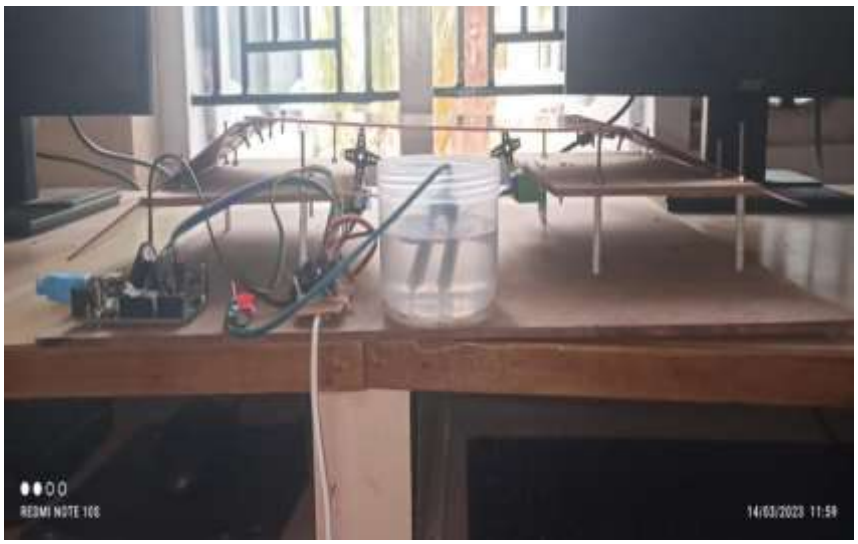

Fig 4: Soil Moisture Sensor detecting Increased water level.

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In the above fig 4 the water level is detected by soil moisture sensor i.e., the water level is beyond the normal level. As the water level is increased beyond the normal level the servo motors are activated. So the motors drive the bridge and adjust the height automatically signaling through buzzer. The increased height of the bridge is shown in the below fig 5.

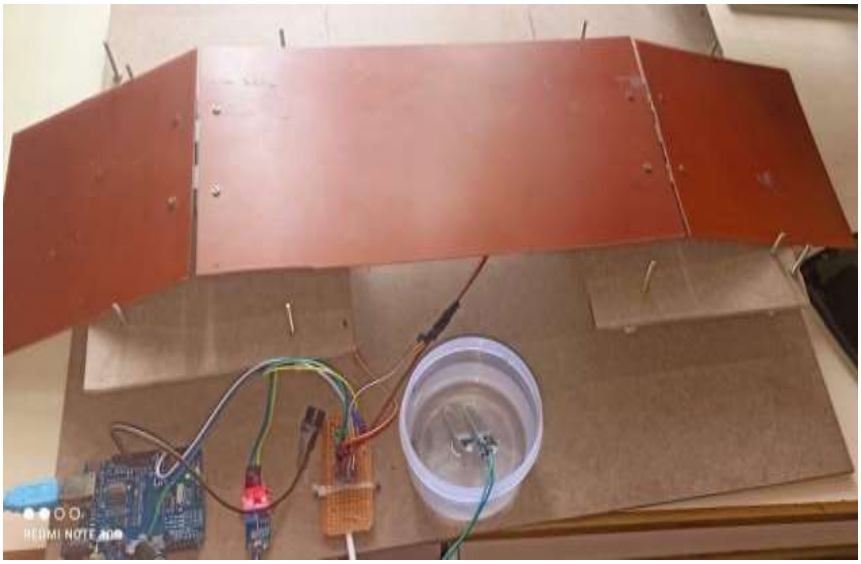

Fig 5: Increased Bridge Height.

The height of the bridge is adjusted automatically based on the water level detected by the soil moisture sensor. This increased height is maintained till the water level is decreased to the normal position. This would adjust the height of the bridge to ensure safe passage for vehicles and pedestrians. This solution would provide a more efficient and safer way to deal with changing water levels in bridges.

VI. CONCLUSION

An automatic height-adjusting bridge could be built using Arduino, servo motors, and moisture sensors to monitor water levels. When the water level increases, the servo motors would adjust the height of the bridge to ensure safe passage for vehicles and pedestrians. The moisture sensors would continuously monitor the water level, and the Arduino would process the data and send instructions to the servo motors. This solution would provide a more efficient and safer way to deal with changing water levels in bridges.

In conclusion, an automatic height-adjusting bridge would be a great application of Arduino, servo motors, and moisture sensors. This system would help prevent accidents and provide a safer way for people to travel across bridges, especially during periods of heavy rainfall or flooding.

ACKNOWLEDGMENT

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