

Dam Automation Using IOT

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Abstract: Here we proposed development and implementation of automatic dam gate openers using IOT. Manual operation of dam gates is often labour-intensive and time-consuming, prompting the need for automated systems to improve efficiency. The research primarily focuses on system design, sensor integration, and performance evaluation. A hardware design is developed utilizing an Arduino UNO microcontroller, which acts as the central processing unit for the automated gate opener system. An ultrasonic sensor is integrated into the system to accurately measure water level and This information is then used to automate gate movements, maintaining optimal water flow and minimizing the risk of flooding. Also in any case if water level touches it heightest level in a dam the red alert of overflow will be sent to user's device using microcontroller ESP 8266(NODEMCU). For avoiding the error by ultrasonic sensor. we add a combination of water level sensor and a ultrasonic in future. Although our system is cost effective, automatic and IOT enabled.

Keywords: Arduino Uno, Ultrasonic Senor, System Design, Alert.

1. INTRODUCTION

Dams play a crucial role in water management, serving multiple purposes such as flood control, irrigation, hydroelectric power generation, and water supply. The efficient operation of dam gates is vital for maintaining optimal water levels and mitigating potential risks associated with water flow. Traditionally, dam gates have been operated manually, requiring considerable human effort and time . However, manual operation poses challenges in terms of labor requirements, response time, and potential human errors To address these challenges, the integration of automation technology into dam gate operation has gained significant attention. The objective of this research is to investigate the design, development, and implementation of automatic dam gate openers mainly using Arduino uno

and ultrasonic sensors. we aim to develop a cost-effective solution that enhances the efficiency and safety of water management systems.

2. OBJECTIVES

- Safety
- Better Control
- Cost Savings
- Real-time Monitoring

3. LITERATURE REVIEW

“Dam Automation and Application Using IOT-(A Prototype Model Study)” (IJITE et al. (2020)) - This study described the development of an automatic dam gate using water level sensor. The system has two levels named as low level and high level. When water level is equivalent to its low level it send a yellow alert to authority and if it goes to higher level it send a red alert and dam gates get open.

“Dam Parameters Monitoring System” (IICPE et al. (2016) – The research paper is about to develop a web portal which shows the information of dam gate status, weather conditions like water level, rain fall, gate position, temperature, humidity etc. The smart controller collects this all info and operate the gate motion and the alert system accordingly.

“Water Level Monitoring and Management of Dams using IoT” (IOT-SIU et al. (2018) – This research gives an outline for the development of an information system based on the existing systems with the utilization of some sensors and IOT. Also, it proposes a novel idea of collecting and sharing real-time information about water level sensing and far field communication.

4. METHODOLOGY

Hardware used:

1. Battery (9V)
2. Ultrasonic sensor
3. Arduino uno
4. Motor driver
5. Node MCU
6. LED and buzzer
7. DC motors

Software used:

1. Telegram app
2. Arduino IDE

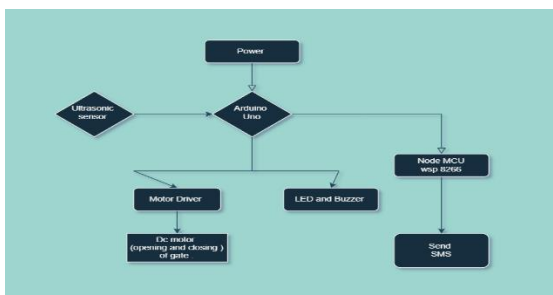


Fig.1

Fig [1] shows the system architecture diagram of monitoring system. There are some parts as input, controller, communication.

A) Input:

Ultrasonic sensor comes under the input section. It measures the time required for a wave to come back to sensor. Then by applying the formula of (distance = speed * time) we can calculate the distance that is water level. The data is then sent to Arduino Uno.

B) Controller:

Arduino IDE and motor driver are controllers. Arduino IDE is platform where we can give command to Arduino of what to do after what. The Motor driver used to control the direction of motor (clockwise or anticlockwise) and to control rpm of motor.

C) Communication:

Here we using the node MCU for communication with user using atelegram app. We have made our own bot to receive the message that is sent by an MCU. This all process needs a Wi-Fi connection for being connected to internet.

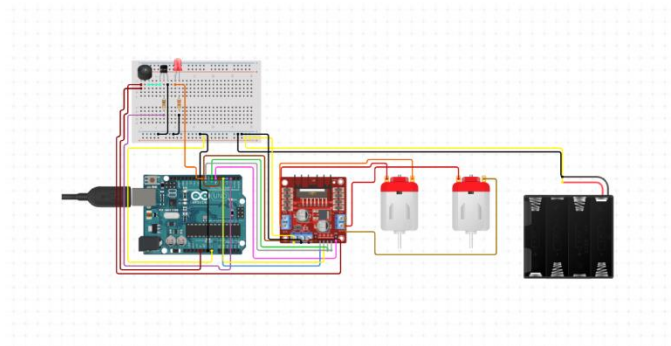


Fig.2

Fig [2] shows the circuit diagram of system which control the opening and closing of gate of dam.

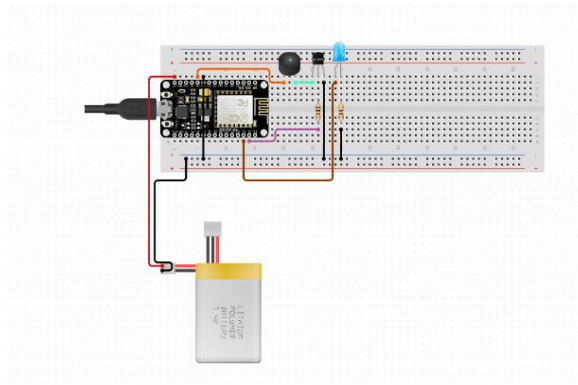


Fig.3

Fig [3] shows the circuit diagram of system which control the communication system which is done by node MCU.

5. FEATURES

1. Accurate Water Level Monitoring: The integrated ultrasonic sensors provide accurate and real-time measurement of water levels in the dam. This feature ensures precise control of gate openings based on water level .

2. **Automated Gate Operations:** The system automates the process of opening and closing dam gate using rack and pinion. It adjusts gate positions in response to changing water levels, maintaining optimal water flow and mitigating flood risks.
3. **Safety Measures:** The system incorporates safety protocols and fail-safe mechanisms to prevent accidents or gate malfunctions. Emergency shutdown procedures are implemented to ensure the safety of the infrastructure and surrounding areas.

6. RESULTS AND DISCUSSION

Water level is detected by ultrasonic sensor and displayed the percentage of water level on led and serial monitor. According to that water level dam gate will open and when water level falls it will close the gate automatically. When the gate opens the alert message will send to users mobile on telegram app by nodeMCU and he will convey that message to citizens who lives near the dam area. Also, When the water level exceeds its highest level, the led and buzzer get on.

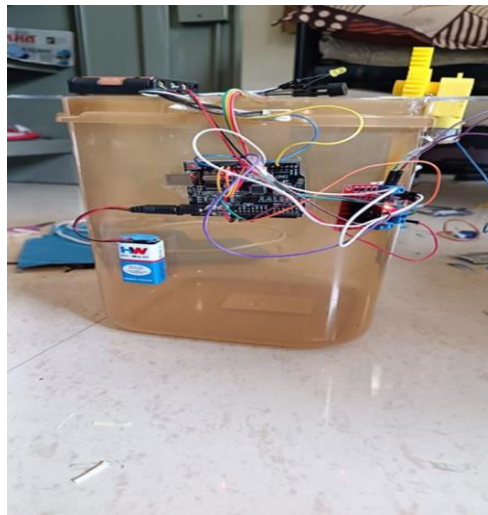


Fig.4

Fig [4] shows the connections of motor driver and other components to arduino uno.

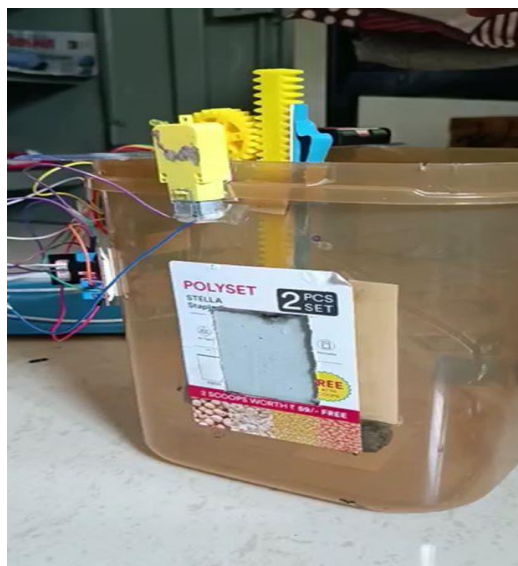


Fig.5

Fig [5] shows the Dam gate which actuate using rack and pinion mechanism.

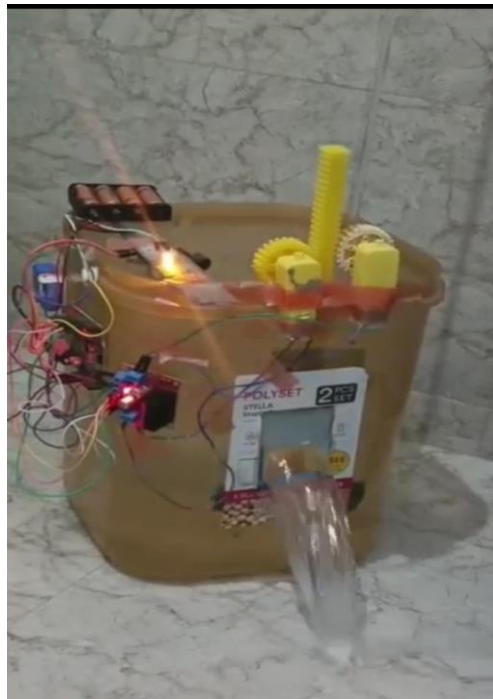


Fig.6

Fig [6] shows when water level exceeds and gate is opened and water emerges from dam prototype model.



Fig.7

Fig [7] shows the alert message which is sent on users mobile.

7. FUTURE SCOPE

We can implement this prototype idea in existing dams. Also, we can use the water level sensor to detect water level more accurately and display it on

Percentage of water level on LCD. In this project we only use one gate but also we go for more gates so water flow become maintained.

8. CONCLUSION

The project based on an automatic dam gate opener using Arduino UNO and ultrasonic sensors. The project successfully achieved its objectives and demonstrated the effectiveness of the system in enhancing the efficiency and safety of water management.

The cost-effectiveness of the system, utilizing affordable Arduino kits and accessible ultrasonic sensors, made it suitable for small to medium-scale water management projects. The system's scalability and adaptability allowed it to be tailored to different dam sizes and environmental conditions.

9. ACKNOWLEDGMENT

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