IE2070
Embedded Systems

2nd Year, 2nd Semester

Project Proposal Submission

Submitted to

Sri Lanka Institute of Information Technology

In partial fulfillment of the requirements for the

Bachelor of Science Special Honors Degree in Information Technology

17th March 2023

Declaration

We certify that this report does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any university, and to the best of my knowledge and belief it does not contain any material previously published or written by another person, except where due reference is made in text.

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Content

Introduction

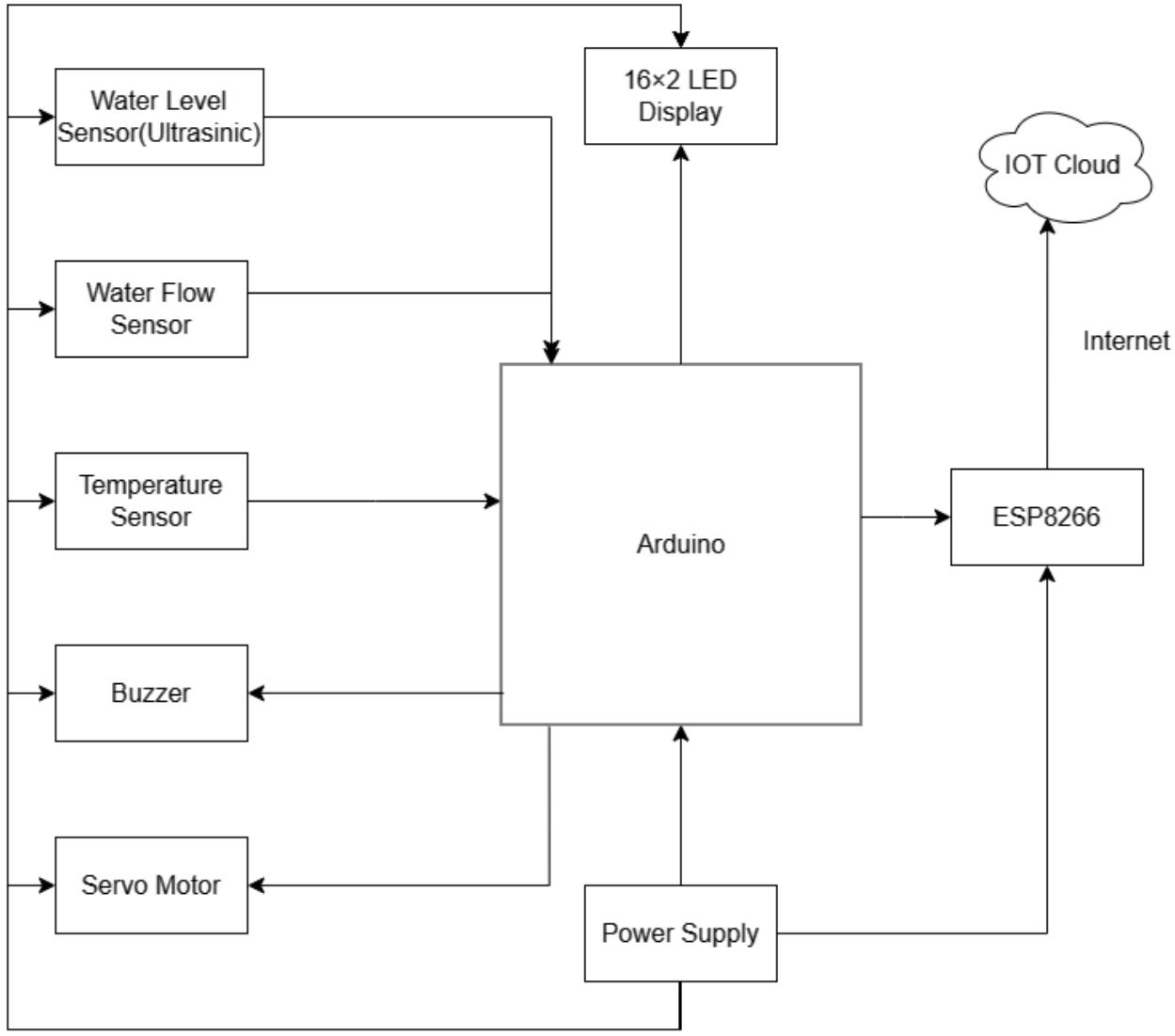
The Internet of Things (IoT) has revolutionized the way we interact with the world around us, providing new opportunities for automation and data collection. One area where IoT technology can be particularly useful is in the management of dams, which are critical infrastructure for regulating water flow. An IoT-based automatic DAM control system can help optimize water usage, prevent disasters, and ensure the safety and efficiency of the dam.

An IoT-based automatic DAM control system uses a network of sensors to monitor the water level, flow rate, and other relevant parameters in real-time. The sensor data is transmitted to a cloud-based platform, where it is analyzed using machine learning algorithms and other advanced techniques to determine the optimal gate opening for the dam. The gate control signal is then sent back to the dam, where it is used to operate the gates automatically.

The benefits of an IoT-based automatic DAM control system are numerous. By leveraging IoT technology, the system can monitor a wide range of parameters and respond to changing conditions in real-time, ensuring the safety and efficiency of the dam. Additionally, the cloud-based platform allows for centralized management and analysis of data, providing valuable insights into the performance of the dam and enabling proactive maintenance.

In this context, an IoT-based automatic DAM control system represents a significant advancement in dam management and provides a pathway towards sustainable water resource management. By improving the safety and efficiency of dams, such a system can contribute to the overall resilience of communities and ecosystems.

Block diagram



Objectives

The objectives of this project are as follows:

- Designing and developing an IoT-based automatic dam control system using Arduino and Node MCU.
- Designing and developing a sensor system that will monitor water levels, temperature and flow rates in real-time.
- Implementing a control algorithm that will automatically adjust dam operations to maintain safe and efficient water levels and flow rates.
- Using actuators to control dam operations based on the data collected by sensors.
- Store and process data on a web server for analysis and visualization.
- Developing a user-friendly interface for monitoring and controlling the dam operations.

Methodology

01). Sensor Selection:

The sensors to be used in the IoT-based automatic dam control system are crucial to monitor the water levels and flow rates accurately. Here are the sensors that will be used:

- Water Level Sensor: Water level sensors will be used to measure the water level of the dam. The most used water level sensor is the Ultrasonic sensor, which is inexpensive and can measure the distance to water accurately.
- Water Flow Rate Sensor: Water flow rate sensors will be used to measure the flow rate of water through the dam.
- Temperature Sensor: Temperature sensors can be used in conjunction with other sensors, such as water level sensors, to monitor conditions in and around the dam during flooding events.

02). Actuator Selection:

Actuators are essential to control the opening and closing of the dam gates and regulate water flow rates. The following actuators will be used in the proposed system:

- Servo Motors: Servo motors will be used to control the opening and closing of the dam gates. The servo motor will be connected to the gate and will be controlled by the Arduino or Node MCU.
- Buzzer: A buzzer will be used to alert dam operators when certain thresholds are reached, such as when the water level rises above a certain point or when the temperature of the dam reaches a critical level.
- Display: A display will be provided real-time information to dam operators, such as water level, temperature, and flow rate, allowing them to monitor the condition of the dam and make informed decisions about how to manage it.

03). Control Algorithm:

A control algorithm will be developed that can automatically adjust the operations of the dam to maintain safe and efficient water levels and flow rates. The algorithm will receive input from the sensors, process the data, and control the actuators based on the programmed logic.

04). Web Server Development:

The web server will be developed to store and process the data collected by the sensors. The server will also provide a user interface for monitoring and controlling the dam operations. The following functions are expected of the web server:

- Real-time Data Monitoring: The web server will display real-time data on water levels and flow rates to provide insights into the dam's current state.
- Data Storage and Analysis: The server will store the data collected by the sensors and provide analysis tools to understand the patterns and trends.
- User Interface: The web server will provide a user interface for users to monitor and control the dam operations.
- Alerts and Notifications: The server will generate alerts and notifications to inform users of any critical situations or emergencies.

05). Integration of Sensors and Actuators with Arduino and Node MCU:

The sensors and actuators will be integrated with the Arduino and Node MCU microcontrollers to collect data and control dam operations. The Arduino or Node MCU will process the sensor data and control the actuators based on the control algorithm.

06). Testing and Validation:

The IoT-based automatic dam control system will be tested and validated using simulated data and a physical dam model to ensure that it is functioning as intended. The system will also be tested in a real-world environment to evaluate its effectiveness in maintaining safe and efficient water levels and flow rates.

Conclusion

The proposed IoT-based automatic dam control system will provide an efficient solution for monitoring and controlling the water levels and flow rates in a dam. The use of Arduino and Node MCU microcontrollers, sensors, and actuators will automate the dam operations and reduce manual intervention. The web server will provide real-time monitoring, data storage, analysis, and control over the dam operations, ensuring safe and efficient operation while minimizing the risk of flooding.

References

1. "Smart Dam: An IoT-Based Dam Monitoring and Control System" by A. Samad et al. (2021). This paper presents an IoT-based smart dam monitoring and control system that uses various sensors and actuators to monitor and control different aspects of a dam, including water level, temperature, and flow rate.
2. "A Comprehensive Review on Dam Monitoring Systems: Challenges, Solutions, and Future Directions" by A. Al-Mouhamed et al. (2021). This paper provides a comprehensive review of dam monitoring systems, including IoT-based systems, and discusses the challenges, solutions, and future directions for the field.
3. "IoT-Based Automatic Dam Monitoring and Control System" by R. Bhatia et al. (2020). This paper proposes an IoT-based automatic dam monitoring and control system that uses various sensors and actuators to collect and transmit data about a dam's condition and to control the flow of water in and out of the dam.