IoT BASED RESERVOIR CONTROL SYSTEM

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Abstract. The IoT-based reservoir control system automates water level monitoring and management, ensuring efficient water use and preventing overflow or shortages. It includes Arduino, ESP8266, Blynk Cloud, ultrasonic sensors, servo motors, GSM modules, and the Telegram app. By automating reservoir control, the system conserves water and ensures a sufficient supply during shortages. IoT technology, which combines networking and sensing, is increasingly used in everyday applications [1]. This project shows how mobile communication, cloud computing, and IoT solve real-world issues. Using Blynk Cloud and ESP8266, it enables global access, remote control, data display, and storage [1]. This flexible technology suits both small-scale farming and large-scale urban water systems, showcasing practical IoT applications for automation and resource management.

Keyword: Arduino Uno, ESP8266 Wi-Fi Module, Ultrasonic Sensor, Servo Motor, GSM Module, Blynk App, Telegram App

INTRODUCTION

Myanmar faces catastrophic flooding during the monsoon season, as seen in 2015 when excessive rainfall led to dam overflows, displacing thousands. The Internet of Things (IoT) has revolutionized water resource management, offering real-time monitoring and control of reservoirs. This system outlines an IoT-based reservoir control system using an Arduino Uno, ESP8266 Wi-Fi module, ultrasonic sensor, servo motor, GSM module, Blynk cloud, and Telegram app. The system monitors water levels, controls the reservoir gate, and sends alerts through SMS and Telegram. Blynk's dashboard allows real-time monitoring, making the system efficient and responsive compared to traditional methods.

PROBLEM

This system helps solve key security problems. It sends real-time alerts to notify users quickly when something unusual happens. The system can be monitored and controlled remotely through mobile apps like Telegram and Blynk, making it convenient to manage from anywhere. Many traditional security systems are expensive, difficult to install, and complicated to use. This system is different because it is affordable, easy to set up, and user-friendly, making it accessible to more people. It combines several components, such as ultrasonic sensors to detect movement, a servo motor to control actions, and a GSM module for sending messages, into one simple and efficient system. By providing real-time alerts and

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remote control, this system enhances security, allowing quick responses and easy management. It's cost-effective and user-friendly, making it accessible for everyday users without technical expertise.

APPROACH

This system's functions include using an ultrasonic sensor to measure distance, using sensor readings to drive a servo motor, and sending data and alarms via a GSM module, Telegram app, and Blynk cloud. Wi-Fi connectivity is provided by the ESP8266, allowing for remote control and monitoring. All the components are integrated by the Arduino, which acts as the central controller. The Arduino development board is a piece of hardware, and the Arduino IDE (Integrated Development Environment) is a piece of software used to write code. This method will guarantee thorough remote monitoring and control by enabling the system to efficiently monitor distances, regulate mechanical activities, and transmit alarms and data over a variety of channels.

The system starts by initializing and detecting the user level with sensors. It uses two ultrasonic sensors to evaluate water levels and determine appropriate actions. For Ultrasonic Sensor 1, if the water level is less than 6 cm, Door 1 opens; otherwise, it remains closed. For Ultrasonic Sensor 2, if the measured distance is between 8 cm and 12 cm, the system sends a message labeled "RED Level" and initiates an emergency phone call. If the distance is less than 8 cm, Door 2 opens; otherwise, it stays closed. This series of actions ensures the system responds effectively based on real-time sensor data, prioritizing user safety and efficient operation.

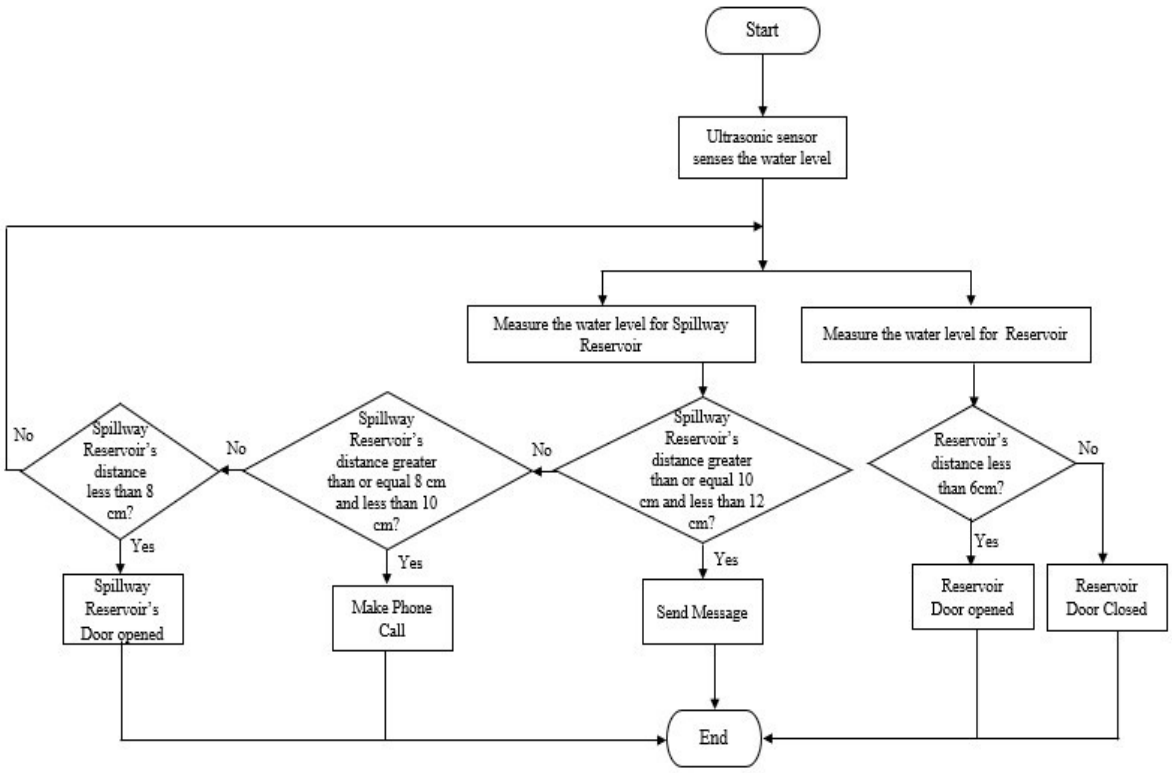

Figure 1: Flow Chart for Sending Alert Messages from GSM and Automatic Opening of Water

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The system begins by checking if the Wi-Fi is on. If it is, the system measures the water levels at two distances. For the first measurement, the water level is displayed in a mobile application via Blynk. For the second measurement, if the distance is less than 12 cm, a Telegram message alerts the user about the water level. If the water level is sufficient, the servo motor turns on; otherwise, it turns off. This process effectively manages water levels using IoT technology, ensuring real-time updates for user convenience and safety.

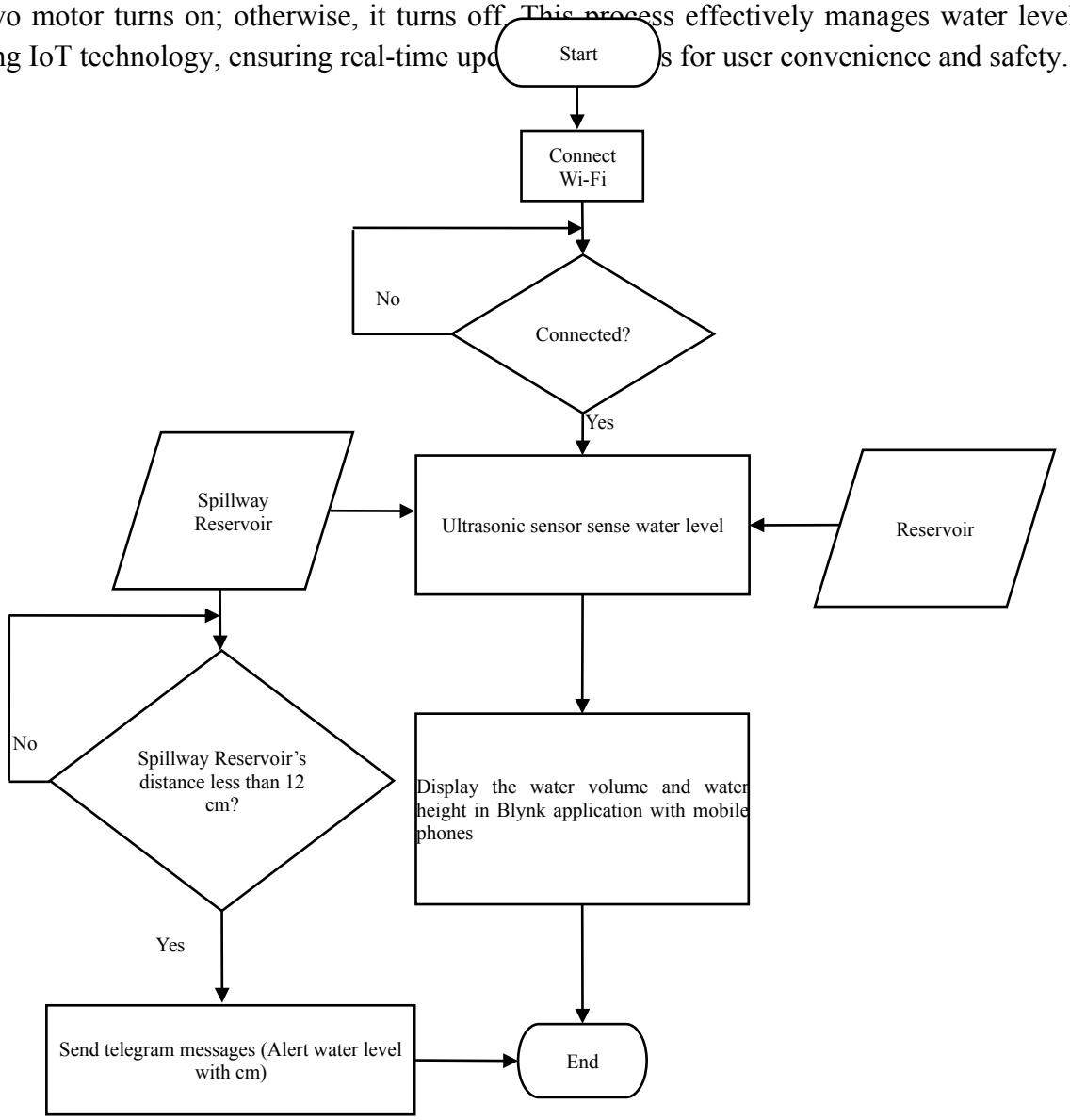

Figure 2: Flow Chart for Monitoring and Controlling in Blynk and Telegram Alert Messages

RESULTS

The integration of Arduino with the ESP8266, ultrasonic sensor, servo motor, GSM module, Blynk Cloud, and Telegram was successful. This setup allowed effective communication for real-time monitoring and control. Users could easily monitor sensor data and control the servo motor remotely using the Blynk app and Telegram bot. The ultrasonic sensor detected objects and sent alerts through both platforms. These sensors operate by

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emitting a high-frequency sound wave, typically beyond the range of human hearing, and then measuring the time it takes for the echo to return after reflecting off an object[2]. The GSM module provided backup SMS notifications. While the system worked well overall, there were occasional delays due to network issues, and the ESP8266 and GSM modules used more power than expected. Additionally, interference from the GSM module affected SMS alerts, but repositioning components helped improve the situation.

Figure 3: Implementation of this system

CONCLUSION

A major advancement in the management of water resources is the reservoir control system that is based on the Internet of Things. The system accomplishes exact control over the water levels and quality of the reservoir in real time by means of the seamless integration of sensors, actuators, and a cloud-based platform. Through an intuitive web or smartphone interface, this feature enables stakeholders to remotely monitor vital metrics like water level, and quality, guaranteeing access to current information from any place. The system optimizes water consumption by utilizing automated procedures and data-driven insights. This reduces the need for manual intervention, which in turn lowers operational costs and improves overall resource efficiency. This breakthrough creates a scalable platform for future applications in smart city infrastructure and environmental conservation initiatives, in addition to making water management procedures more sustainable.

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