SMART SPRINKLER WATER FLOW MONITORING AND ALERT SYSTEM

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Personal Project Report

Abstract

This project focuses on developing a smart system that monitors the water flow in a sprinkler irrigation setup. The system detects if water is flowing through the pipes using a water flow sensor. If water flow stops unexpectedly, it sends an SMS notification to the farmer's phone and activates a buzzer alert. The goal is to save time and effort by eliminating the need for manual farm visits during night irrigation and improve irrigation efficiency.

1. Problem Statement

Farmers who use sprinkler irrigation often face the challenge of checking manually whether water is flowing properly, especially during night hours. Walking long distances daily to verify irrigation status wastes time and energy. Sometimes, unexpected stoppages due to power cuts or blockages go unnoticed, leading to under-irrigation or crop stress.

2. Objectives

• Design a system to automatically detect water flow status. • Provide instant alerts through buzzer and SMS when water flow stops. • Save farmers' time and enhance monitoring reliability. • Provide a base for future smart farming systems using IoT technologies.

3. System Overview

The Smart Sprinkler Water Flow Monitoring and Alert System uses a water flow sensor connected to a microcontroller (Arduino or ESP32). When water flows, the sensor sends pulses to the controller. If pulses stop for a specific period, the controller triggers both a buzzer alarm and an SMS alert using a GSM module (SIM800L).

4. Hardware Components

Component	Description	Function
Arduino / ESP32	Microcontroller board	Processes sensor data and triggers alerts
Water Flow Sensor (YF-S201)	Detects water flow	Measures water movement in the pipe
GSM Module (SIM800L)	Communication module	Sends SMS alerts to phone
Buzzer / LED	Sound or light alarm	Alerts user locally when flow stops
Power Supply	Battery or adapter	Provides power to components
Relay Module (optional)	Electronic switch	Can control water pump automatically

5. Working Principle

1. The water flow sensor detects water movement and sends pulse signals to the microcontroller. 2. The microcontroller calculates the flow rate in real time. 3. If no pulses are detected for a set duration (e.g., 30 seconds), the system assumes water flow has stopped. 4. It triggers the buzzer and sends an SMS alert to the user's mobile phone. 5. The farmer can then take immediate action to check or fix the issue.

6. Circuit Description

The water flow sensor is connected to the Arduino digital pin (D2) to read pulses. The GSM module uses pins D10 (RX) and D11 (TX) for serial communication. A buzzer is connected to pin D8 to produce sound alerts. All components share a common ground. The circuit can be powered through a 5V adapter or rechargeable battery pack.

7. Software Design (Algorithm & Arduino Code)

Algorithm: 1. Initialize pins and communication modules. 2. Continuously read water flow sensor data. 3. If flow rate = 0 for more than 30 seconds → trigger alert. 4. Activate buzzer and send SMS. 5. Wait until water flow resumes, then stop buzzer.
Sample Arduino Code:
#define FLOW_SENSOR 2 #define BUZZER 8 unsigned long lastFlowTime = 0; bool flowDetected = false; void setup() { pinMode(FLOW_SENSOR, INPUT); pinMode(BUZZER, OUTPUT); Serial.begin(9600); // For GSM module } void loop() { int sensorValue = digitalRead(FLOW_SENSOR); if (sensorValue == HIGH) { lastFlowTime = millis(); flowDetected = true; } if (millis() - lastFlowTime > 30000 && flowDetected) { digitalWrite(BUZZER, HIGH); Serial.println("AT+CMGF=1"); delay(1000); Serial.println("AT+CMGS="+255XXXXXXXXX""); delay(1000); Serial.println("ALERT: Water flow stopped!"); Serial.write(26); // Ctrl+Z to send SMS flowDetected = false; } if (sensorValue == HIGH) digitalWrite(BUZZER, LOW); }

8. Expected Results

• When the water is flowing, the system remains silent. • If water stops, a buzzer sounds and an SMS notification is sent. • The system reliably detects flow interruptions, saving time and improving irrigation monitoring.

9. Future Enhancements

• Add IoT dashboard (e.g., Blynk or ThingSpeak) for real-time monitoring. • Use soil moisture sensors to automate irrigation decisions. • Add solar power for energy independence. • Integrate pump control relay for full automation.

10. Conclusion

The Smart Sprinkler Water Flow Monitoring and Alert System demonstrates a practical approach to improving agricultural efficiency using simple and affordable electronics. The dual alert system—buzzer and SMS—ensures farmers are immediately informed of irrigation problems, reducing manual labor and improving water management.