IOT BASED SMART IRRIGATIN SYSTEM

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Contents

1. PROJECT DESCRIPTION

Introduction

Smart agriculture is a solution to many global agricultural issues, such as increasing productivity, monitoring results, and effective use of water. The industry is rapidly looking into adopting IoT solutions into their workflows.

Optimizing the schedule and amount of water allows us to save resources and provide the best care for crops. Sensor-based IoT technologies collect data about soil and update crop status and transmit this information from sensors to farm irrigation systems.

Controllers Used

An **IoT based smart irrigation System** using Raspberry Pi-4, Moisture sensor, and ArdinoUno. The following are the components used in this project.

- Raspberry Pi: Acts as the central processing device for the sensors and watering system. It is utilized for Kivy MD app data transmission and reception.
- Kivy MD App: A smartphone app that was developed in conjunction with Kivy MD that enables system communication.
- Arduino WiFi: Uses the Arduino's IP address to send data to a specially created dashboard.
- Arduino: This is the primary CPU that controls the pump based on information obtained from the Raspberry Pi. Via serial transmission, it sends the pump status and soil moisture to the Raspberry Pi.
- Pump: submersible water pump in the irrigation system that forces the water flow through the pipe.
- Relay: The relay responds to input from the user and sensor by turning the pump on and off.
- Battery: 12V removable battery powers the submersible pump.
- Soil moisture sensor: Continuously monitors the soil moisture level and provide input to the Arduino and Raspberry pi controllers

Working Principle

This project has two controllable modes of operation: manual and automatic.

In Auto mode, the soil moisture sensors will keep monitoring the soil moisture level and sends the feedback to Raspberry pi-4 controller, once the soil moisture value is greater than threshold value, the Raspberry pi will sends to signal to Ardino UNO controller, which then turn the pump ON and the water will flow to the plants.

The watering will continue until the soil moisture value becomes less than the threshold value, and the Ardino UNO will turn the pump OFF.

In Manual control, the input from the soil moisture is by passed. The control shall be performed manually through mobile from a remote location.

The entire operation shall be monitored via a camera, connected to the Raspberry pi.

2. USE OF IOT and AI APPLICATION

Android App

As mentioned in 'Working Principle', I have integrated the microcontrollers Raspberry Pi, Ardino UNO into an IOT platform through an Android Application. I have used Python language for coding and Kivy MD to Implement an Android application apk file.

The App communicates with sensors that gather data on soil moisture, temperature, and soil conditions. These sensors are connected to a remote smartphone.

The app interface consists of two pages. The first page features four tabs: AUTO, MANUAL, and ON-OFF. On the second page, users can view soil moisture trends graphically and access numerical data.

- Auto Mode

  In AUTO mode, the system automatically turns on the water pump when soil moisture is insufficient. The pump delivers water to the plants until the desired moisture level is reached.

- Manual Mode

  In the MANUAL mode, users can manually activate or deactivate the water pump. By tapping the **ON** tab, the watering will be initiated, and by selecting the **OFF** tab, water pump will be stopped.
- This manual mode provides users with direct control over irrigation, enabling customization of watering duration and immediate responses to specific conditions, without relying on soil moisture data.

- Web dashboard

  A **custom-designed mobile dashboard** provides real-time soil moisture data in both graphical and numerical formats. This allows users to monitor soil moisture levels conveniently.

- Real-time video surveillance

  The real time video surveillance enhances monitoring and control by providing live visual information. It allows for immediate response to incidents or threats, making it a valuable tool for security.

3. LEARNING EXPERIENCE

The entire project was a learning experience. I've had a number of challenges:

- relay malfunctions;
- system not working under manual mode;
- camera feed didn't worked,
- Socket were not communicating, etc.

Each time, I had to change my hardwire interface, and revised my coding, and use of different interface platforms.

Using of different interface platforms caused me to run into additional issue with the pump to relay interface, for which I have to modify the complete set-up.

Finally, I am satisfied and able to succeed what I want to implement.

4. CERTIFICATION AND RECOGNIZTION

- Winner in the inter-schools competition for my coding on "*Animated illustration on Sustainable development Goal*" using SCRATCH
- Received the best prototype award for "*Automatic plant watering*" in the field of STEAM on MAKERSHALA website.
- Received participation certificate from Salwan Public School inter-school competition for "*Smart Trash Bin with Efficient Waste segregation.*"

5. MAGNITUIDE OF THE IMPACT CREATED

I now have a similar system in place at our house, which we think will be more helpful—especially while we are on vacation.

The prototype now only depicts a tiny portion of the watering system; however, given the necessity for afforestation and the present state of global warming, the entire system can be realized by linking several water sources and operating at multiple levels.