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SMART IOT BASED PLANT WATERING SYSTEM WITH MOBILE APPLICATION INTEGRATION

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ABSTRACT-This project introduces a smart, IoT-enabled plant watering system designed to simplify plant care by leveraging automation and mobile technology. The system integrates soil moisture sensors, temperature, and humidity monitors to determine the optimal watering schedule. A mobile application serves as the control interface, allowing users to monitor real-time environmental data and manually override the automated watering system when needed. By enhancing convenience and ensuring efficient water use, this solution is ideal for busy individuals or those looking to optimize plant care.

Keywords: IoT, Integration, Smart Watering, Irrigation

1.INTRODUCTION

Plant care is an essential part of maintaining a healthy and sustainable environment, but it often requires time, effort, and attention to detail. Many individuals face challenges in ensuring their plants receive adequate watering, especially with busy schedules or limited access to the plants. Overwatering or underwatering can lead to plant health issues, further complicating the process. This project aims to address these challenges by developing a smart, IoT-based plant watering system integrated with a mobile application. The system automates the watering process using real-time data collected from sensors that monitor soil moisture, temperature, and humidity levels. This data is transmitted to the mobile application, enabling users to track plant conditions and control watering schedules remotely.

By providing a user-friendly interface and intelligent automation, this system ensures optimal plant health while minimizing water waste [8]. It is designed for anyone looking to simplify plant care and reduce the effort required to maintain healthy plants, making it a valuable tool for plant enthusiasts, home gardeners, and urban dwellers[9].

2.LITERATURE REVIEW

Smart irrigation systems leveraging IoT and automation have been extensively studied in recent years, demonstrating significant potential for optimizing plant care and water conservation [1]. Research has highlighted the effectiveness of IoT in agriculture, with sensors monitoring critical parameters such as soil moisture, temperature, and humidity to determine optimal watering schedules [2]. For instance, studies emphasize how real-time data processing enables precise irrigation control, reducing water wastage and improving plant health [3]. Similarly, automated irrigation systems show that integrating controllers with sensors

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minimizes human intervention while ensuring consistent plant hydration. However, these systems often lack accessibility for non-technical users, limiting their widespread adoption [4].

Mobile applications have emerged as an essential tool for integrating smart technologies with end-user interfaces, enhancing usability and accessibility. Recent studies demonstrate that mobile applications provide real-time monitoring, remote control, and data visualization, making IoT-based irrigation systems more user-friendly [5]. These systems also contribute to environmental sustainability by reducing water consumption which reports a potential 30% reduction in water usage through automation [10]. Despite these advancements, challenges such as high costs, complex installations, and limited customization persist in existing systems [6]. This project addresses these gaps by developing an affordable and user-friendly IoT-based plant watering system with mobile application integration, aiming to make smart irrigation accessible to a broader audience [7].

3.System Model

The Block Diagram of our prototype is as shown below

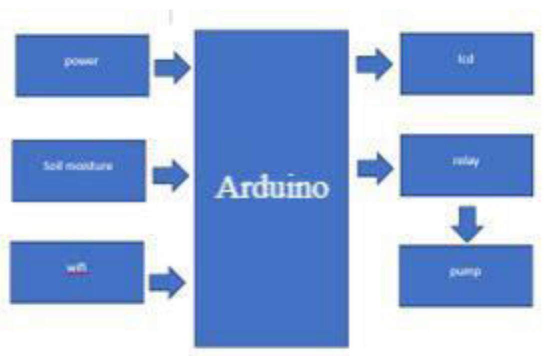

Fig.1. Block Diagram of Proposed System

The Arduino board serves as the central controller for the system. It processes data from sensors, communicates with the mobile app, and controls the watering mechanism.

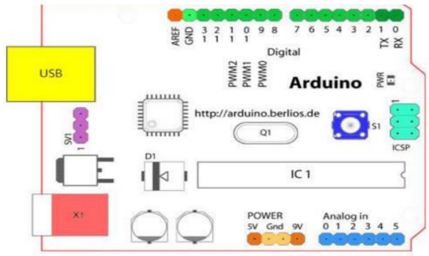

Fig.2. Arduino SoC Module

Power Supply: You'll need a suitable power supply to provide power to the Arduino, water pump, and other components. Ensure it can provide the necessary voltage and current.

LCD (Liquid Crystal Display): The LCD screen can display essential information about plant hydration levels, system status, and more.

Fig.3. LCD Display

Soil Moisture Sensor: This sensor is used to measure soil moisture levels. It helps in determining when to water the plants.

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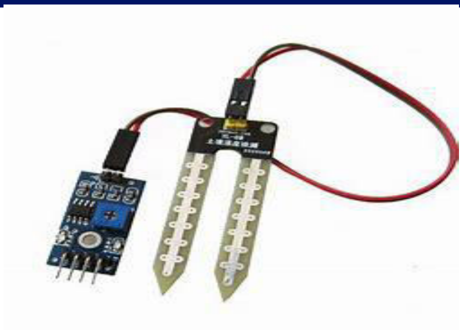

Fig.4. Soil moisture sensor

Relay Module: The relay module is used to control the water pump. It acts as a switch to turn the pump on and off based on sensor readings.

Fig.5. Relay Model

GSM Module: A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system[1]. The modem (modulator-demodulator) is a critical part here[1]. It allows electronic devices to communicate with each other over the GSM network[2].

Fig.6. GSM Module

DHT sensor: The DHT sensor, specifically the DHT11 or DHT22, is used to monitor temperature and humidity levels in the environment, providing essential data for optimizing plant care.

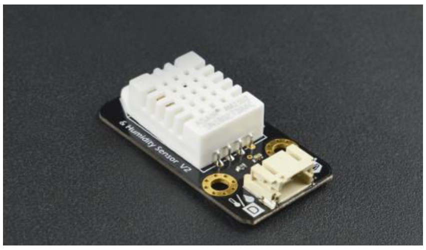

Fig.7. DHT Sensor

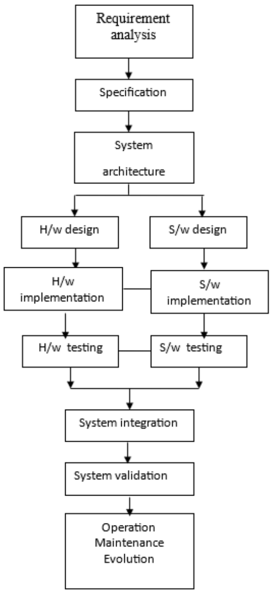

Fig.8. Design Flow of Proposed System

Begin by analysing the requirements to understand what is needed for the system. Document the functional and non-functional requirements to guide development. Design the overall system structure, specifying hardware (H/w) and software (S/w) components. Create detailed plans for hardware functionality and structure. Develop detailed software design tailored to the system's needs. Build the hardware components based on the design. Code and develop software components as planned. Perform individual tests on

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hardware and software to ensure they work correctly. Combine hardware and software into a single system and test integration. Validate the system, then launch it while ensuring regular updates and evolution.

It starts with Requirement Analysis, where user needs are identified and transformed into Specifications that define what the system should achieve. Based on this, a System Architecture is created to outline hardware (H/w) and software (S/w) components.

In the Design phase, detailed plans are made for both hardware and software. The hardware design focuses on physical components, while the software design deals with algorithms and interfaces. These designs are then implemented during the H/w and S/w Implementation stages, where hardware is built, and software is coded.

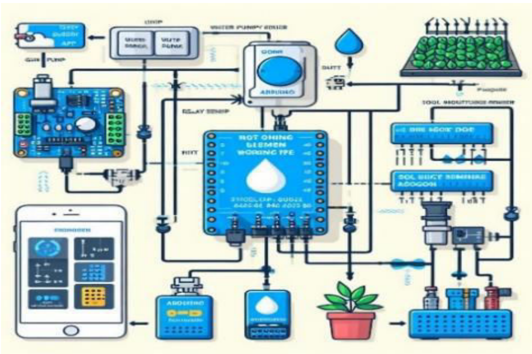

Fig.9. Working of proposed system

After implementation, the components undergo H/w and S/w Testing to ensure they work correctly. Following this, the system is brought together in the System Integration stage, ensuring hardware and software function seamlessly as one unit.

Finally, the complete system is validated in the System Validation stage to confirm it meets specifications. Once validated, it moves to Operation, Maintenance, and Evolution, where it is deployed, maintained, and updated over time to meet evolving requirements.

4.RESULTS

IoT-based watering system designed to assist the elderly in maintaining their plants effortlessly. This system automates the process of watering by utilizing sensors, controllers, and a mobile application for real-time monitoring and control.

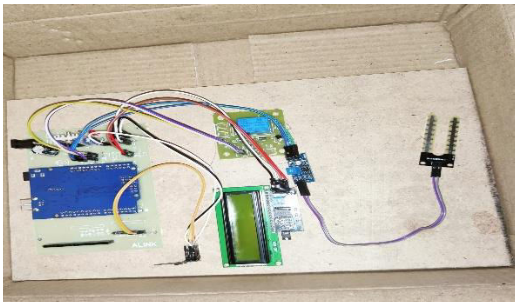

Fig.10. Result of proposed system

At the core of the system is a moisture sensor embedded in the soil, which continuously measures the soil's moisture levels. The data collected by the sensor is sent to a microcontroller, such as an Arduino, which processes this information. If the moisture level falls below a predefined threshold, the controller activates a water pump connected to a water source, such as the bucket shown in the image, to hydrate the plants.

The system also integrates with a mobile application, enabling users to monitor the soil conditions remotely. Through the app, users can manually control the watering system if needed, providing flexibility and convenience. This makes it particularly useful for elderly individuals, as it minimizes the physical effort required to care for their plants while ensuring proper plant maintenance.

5.CONCLUSION

According to the results, the elderly have perceived the benefits of using IoT Planting System. They have a good attitude to our application and they found that technology is not something far away. It is easy for them to use and they found that technology could help mental health of the elderly in the recreation side by doing activity they like. However, The aspect of beneficial in using IoT Planting System that focus on the cultural dimension must be applied in the future work by adding function to predict and suggest suitable plant that match life style of each elderly.

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