International Journal for Modern Trends in Science and Technology
Volume 10, Issue 06, pages 13-16.
ISSN: 2455-3778 online
Available online at: http://www.ijmtst.com/vol10issue06.html
DOI: https://doi.org/10.46501/IJMTST1006004

Envirohydrate: An IoT-Based Smart Plant Care System

Anita Joshi | Soham Tawari | Roshesh Tembhurkar | Vishalakshi Deshmukh | Kunal Thakare | Soham Thakkar | Arjun Thakur

Department of Engineering, Science and Humanities, Vishwakarma Institute of Technology, Pune, India.

To Cite this Article
Anita Joshi, Soham Tawari, Roshesh Tembhurkar, Vishalakshi Deshmukh, Kunal Thakare, Soham Thakkar and Arjun Thakur, Envirohydrate: An IoT-Based Smart Plant Care System, International Journal for Modern Trends in Science and Technology, 2024, 10(06), pages. 13-16. https://doi.org/10.46501/IJMTST1006004

Article Info
Received: 14 May 2024; Accepted: 01 June 2024; Published: 08 June 2024.

ABSTRACT

This research paper introduces "Envirohydrate," an innovative IoT-based smart plant care system designed to revolutionize agricultural practices by providing real-time monitoring and automated management of essential environmental parameters. The system integrates state-of-the-art sensors, including a moisture sensor and a DHT temperature and humidity sensor, coupled with a water pump and relay mechanism, all controlled by an ESP32 microcontroller with Wi-Fi connectivity. The Blynk software facilitates seamless IoT control, enabling users to monitor and regulate environmental conditions through a user-friendly interface. The system's core functionalities include the continuous measurement of soil moisture levels, ambient temperature, and humidity, crucial factors for plant growth. The collected data is transmitted to the Blynk application, offering users a comprehensive overview of their plant's immediate surroundings. Additionally, the system incorporates a two-mode operation: manual and auto. In the manual mode, users have the flexibility to control the water pump manually, while the auto mode employs intelligent algorithms to automate the watering process based on present thresholds, optimizing water usage, and ensuring optimal plant health. Envirohydrate addresses the critical need for precision agriculture, where efficient resource utilization is paramount. By leveraging IoT technologies, the system enhances the ability to remotely monitor and manage plant care, minimizing the risk of under or overwatering and creating an environment conducive to optimal crop growth. The integration of Blynk software not only provides real-time data visualization but also enables remote control, offering a user-friendly and accessible solution for both novice and experienced farmers. This research contributes to the field of precision agriculture and IoT-based smart plant care systems by presenting a cost-effective, scalable, and user-friendly solution. The Envirohydrate system demonstrates its potential to revolutionize traditional farming practices, promoting sustainability and efficiency in crop management. Future enhancements and scalability options are discussed, outlining a roadmap for further advancements in smart agriculture

KEYWORDS: IoT-Based Plant Care, Environmental Monitoring System, Soil Moisture Sensing, DHT Sensor Integration, ESP32 Microcontroller Control, Blynk Software Interface, Water Pump Automation, Remote Monitoring and Control, Real-time Data Visualization, User-Friendly Interface, Wi-Fi Enabled Plant Care, Efficient Resource Utilization, Smart Irrigation, IoT Solutions for plant care.

1.INTRODUCTION

In the realm of plant care, leveraging technological advancements is essential to enhance the efficiency and effectiveness of nurturing processes. This research introduces "Envirohydrate," an innovative IoT-based smart plant care system designed to redefine conventional approaches to plant maintenance. Employing an array of cutting-edge components, including moisture sensors, DHT temperature and humidity sensors, a water pump, relay, and a Wi-Fi-enabled ESP32 microcontroller, the system aims to provide real-time monitoring and automated control. The Blynk software acts as the interface, offering users an intuitive platform for managing their plants' immediate environment.

The development of Envirohydrate is motivated by the need for precision in plant care, where timely and accurate data plays a pivotal role. By continuously monitoring crucial parameters such as soil moisture levels, ambient temperature, and humidity, the system ensures a comprehensive understanding of the plant's surroundings. This information is not only visually accessible in real-time but is also utilized to automate plant care processes through the integrated water pump and relay mechanism.

Envirohydrate operates in two distinctive modes: manual and auto. In the manual mode, users have direct control over the water pump, enabling personalized and on-demand care. Conversely, the auto mode employs intelligent algorithms to automate the watering process based on preset thresholds, promoting hassle-free and optimized plant care.

The Blynk software integration facilitates remote monitoring and control, allowing users to access vital information about their plants and intervene, when necessary, irrespective of their physical location. This paper provides a detailed exploration of the Envirohydrate system, delving into its architecture, component functionalities, operational modes, and the significance of its contributions to the field of smart plant care. By combining advanced sensors, IoT connectivity, and a user-friendly interface, Envirohydrate aims to set a new standard in plant care practices, offering an efficient, adaptable, and accessible solution for plant enthusiasts and caretakers alike.

2. METHODOLOGY/EXPERIMENTAL

A. Components

1. Moisture Sensor: The moisture sensor serves as a critical component for measuring soil moisture levels, providing essential data for informed watering decisions.

2. DHT Temperature and Humidity Sensor: This sensor contributes vital information on ambient temperature and humidity, crucial factors influencing plant health and growth.

3. Water Pump: The water pump facilitates automated irrigation, responding to sensor data and user-defined parameters for precise and controlled watering.

4. Relay: The relay acts as a switch, controlling the activation and deactivation of the water pump based on system inputs and user preferences.

5. ESP32 Microcontroller: The ESP32 microcontroller serves as the central processing unit, orchestrating the communication between sensors, the water pump, and the Blynk software.

6. Blynk Software: Blynk software acts as the user interface, providing a visually intuitive platform for real-time data visualization and control over the plant care system.

7. Battery: The battery component provides a portable and independent power source for the system, ensuring uninterrupted functionality and allowing flexibility in deployment.

B. Method

1. Component Assembly:

- Begin by assembling the hardware components, including the moisture sensor, DHT temperature and humidity sensor, water pump, relay, ESP32 microcontroller, and battery.
- Ensure proper connections between the components, following the specifications provided by the respective manufacturers.

2. Sensor Calibration:

- Calibrate the moisture sensor to establish baseline values for soil moisture levels.
- Calibrate the DHT sensor to ensure accurate readings of ambient temperature and humidity.

3. Microcontroller Programming:

• Program the ESP32 microcontroller using an appropriate Integrated Development Environment (IDE), incorporating libraries for sensor data acquisition and communication.

• Implement logic for data processing and decision-making based on sensor readings.

4. User Interface Design:

• Develop the user interface using the Blynk software, defining widgets for real-time data visualization and control elements for manual mode operations.

• Establish communication protocols between the ESP32 microcontroller and the Blynk application.

5. Integration of Water Pump and Relay:

• Integrate the water pump and relay with the microcontroller, configuring them to respond to sensor data and user inputs for automated irrigation.

3. FUTURE SCOPE

The Envirohydrate smart plant care system, as presented in this research, serves as a foundational framework with promising opportunities for future enhancements and innovations. Several avenues for research and development have been identified, paving the way for an evolving and adaptive system. Firstly, the integration of advanced sensors, such as nutrient and light sensors, holds the potential to enrich the dataset, providing a more nuanced understanding of the plant's requirements. Further exploration into machine learning algorithms presents an exciting prospect for predictive watering schedules tailored to specific plant species and environmental nuances. Additionally, the system can benefit from the incorporation of energy harvesting solutions, exploring sustainable alternatives to traditional power sources. The envisioned development of a dedicated mobile application, cloud integration for data analytics, and wireless mesh networking could collectively transform the user experience and extend the system's reach. Collaborative platforms and integration with smart home ecosystems offer opportunities for users to engage in shared learning and seamlessly incorporate plant care into their broader home automation setups. Furthermore, the exploration of low-power operation modes and customizable alerts ensures a balance between system efficiency and user-tailored notifications. As the realm of smart plant care continues to evolve, these future avenues present exciting prospects for refining and expanding the capabilities of the Envirohydrate system, contributing to the advancement of smart agriculture and sustainable plant management practices.

4. CONCLUSION

Although In conclusion, the Envirohydrate smart plant care system represents a significant step forward in leveraging IoT technologies for efficient and user-friendly plant management. Through the seamless integration of advanced sensors, a responsive microcontroller, and intuitive software interfaces, the system offers a holistic approach to addressing the dynamic needs of plants. The ability to monitor crucial environmental parameters such as soil moisture, temperature, and humidity in real-time empowers users with actionable insights, enabling timely interventions and informed decision-making.

The dual-mode functionality, encompassing manual and automated watering processes, ensures flexibility and adaptability to diverse user preferences and plant care scenarios. The incorporation of the Blynk software not only facilitates remote monitoring and control but also enhances the accessibility of the system, making it user-friendly for individuals with varying levels of technical expertise.

The future scope outlined for the Envirohydrate system underscores its potential for continual improvement and evolution. With avenues such as advanced sensor integration, machine learning algorithms, and collaborative platforms, the system stands poised for further innovation in smart plant care. As the agricultural landscape undergoes transformation towards precision and sustainability, Envirohydrate offers a glimpse into the possibilities of technology-driven solutions that can contribute to efficient resource utilization and improved crop health.

In essence, Envirohydrate is not merely a standalone project; it represents a commitment to the ongoing exploration of smart agriculture technologies. As we strive to meet the challenges of a growing population and changing environmental conditions, innovations like Envirohydrate showcase the potential of technology to revolutionize traditional practices and contribute to a more sustainable and productive future in plant care and agriculture.

5. ACKNOWLEDGMENT

It is our privilege to express our sincerest regards to our guide Prof. Anita Joshi for the valuable inputs, able guidance, encouragement, whole-hearted cooperation, and constructive criticism throughout the duration of this work. We deeply express our sincere thanks our Head of department for encouraging and allowing us to presenting this work.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] Abhishek. R, Akash. R, P. N Sudha, "Automatic plant watering system using Arduino."
[2] Mani Bansal, Abhay Pandey, Mandvi Singh, Nivesh Sharma, "A Literature Review on automatic watering of Plants."
[3] Yin Yin Nu, San San Lwin, Win Win Maw, " Automatic Plant Watering System using Arduino UNO for University Park."
[4] Dulani Nirosha Liyanage, Ud ari Uvindhya Rathnathunga, "Advanced automated Indoor Hydroponic Unit for Plant Growth Detection."
[5] Kritika Shah, Saylee Pawar, Gourav Prajapati, Shivam Upadhyay, Gayatri Hegde, "Proposed Automated Plant Watering System using IoT."