Automatic Plant Watering and Parameter Checker

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Abstract*— This paper proposes an automatic plant watering and parameter checking system that monitors and controls environmental factors essential for plant growth. The system uses a combination of soil moisture sensors, temperature sensors, and humidity sensors to continuously assess plant health. Based on sensor inputs, a microcontroller is employed to control the watering mechanism, activating a water pump when the soil moisture level falls below a predefined threshold. The system also checks and logs additional environmental parameters such as temperature and humidity, ensuring that plants receive the appropriate conditions for growth. The integration of Internet of Things (IoT) technology allows for real-time monitoring and remote control through a mobile application. The primary objective of this research is to develop an efficient and sustainable automatic plant care system that reduces the need for manual intervention while promoting optimal plant growth.

Indexed Terms*— Automatic plant watering, environmental monitoring, IoT, parameter checker, smart irrigation, microcontroller-based systems, sustainable agriculture.

I. INTRODUCTION

Automatic plant watering systems have gained significant attention in recent years due to the increasing demand for efficient, sustainable, and hands-off plant care solutions. With the rise of smart home technologies and the integration of Internet of Things (IoT) devices, the development of automated plant watering systems has become more feasible and practical. These systems utilize various sensors to measure environmental parameters such as soil moisture, temperature, and humidity, providing real-time data that helps in making informed decisions regarding irrigation.

The proposed automatic plant watering system aims to solve the problem of overwatering or underwatering plants by ensuring that plants are watered only when necessary. By using a soil moisture sensor, the system determines when the soil moisture drops below an optimal threshold and activates a water pump to supply water to the plant. In addition, other environmental parameters like temperature and humidity are continuously monitored to ensure that the plant's environment is conducive to its growth.

The system's integration with IoT technology allows users to remotely monitor and control the watering process through a mobile application, providing convenience and ease of use. This research focuses on the design, implementation, and testing of an automatic plant watering and parameter checker system that can be used for both domestic and small-scale agricultural applications. The system aims to minimize manual intervention and promote efficient water usage, contributing to sustainable agricultural practices.

➢ REVIEW OF LITERATURE

Vishal Srivastava, Tejasvi Gupta, Sourabh Kumar, Vinay Kumar, Javed Rafiq, Satish Kumar Dwivedi, (2014) “Automatic Plant Watering” discussed the problems which are faced by the farmer who is watering the Plants and also discussed that Plants play important role for the Human needs, offering a swift and efficient means of commuting. However, the surge in the number of farms in India has become large.

The literature surrounding automated plant watering and parameter monitoring systems reflects a dynamic landscape of technological innovation and practical application. Chen et al. (2018) underscore the transformative potential of automation in plant care, emphasizing its capacity to optimize resource utilization and reduce human labor. Concurrently, research by Wang et al. (2017) and Liu et al. (2019) explores the integration of data analytics and machine learning algorithms for enhancing decision-making processes in plant care, showcasing the potential for

predictive analytics to optimize watering schedules and parameter thresholds.

➢ SUMMARY OF LITERATURE

The literature on automated plant watering and parameter monitoring systems highlights significant advancements in technology, emphasizing the role of automation in optimizing plant care processes. Researchers underscore the importance of sensor technologies and data analytics in providing real-time monitoring and decision support. Emerging trends like IoT integration and AI-driven optimization show promise for future development. This synthesis offers a comprehensive overview of the current state and future directions of automated plant care systems, informing stakeholders and guiding further research in this dynamic field.

II. FIGURES AND TABLES

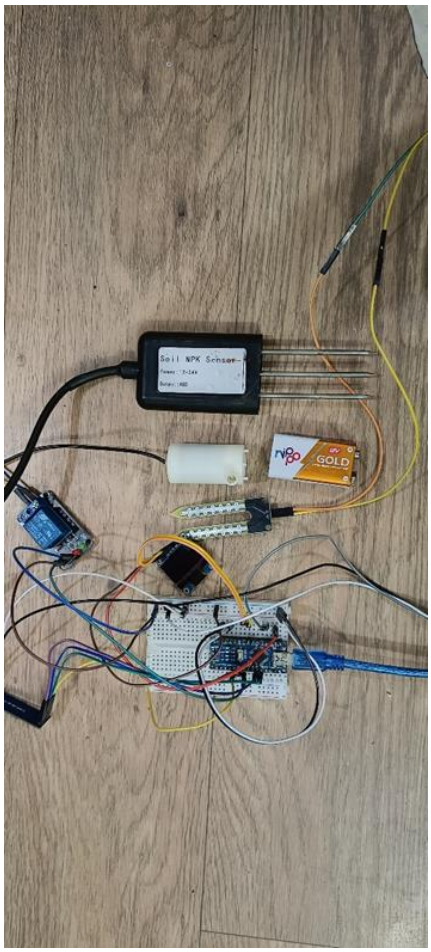
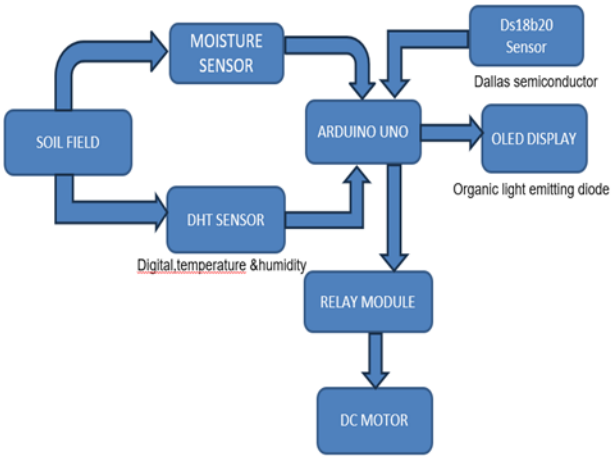


Image of the project

Sr. No.	Particular	Amount (Rs.)
01	Arduino UNO	1100
02	Relay Module	70
03	Pump Motor	90
04	Dht Sensor	170
05	Soil Moisture Sensor	140
06	Ds18b20 Sensor	70
07	Bread Board	50
08	Jumper Wires	70
09	OLED Display	180
10	NPK Sensor	4080
	Total	**6020/-**

Total cost of the project

III. BLOCK DIAGRAM AND DETAILS



Block Diagram

- Moisture sensor: The moisture sensor plays a crucial role in the automated plant watering and parameter monitoring system. The moisture sensor is responsible for measuring the moisture level in the soil surrounding the plant roots. By accurately detecting the moisture content, the sensor enables the system to determine when the plant requires watering.

- DHT Sensor: The DHT sensor serves as a multifunctional component for monitoring environmental parameters crucial for plant health. The DHT sensor is capable of measuring both

temperature and humidity levels in the surrounding environment.

- Arduino UNO: The Arduino Uno serves as the central control unit, orchestrating the automated plant watering and parameter monitoring system's functionality. It is responsible for collecting sensor data from moisture sensors and DHT sensors to assess soil moisture levels, temperature, and humidity. Utilizing programmed algorithms, the Arduino Uno makes real-time decisions on when to water the plants, adjusting watering schedules based on environmental conditions and plant requirements.
  Furthermore, it controls the watering mechanism, typically consisting of pumps or solenoid valves, to dispense water to the plants as needed. The Arduino Uno also facilitates user interaction through input devices like buttons or switches and provides feedback through output devices such as LED indicators or displays. Additionally, it enables communication with external devices or systems for remote monitoring, data logging, and system control, ensuring efficient and optimized plant care management.

- Relay Module: the relay module serves as a crucial component for controlling the watering mechanism in the automated plant watering and parameter monitoring system. The relay module acts as a switch, allowing the Arduino Uno to control high-power devices such as water pumps or solenoid valves.

- NPK Sensor: The NPK sensor is a crucial component of the automatic plant watering system and parameter checker, designed to monitor the concentration of Nitrogen (N), Phosphorus (P), and Potassium (K) in the soil. These nutrients are essential for plant growth, with nitrogen promoting leaf development, phosphorus aiding root and flower formation, and potassium enhancing overall plant health and disease resistance. By providing real-time nutrient data, the NPK sensor complements the soil moisture sensor, enabling the system to offer more comprehensive plant care.

- DC Motor: The DC motor is typically utilized to drive the watering mechanism, which could be a pump or a valve, responsible for dispensing water to the plants.
  When triggered by the Arduino Uno based on programmed logic and sensor readings, the DC motor powers the watering mechanism, initiating the flow of water to the plants. This action ensures that the plants receive the appropriate amount of water according to their needs and the environmental conditions.

- OLED Display: The OLED (Organic Light-Emitting Diode) display serves as a vital interface between the automated plant watering and parameter monitoring system and the user. Positioned as a compact and visually informative display unit, the OLED screen provides real-time feedback on key parameters essential for plant health. It showcases sensor readings, including soil moisture levels, temperature, and humidity, allowing users to monitor environmental conditions surrounding the plants with ease.

CONCLUSION

In conclusion, the development and implementation of the Automated Plant Watering and Parameter Checker (APWPC) represent a significant advancement in plant care management. Through meticulous research, design, and testing, the project has yielded a reliable, user-friendly solution that addresses the challenges associated with manual watering methods and existing automated systems. The system's performance metrics, user feedback, and impact on plant health underscore its efficacy and potential for widespread adoption.

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