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Survey Paper on Smart Planter: Simplifying Plant Care with AI Sensors

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Abstract: This paper presents a smart plant care system developed to address the challenges of indoor plant maintenance for busy or novice plant owners. Leveraging AI sensors and IoT technology, the system continuously monitors crucial environmental parameters—soil moisture, temperature, and light exposure—to optimize plant health. Real-time data analytics and machine learning algorithms analyze this data, predicting care needs and automating responses like watering adjustments, with minimal user input. The user-friendly mobile app interface provides actionable insights, enabling remote monitoring and proactive care. This report covers the system's layered architecture, practical benefits, implementation challenges, and potential for integration with smart home systems. It also explores future advancements in AI-driven plant care, emphasizing the potential of this technology to transform indoor gardening by making it more accessible, efficient, and precise.
Keywords: AI Sensors, Smart Plant Care, IoT in Indoor Gardening, Machine Learning, Automation, Plant Health Monitoring.

I. INTRODUCTION

Indoor plants have become increasingly popular, adding a refreshing element of nature to modern living spaces. However, maintaining indoor plants presents unique challenges, especially for beginners or those with limited time for plant care. Issues such as overwatering, insufficient lighting, and lack of knowledge about specific plant needs frequently lead to poor plant health or premature plant loss. Traditional care methods often rely on intuition and experience, which can lead to inconsistent results and missed opportunities for timely intervention.

With advancements in artificial intelligence (AI) and the Internet of Things (IoT), these challenges can be addressed by implementing technology that enables continuous, real-time monitoring of plant health parameters. By leveraging sensors to gather essential data such as soil moisture, temperature, and light levels, and processing this data through machine learning algorithms, a smart plant care system can predict plant needs and automate care actions, like watering, for consistent and optimal care.

Smart plant care systems offer a solution for individuals seeking effective, hassle-free plant maintenance by combining AI-driven insights with automated functionality, thereby fostering healthier plants and enhancing user experience.

II. METHODOLOGY

The methodology for the Smart Plant Care System is divided into the following phases: Requirement analysis, System architecture, algorithm design, flowchart, implementation, testing.

A. Requirement Gathering

The requirement gathering phase focused on understanding the core needs of the smart plant care system. Insights were collected from plant owners, especially beginners and busy individuals. Key requirements include:

1) *Environmental Monitoring:* Sensors for soil moisture, temperature, and light to monitor plant health.
2) *Automated Care*: The system should automatically adjust conditions, such as watering, based on sensor data.
3) *User Interface:* A simple, intuitive mobile app to view real-time data, receive alerts, and manually control the system.
4) *Data Analysis*: Use of machine learning for predictive care and action scheduling.

These features aim to make plant care easier and more efficient.

B. System Architecture

The system architecture consists of multiple layers that ensure smooth operation and integration:

1) *Physical Layer:* IoT sensors (soil moisture, temperature, light) monitor environmental factors, while actuators (automatic watering) respond based on sensor data.

2) *Data Processing Layer:* A microcontroller (e.g., Arduino/Raspberry Pi) collects data from sensors, processes it, and sends it to the cloud for storage and analysis.
3) *Cloud Layer:* Data is stored securely and processed using machine learning algorithms to predict plant care needs.
4) *User Interface Layer:* A mobile app displays real-time data, sends alerts for plant care actions, and allows manual control of the system.
5) *Decision-Making Layer:* A behavior tree model processes sensor data to automate actions like watering, ensuring optimal plant care.

C. Algorithm

The robot utilizes multiple algorithms to ensure efficient navigation and seeding:

1) *Start:* Initialize system and sensors for data collection.
2) *Collect Sensor Data:* Gather soil moisture, temperature, and light intensity data; store in variables.
3) *Set Thresholds:* Define optimal values for plant health parameters (e.g., optimalMoisture, optimalTemp).
4) *Analyse Data:* Run sensor data through a machine learning model to check if values are within optimal thresholds. Identify any needed actions (e.g., watering, adjusting light).
5) *Predict Care Options:* Use time-series analysis to forecast when watering or light adjustments are needed.
6) *Notify User:* If needed, alert the user via mobile app with specific care instructions.
7) *Automate Irrigation:* Activate irrigation if soil moisture is below the threshold.
8) *Update App:* Show current plant status and recommendations in real-time on the app.
9) *Repeat Process*: Continuously monitor and re-evaluate plant conditions.
10) *End:* Stop the process when the system is turned off.

D. Flowchart

1) *Start:* The system is initialized, activating all components, including sensors, microcontroller, wireless communication modules, and the cloud platform. This step ensures that the system is ready to collect data and respond to user inputs.
2) *Collect Sensor Data:* The IoT sensors begin gathering real-time environmental data, such as soil moisture, temperature, and light intensity. This data is then sent to the microcontroller for processing and further analysis.
3) *Process Data:* The microcontroller processes the raw data from the sensors and checks it against predefined thresholds. If the data is within the optimal range, the system continues monitoring; otherwise, it proceeds to the next step to determine necessary actions.
4) *Analyze data using Machine Learning:* The system's machine learning algorithms analyze the collected data to predict any potential plant health issues. The model checks if the plant's environment is optimal and identifies any adjustments needed (like watering or light adjustments).
5) *Predict and Automate Care options:* Based on the analysis, the system predicts actions needed to ensure the plant's health, such as initiating watering or adjusting light levels. The system automatically takes these actions if required, such as activating the irrigation system when moisture levels drop below the set threshold.
6) *Send notification to user:* If any intervention is needed, the system alerts the user via the mobile application or dashboard interface, providing clear instructions on what care actions are required (e.g., watering, adjusting light, etc.).
7) *Update mobile app:* The mobile app receives real-time updates, displaying the current status of the plant, including its health metrics and any actions taken or recommended.
8) *Repeat Process:* The system continuously monitors the plant's environment and re-evaluates conditions at regular intervals to ensure optimal care. If any conditions change, it repeats the process to maintain plant health.
9) *End:* The process continues as long as the system is active. If the system is turned off or the user chooses to stop monitoring, the process ends.

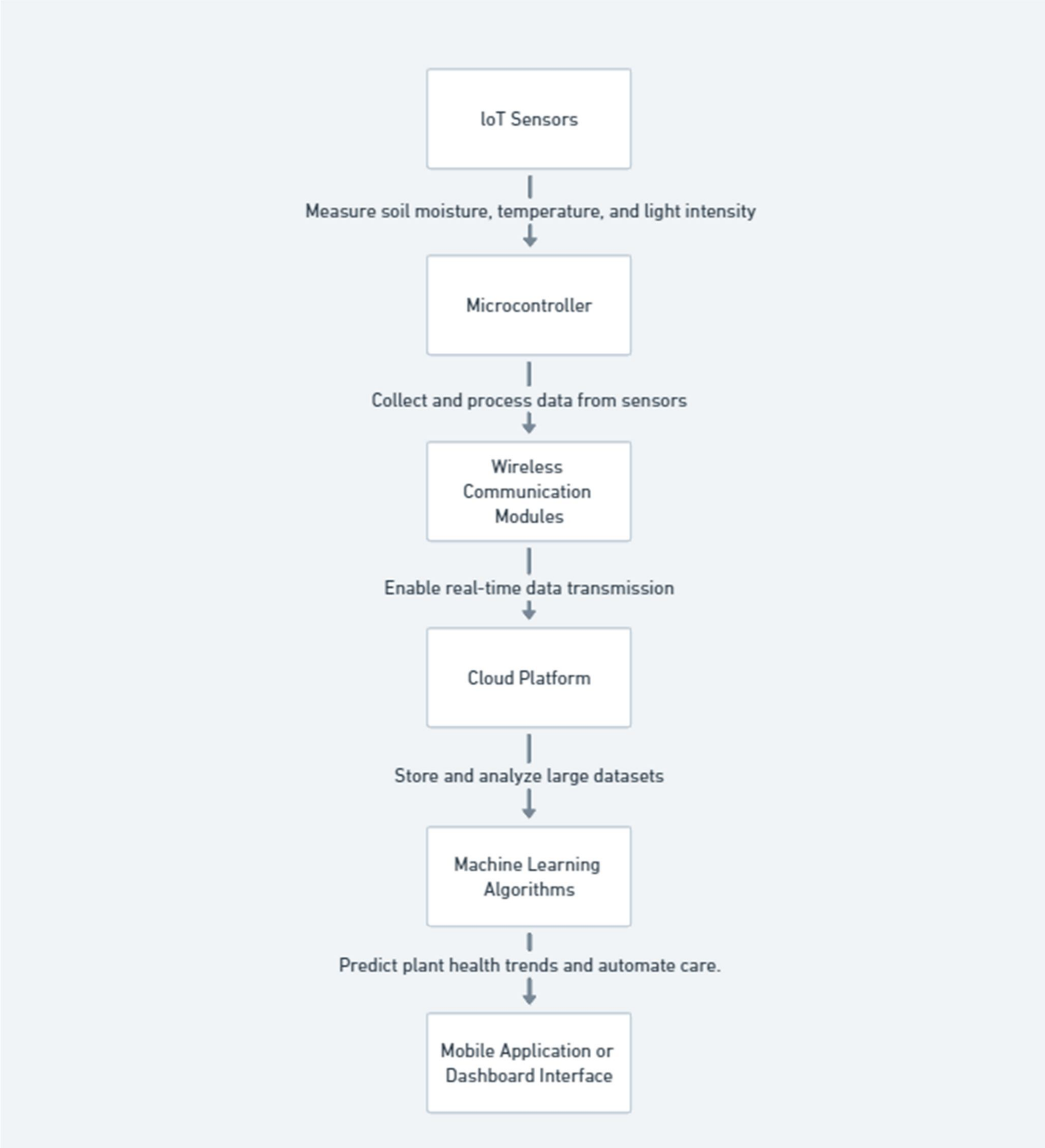


Fig. 1 Flowchart

III. CONCLUSION

In conclusion, the AI-driven plant care system offers a transformative solution for modern plant care by leveraging advanced technologies like IoT sensors, machine learning algorithms, and cloud-based platforms. The system continuously monitors crucial environmental factors such as soil moisture, temperature, and light levels, providing real-time data that empowers users to make informed, precise decisions for plant care. By eliminating the guesswork traditionally associated with gardening, the system tailors care to the specific needs of each plant, ensuring optimal conditions for growth.

Additionally, the system enhances user convenience by sending alerts only when necessary, reducing the need for constant attention and manual intervention. This proactive approach helps prevent common issues like overwatering or neglect, saving time for busy individuals and promoting healthier plants. Ultimately, the AI-driven plant care system fosters a more sustainable, responsible, and enriching gardening experience, encouraging users to form a deeper connection with their plants while enjoying the benefits of thriving, well-cared-for greenery.

REFERENCES

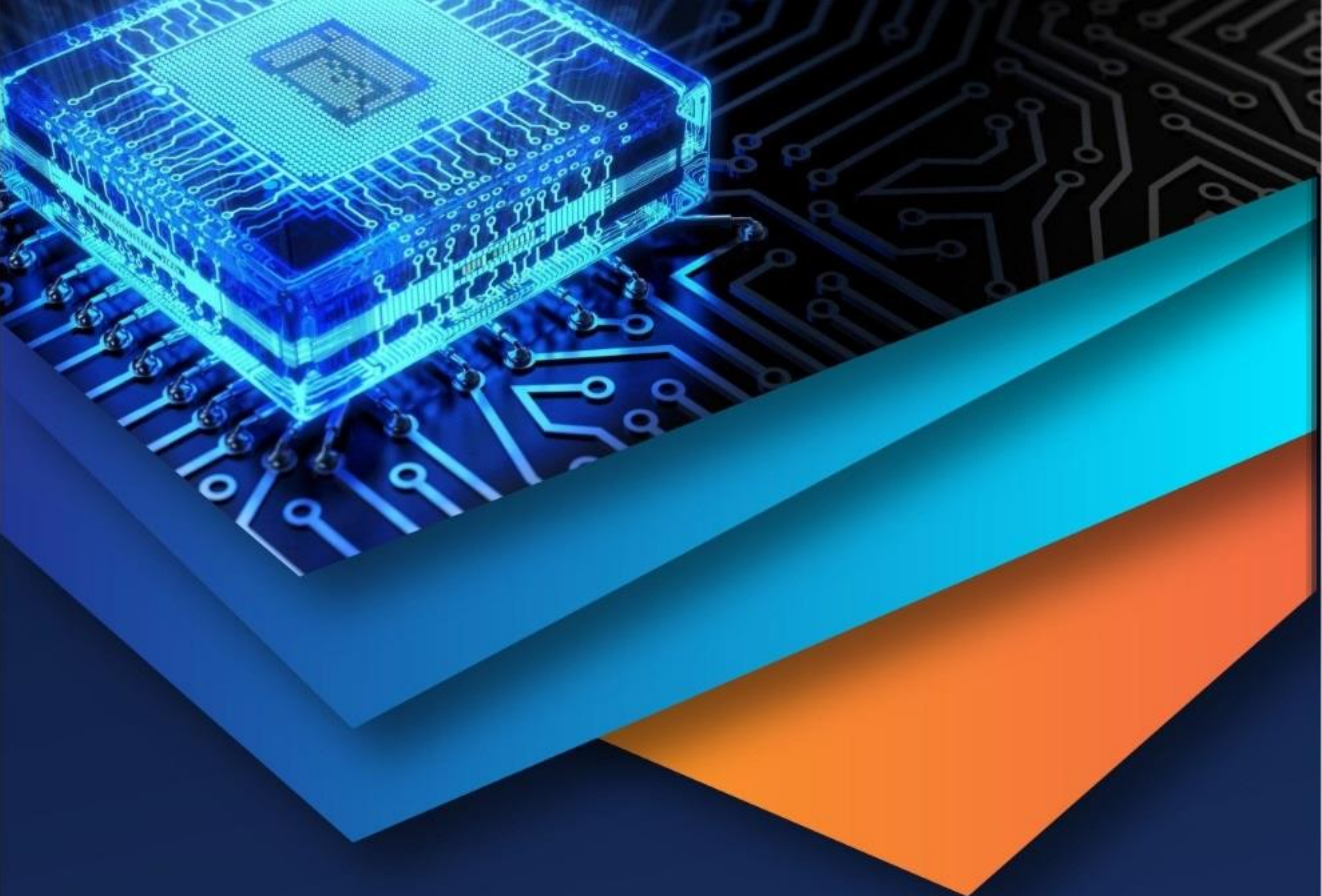
[1] K. Dijkstra, M. E. Pieterse, and A. Pruyn. "Stress-reducing effects of indoor plants in the built healthcare environment: The mediating role of perceived attractiveness". In: Preventive Medicine 47.3 (2008), pp. 279–283.N. Kawale, S. Jagdale, and M. Bhangale, "Seed Sowing Robot Using IoT", International Research Journal of Modernization in Engineering Technology and Science (IRJMETS), 2020.

[2] Bernardo Tabuenca et al. "Talking to Plants: An IoT System Supporting HumanPlant Interactions and Learning". In: (2021).

[3] F. Santos and H. Barros. "AI-Based Insights for Plant Health Monitoring: Challenges and Opportunities". In: Smart Agriculture Technology 11.1 (2023), pp. 43– 52.

[4] Mridula Dwivedi, Babita Pandey, and Vipin Saxena. "Analyzing the Frontier of AI-Based Plant Disease Detection: Insights and Perspectives". In: Microbial Data Intelligence and Computational Techniques for Sustainable Computing. Springer, 2024, pp. 195–204.

[5] N.K. Nawand and V.R. Satpute. "IoT Based Low Cost and Intelligent Module for Smart Irrigation System". In: Computers and Electronics in Agriculture 162 (2019), pp. 979–990.



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