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Hydroponics using IOT

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A B S T R A C T

This report presents the abstract for the project "An automated hydroponic farm for home use" undertaken by Neel Kirti Jabuvani, Prajwal Vijay Kasbale, Hrushikesh Mangesh Bhoir, and Rushikesh Dilip Patil, pursuing Diploma in Information Technology from Vidyalankar Polytechnic, under the certification and acknowledgment of VHIRON, a brand of Jinshaashan Info LLP. The project's objective is to create an innovative solution for modern home farming through an automated hydroponic system. The proposed system aims to address the challenge of achieving self-sustaining and efficient cultivation at a small scale. The primary focus is on integrating IoT (Internet of Things) technology, sensors, and electrical components to enable seamless automation and remote control. The problem statement entails the development of a hydroponic farm that achieves three key functionalities: self-irrigation, self-supplementation, and self-maintenance of both resources and plants. This multifaceted approach requires a comprehensive system design that optimizes water usage, nutrient delivery, and overall plant care. The integration of IoT technology allows for real-time data collection and analysis, enabling informed decisions and timely interventions. Central to the project's success is the creation of a user-friendly mobile application. This app serves as the control interface for the automated hydroponic system. Users can remotely monitor and manage various parameters such as water levels, nutrient concentrations, and environmental conditions.

1. Introduction

This poster presents the project "An Automated Hydroponic Farm for Home Use" undertaken by Neel Kirti Jabuvani, Prajwal Vijay Kasbale, Hrushikesh Mangesh Bhoir, and Rushikesh Dilip Patil, pursuing a Diploma in Information Technology from Vidyalankar Polytechnic. The project is certified and acknowledged by VHIRON, a brand of Jinshaashan Info LLP. The objective is to create an innovative solution for modern home farming through an automated hydroponic system. The system integrates IoT technology, sensors, and electrical components for seamless automation and remote control. The focus is on achieving self-sustaining and efficient cultivation at a small scale, addressing challenges in self-irrigation, self-supplementation, and self-maintenance.

2. Problem Statement

An automated hydroponic farm for home use addresses the need for fresh, healthy food in limited spaces and harsh climates. It offers a sustainable alternative to traditional agriculture with reduced water and nutrient usage. The automation makes it accessible to individuals with limited time or mobility. Potential beneficiaries include urban dwellers, those with limited gardening experience, and individuals wanting to teach agriculture and healthy eating. Unlike commercial hydroponic systems, the proposed solution aims to be affordable, user-friendly, and optimized for home cultivation.

3. Features / Functionalities of Project

- Nutrient Solution System: Delivers essential minerals and nutrients directly to plant roots.

- Growing Medium: Utilizes various mediums like rock wool, perlite, coconut coir, or vermiculite.

- Controlled Environment: Operates in controlled environments like greenhouses or indoor grow rooms.

- pH and EC Monitoring: Monitors and controls pH levels and electrical conductivity of the nutrient solution.

- Lighting Systems: Utilizes artificial lighting systems for optimal plant growth.

4. Review of Literature

The literature review covers hydroponics, automation in agriculture, hydroponic automation, control systems, challenges, and case studies. It provides insights into the integration of automation in hydroponic systems, emphasizing the use of IoT and data analytics for optimal conditions.

5. Modules / Users / Stakeholders

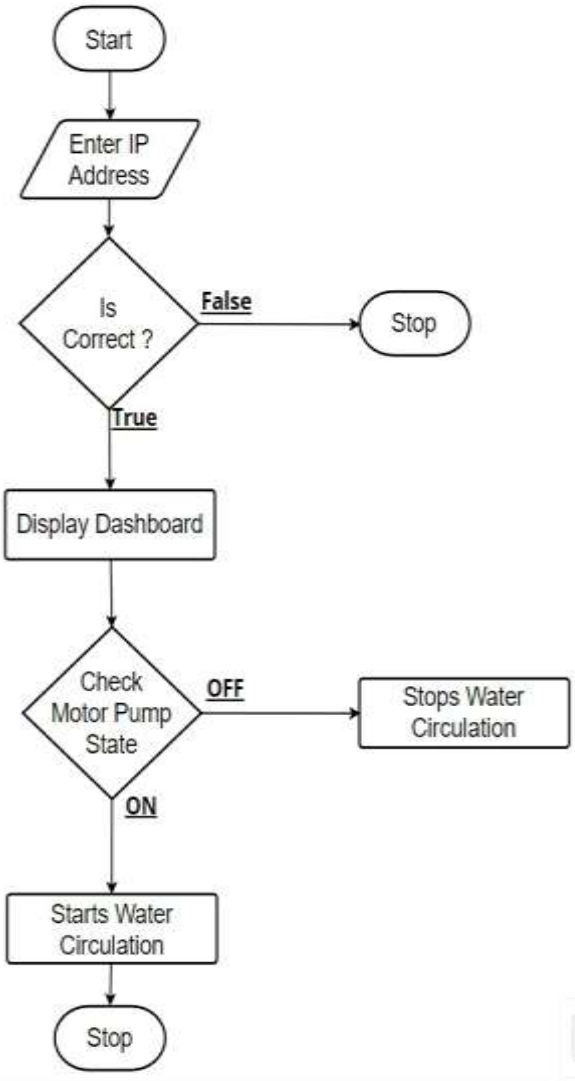
1. Modules:

- Sensing and Monitoring Module
- Control and Actuation Module
- Communication Module
- Mobile App Interface Module

2. Users/Actors:

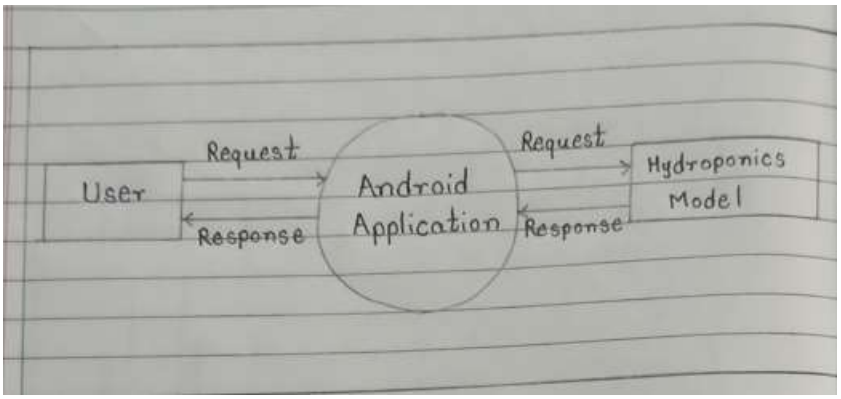
- Home Gardeners/Users
- System Administrator
- System Developer/Programmer
- Sensor Technicians
- Support Team

6. Flowchart

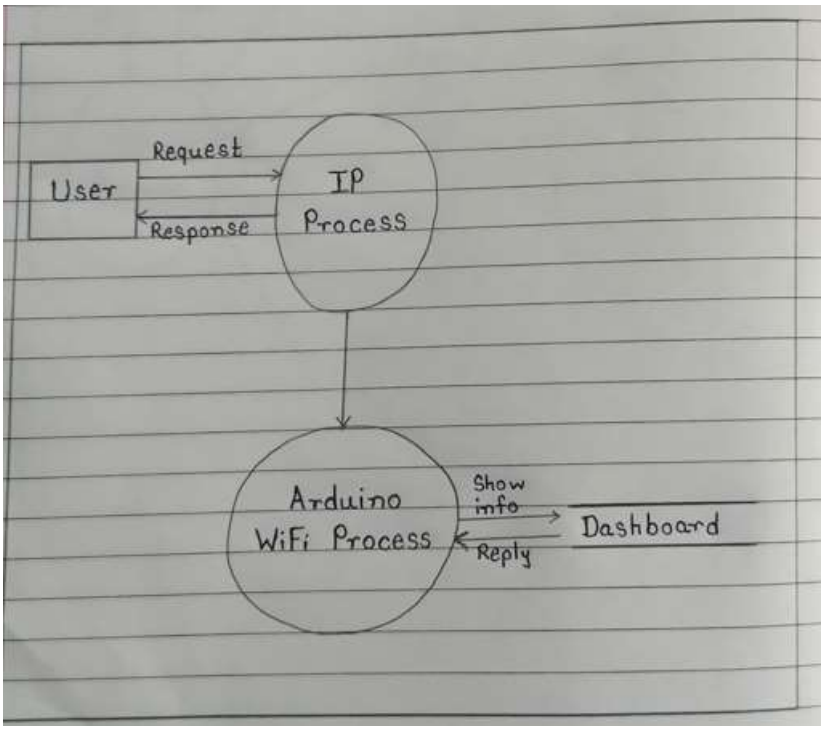


7. Design (DFD & UML Diagram)

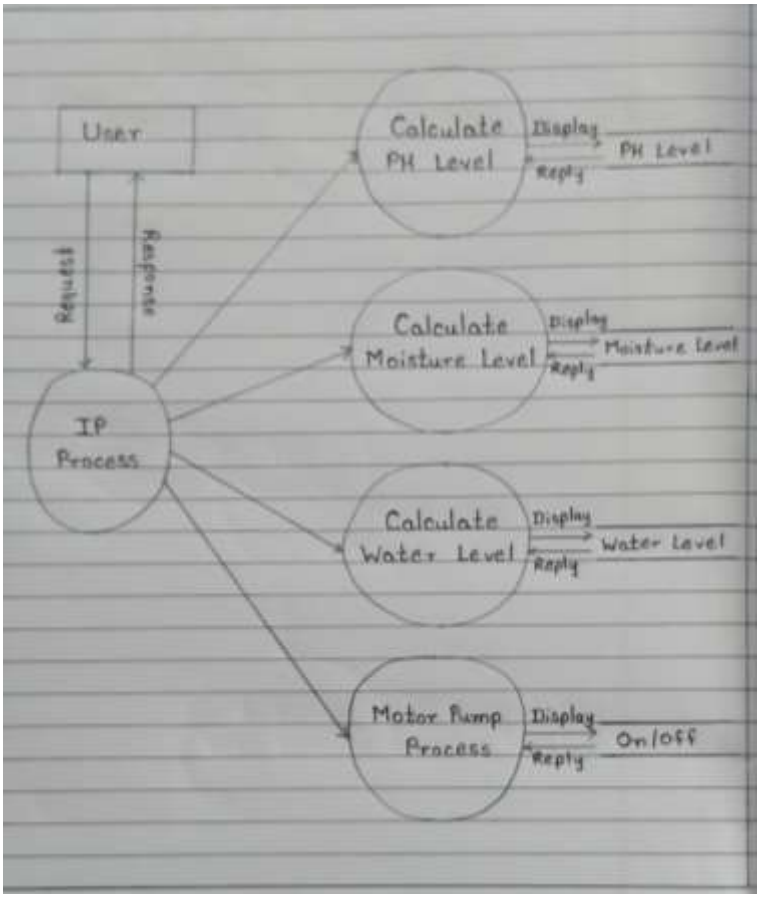
7.1 DFD Diagram



7.2 DFD Level 1



7.3 DFD Level 2



8. Technology Used

- Hardware Requirement: PVC Pipe, Net Pots, Air Stone, Water Pump, Motor

- Software Requirement: IoT Technology, Sensors, Communication Protocols, Mobile App Development, Cloud Services

9. Pros & Cons

Pros:

- Faster plant growth and higher yield

- Efficient space utilization

- Reduced labor requirement

- Improved efficiency in water and nutrient usage

Cons:

- Initial setup cost is higher

- Requires proper monitoring and management

- Potential spread of infections in the system

10. Future Scope

- Hydroponics for sustainable farming

- Increased adoption of automated hydroponic systems for home gardening

- Integration of AI and IoT for precise control and monitoring
- Growth of vertical hydroponic farms in urban settings
- Role in addressing global food security issues

11. Applications

- Growing fresh produce in urban areas
- Educational use in schools and universities
- Quick food production after natural disasters
- Food production for space missions
- Nurseries for cultivating healthy, disease-free plants

12. Conclusion

Hydroponics, especially in an automated system, offers a promising solution for modern agriculture. With the increasing urban population, adopting soil-less cultivation becomes essential for food security and produce quality. Government intervention and research institute interest are crucial for stimulating commercial hydroponic farms and low-cost technologies.