PROJECT REPORT

on

Remote Monitoring of Hydroponic System

Submitted by

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Under the Guidance of

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[2023-2024]

Department of Electrical and Electronics Engineering

Academic Year 2023-2024

CERTIFICATE

This is to certify that Shiny Mittal, PRN No. 1032222161 has successfully completed his/her PBL activity entitled "**Remote Monitoring of Hydroponic System**" and submitted the same during the academic year 2023-24 as a requirement for completion of continuous assessment component under subject Sensors & Actuators.

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Date:

Place: Pune

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to Professor Vinaya Gohokar for her invaluable guidance, mentorship, and support throughout the duration of this project. Her expertise, encouragement, and constructive feedback were instrumental in shaping our ideas and guiding us towards successful outcomes.

We would also like to express our sincere appreciation to our dedicated team members, Shiny Mittal, Komal, Kimaya Bhave and Vaidehi Bhide , for their collaborative efforts, creativity, and commitment to excellence. Their contributions, insights, and teamwork were essential in overcoming challenges and achieving our project objectives.

Finally, we extend our heartfelt thanks to our families and loved ones for their unwavering support, encouragement, and understanding throughout this journey.

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ABSTRACT

Our project focuses on developing a remote monitoring hydroponic system using sensors and an ESP32 microcontroller, under the guidance of Professor Vinaya Gohokar. The system incorporates sensors like PIR, DHT11, DS18S20, and a water level switch to monitor temperature, humidity, motion, and water levels in real-time. By transmitting data to the Blynk IoT app via Wi-Fi, growers can remotely monitor and control their hydroponic setups from anywhere. The user-friendly interface of the Blynk app allows for easy access to vital information and enables growers to optimize environmental conditions for maximum plant growth. Our project aims to revolutionize plant cultivation by providing an efficient, sustainable, and technologically advanced solution for hydroponic farming.

CHAPTER 1
INTRODUCTION

1. Motivation

Hydroponic systems have gained significant popularity in recent years as a sustainable and efficient method of cultivating plants without soil. Unlike traditional farming methods, hydroponics relies on nutrient-rich water solutions to deliver essential nutrients directly to the plant roots. This innovative approach offers numerous advantages, including higher crop yields, faster growth rates, and reduced water consumption compared to conventional soil-based farming.

Our project focuses on developing a remote monitoring hydroponic system that harnesses the power of sensor technology and IoT connectivity to revolutionize plant cultivation. Under the guidance of Professor Vinaya Gohokar, our team of dedicated researchers – Komal, Kimaya, Shiny, and Vaidehi – has embarked on a journey to explore the potential of this cutting-edge technology in agricultural practices.

Basics of the Project

At its core, our remote monitoring hydroponic system consists of an ESP32 microcontroller, various sensors including PIR, DHT11, DS18S20, and a water level switch, and the Blynk IoT app. These components work together seamlessly to monitor key parameters such as temperature, humidity, motion, and water levels in real-time. By leveraging Wi-Fi connectivity, sensor data is transmitted to the Blynk app, providing growers with instant access to vital information about their hydroponic setups.

Importance of the Project

The importance of our project lies in its potential to revolutionize the way plants are cultivated, particularly in urban environments where space and resources are limited. By enabling remote monitoring and control of hydroponic systems, our solution offers several key benefits:

Optimized Plant Growth: Real-time monitoring of environmental parameters allows growers to adjust conditions to optimize plant growth and productivity.
Resource Efficiency: By providing growers with precise control over water and nutrient delivery, our system minimizes waste and conserves resources.
Data-Driven Decisions: Access to real-time sensor data empowers growers to make informed decisions, leading to more efficient and sustainable farming practices.
Scalability: Our system is designed to be scalable, allowing growers to expand their operations and maximize yields without significant increases in resource consumption.
Accessibility: The user-friendly interface of the Blynk app makes it easy for growers of all skill levels to monitor and manage their hydroponic systems from anywhere, at any time.

CHAPTER 2

2. AIM AND OBJECTIVES OF PROJECT

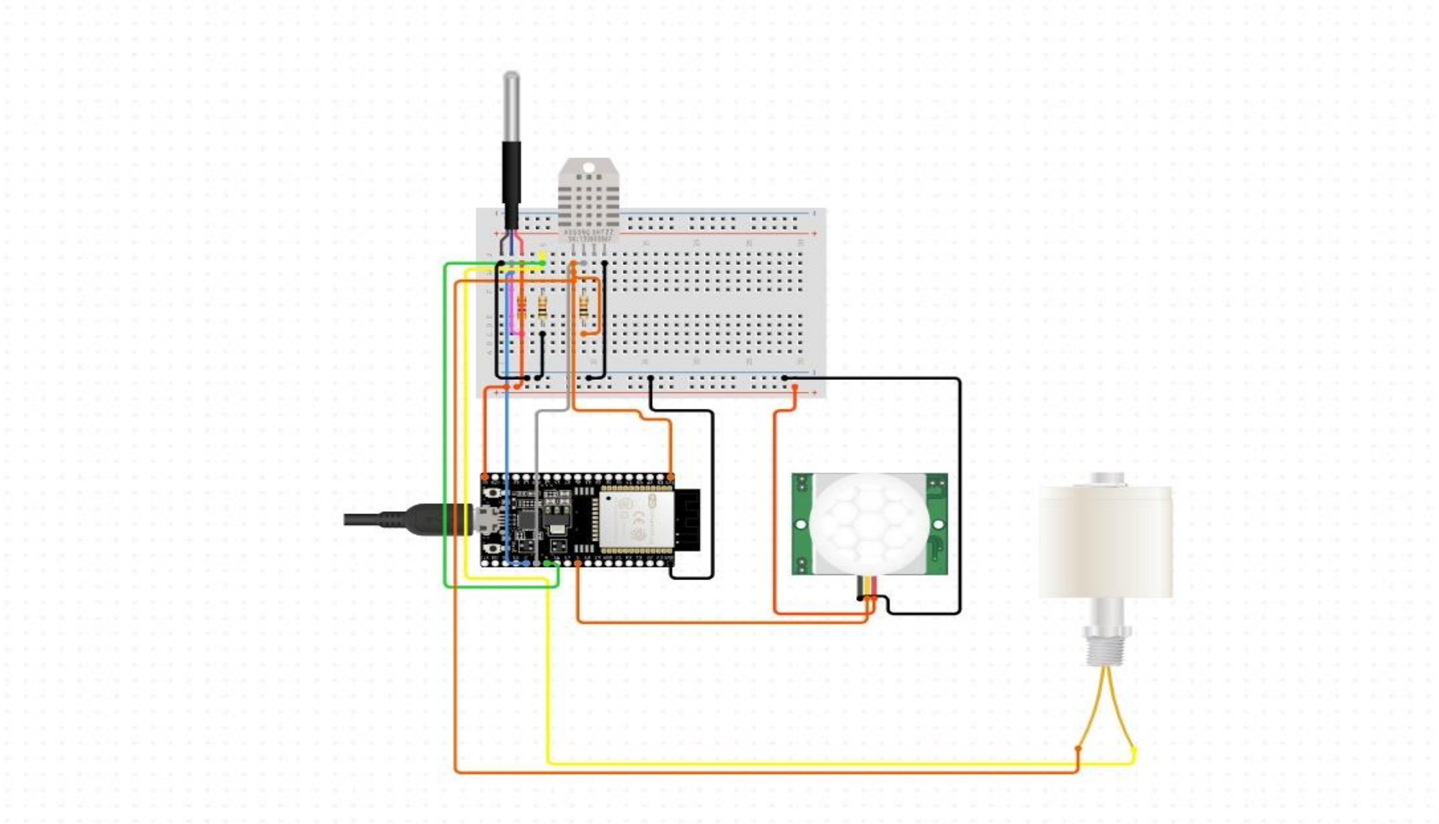
Aim: The aim of our project is to develop a remote monitoring hydroponic system that leverages sensor technology and IoT connectivity to optimize plant cultivation practices.

Objectives:

1. Sensor Integration: Integrate a variety of sensors, including PIR, DHT11, DS18S20, and a water level switch, with an ESP32 microcontroller to monitor key parameters such as temperature, humidity, motion, and water levels in a hydroponic system.
2. IoT Connectivity: Establish Wi-Fi connectivity between the ESP32 microcontroller and the Blynk IoT app to enable real-time transmission of sensor data to the user's smartphone or computer.
3. User Interface Development: Design a user-friendly interface on the Blynk app that allows growers to easily access and interpret sensor data, make adjustments to environmental conditions, and receive alerts or notifications about potential issues.
4. Optimization of Growing Conditions: Utilize the sensor data collected by the system to optimize growing conditions within the hydroponic system, including adjusting nutrient levels, water temperature, and ventilation to maximize plant growth and productivity.
5. Remote Monitoring and Control: Enable growers to remotely monitor and control their hydroponic systems from anywhere, providing flexibility and convenience while ensuring optimal plant health and yield.
6. Scalability and Adaptability: Design the system to be scalable and adaptable to different types and sizes of hydroponic setups, allowing for easy expansion and customization based on the user's specific needs and preferences.
7. Education and Outreach: Provide educational resources and outreach efforts to promote awareness and adoption of remote monitoring hydroponic technology among growers, researchers, and enthusiasts in the agricultural community.

CHAPTER-3

3.1 SYSTEM BLOCK DIAGRAM



3.2 SYSTEM SPECIFICATIONS

<u>Components used:</u>

1. ESP32 microcontroller
2. PIR sensor
3. DS18B20 temperature sensor
4. DHT11 temperature and humidity sensor
5. Side-mounted water level switch
6. Jumper wires
7. Breadboard
8. Blynk IoT app

3.3 SYSTEM ALGORITHM

Initialization:

Set up the ESP32 microcontroller, sensors (PIR, DS18B20, DHT11, water level switch), and Blynk IoT app.

Connect the sensors to the appropriate GPIO pins of the ESP32.

Initialize communication with the Blynk IoT app using the provided authentication token.

Sensor Data Collection:

Continuously read sensor data at regular intervals using the timer.

Read the PIR sensor to detect motion near the hydroponic system.

Query the DS18B20 sensor to measure water temperature.

Utilize the DHT11 sensor to measure air temperature and humidity.

Check the water level switch to determine the water level in the hydroponic reservoir.

Data Transmission:

Transmit the collected sensor data to the Blynk IoT app using virtual pins.

Update the motion detection, temperature, humidity, and water level widgets on the Blynk app with the latest sensor readings.

User Interaction:

Allow users to remotely monitor the hydroponic system through the Blynk app.

Display real-time sensor data on the Blynk dashboard, providing users with insights into the system's status.

Enable users to receive notifications or alerts via the Blynk app in case of abnormal conditions (e.g., high water level, motion detected).

Feedback and Control:

Update LED widgets on the Blynk app to visually indicate motion detection and water level status.

Log events such as motion detection for future reference or analysis.

Optimization and Control:

Analyze sensor data trends over time to identify patterns and optimize environmental conditions for plant growth.

Provide users with control options through the Blynk app to adjust settings such as temperature, humidity, and lighting remotely.

Error Handling:

Implement error handling mechanisms to deal with communication failures or sensor malfunctions.

Provide feedback to users through the Blynk app in case of system errors or issues.

Continuous Operation:

Ensure the system operates continuously, periodically collecting sensor data and updating the Blynk app to provide users with real-time insights into their hydroponic system.

CHAPTER 4

4.1 Result

1. **Real-time Monitoring**: The Blynk app will display real-time data from the sensors, including motion detection, temperature, humidity, and water level.
2. **Convenience**: You can remotely monitor your hydroponic system from anywhere using the Blynk app, providing convenience and flexibility.
3. **Optimized Growing Conditions**: With access to real-time sensor data, you can make adjustments to environmental conditions such as temperature, humidity, and water levels, optimizing growing conditions for your plants.
4. **Efficiency**: By monitoring and controlling your hydroponic system remotely, you can minimize resource wastage and ensure efficient use of water, nutrients, and energy.
5. **Alerts and Notifications**: The system can alert you via the Blynk app in case of abnormal conditions such as high water levels or motion detection, allowing you to take timely action.
6. **Data Analysis**: Over time, you can analyze sensor data trends to identify patterns and make data-driven decisions to further optimize your hydroponic system for maximum yield and efficiency.

CHAPTER 5

5.1 Conclusion

In summary, our project has successfully developed a remote monitoring hydroponic system that utilizes sensor technology and IoT connectivity to optimize plant cultivation. By integrating sensors such as PIR, DS18B20, DHT11, and a water level switch with the ESP32 microcontroller, we have enabled real-time monitoring of crucial parameters like temperature, humidity, motion, and water levels. The Blynk app provides a user-friendly interface for remote monitoring and control, empowering growers to make informed decisions and maximize efficiency. Overall, our system offers a sustainable and efficient solution for modern plant cultivation practices, with the potential to revolutionize agriculture.