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IoT Based Green House Monitoring and Controlling System

Under the guidance of
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ABSTRACT

Nowadays due to urbanization and a lack of suitable land, there is a high demand for greenhouse development. Greenhouses protect plants from diseases and provide optimal conditions for growth. However, farmers face challenges managing temperature humidity, soil moisture, and light intensity levels for optimal growth and productivity of plants. To overcome these challenges, an IoT based greenhouse monitoring and controlling system has been developed using an Arduino Mega microcontroller and various sensors such as DHT11, soil moisture, LDR, and Ultrasonic sensors. The system also includes an LCD display module, cooling fan, LED lights, and water pump to maintain optimal conditions. The Real-Time Clock (RTC) is used to schedule the provision of sufficient water for pants growth. Overall, this system provides a practical solution for greenhouse management, enabling farmers to achieve better plant growth and profits.

INTRODUCTION

An IoT based greenhouse monitoring and controlling system is a technological solution designed to address the challenges faced by farmers in greenhouse management. It is an advanced system that combines the power of the Internet of Things (IoT) and automation to provide optimal conditions for plant growth, thereby increasing plant growth and profits. The system comprises various sensors such as temperature, humidity, light, and soil moisture sensors, as well as an automated control system that regulates the conditions inside the greenhouse. The sensors provide real-time data on the environmental conditions inside the greenhouse, which is transmitted to a cloud-based platform for analysis and control. The system also includes actuators such as fans, pumps, and lights that can be remotely controlled using a smartphone or a computer. By automating the greenhouse management process, farmers can save time, reduce manual effort, and ensure optimal conditions for plant growth, leading to increased plant growth and profits.

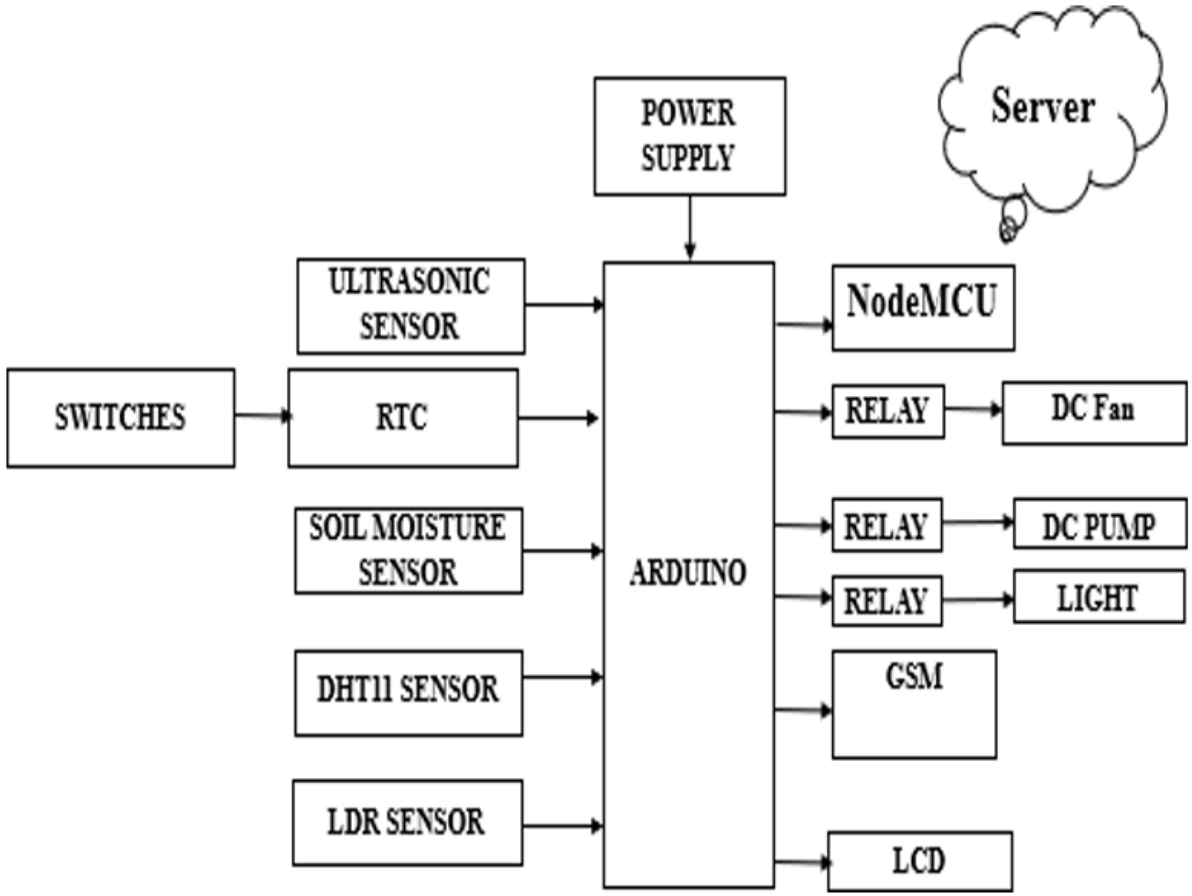
PROBLEM STATEMENT

The problem with traditional greenhouse management is that it requires constant manual effort to monitor and regulate the environmental conditions inside the greenhouse. This can be challenging for farmers, especially when they have to manage multiple greenhouses or when they are not physically present at the greenhouse location. The lack of real-time monitoring and control can result in suboptimal conditions for plant growth, leading to reduced crop yields and profits. Furthermore, traditional greenhouse management practices can be resource-inten-sive, with a significant amount of water and energy being wasted due to inefficient use. To address these challenges, an IoT based greenhouse monitoring and controlling system is needed to automate the process, providing real-time monitoring and control of environmental conditions and optimizing resource utilization for improved plant growth and profitability.

METHODOLOGY

The methodology for this IoT-based greenhouse monitoring and controlling system involves several steps. First, the sensors such as DHT11, soil moisture, LDR, and ultrasonic sensors are connected to the microcontrollers like Arduino Mega and NodeMCU. These sensors continuously collect data on the temperature, humidity, light intensity, soil moisture level, and distance, respectively. The data from these sensors is then transmitted to the cloud server using communication modules like WiFi or GSM. Next, the cloud server receives the data and performs analytics and visualization using Thingspeak The results of these analytics are then communicated to the user through mobile or web-based applications like Blynk Finally, the actuators like DC motor, light, and cooling fan are controlled based on the analytics results received from the cloud server. For example, if the soil moisture level is low, the water pump is activated to water the plants. Similarly, the LED lights and cooling fan are controlled to maintain optimal light intensity and temperature inside the greenhouse.

ARCHITETURE DIAGRAM



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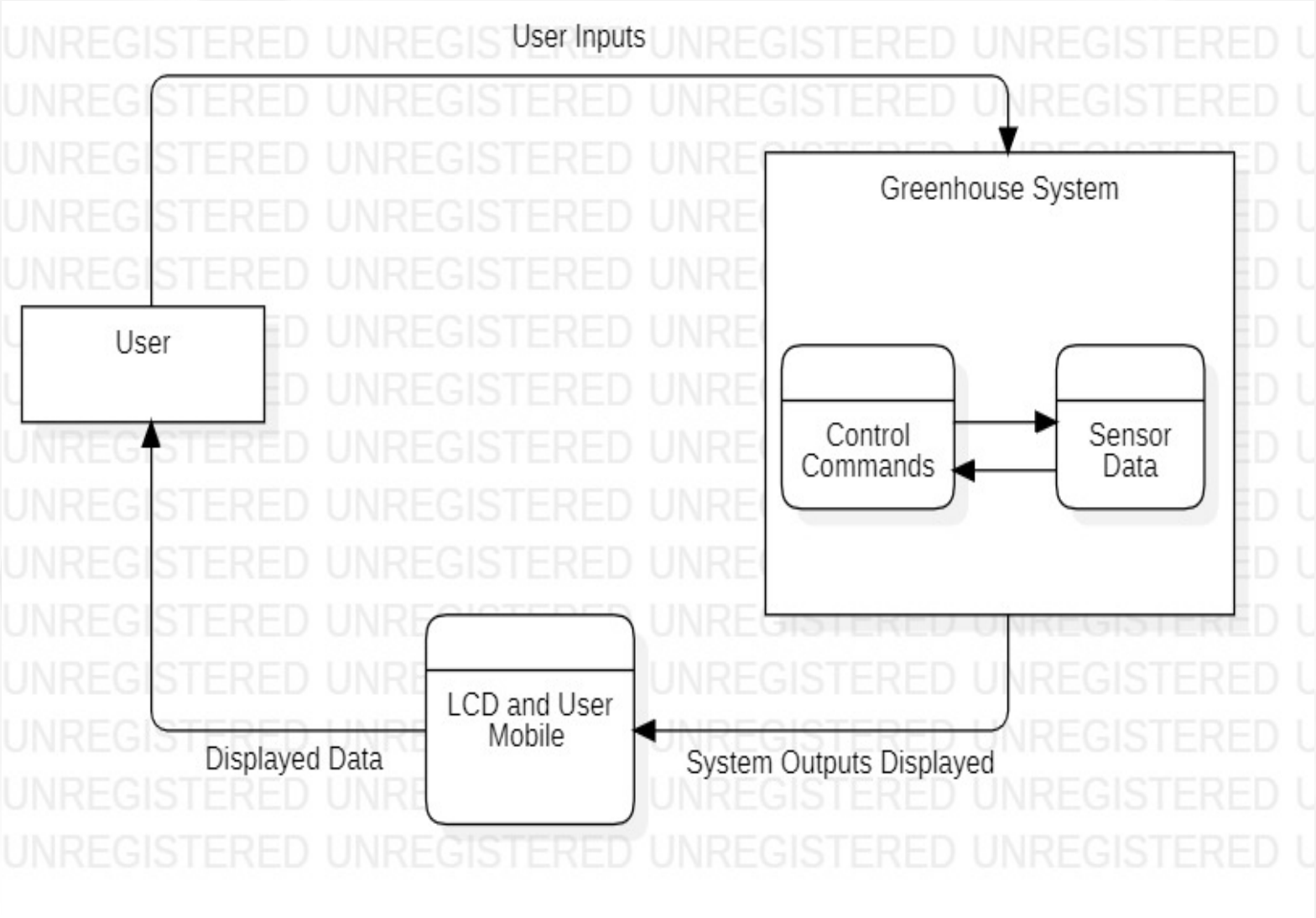

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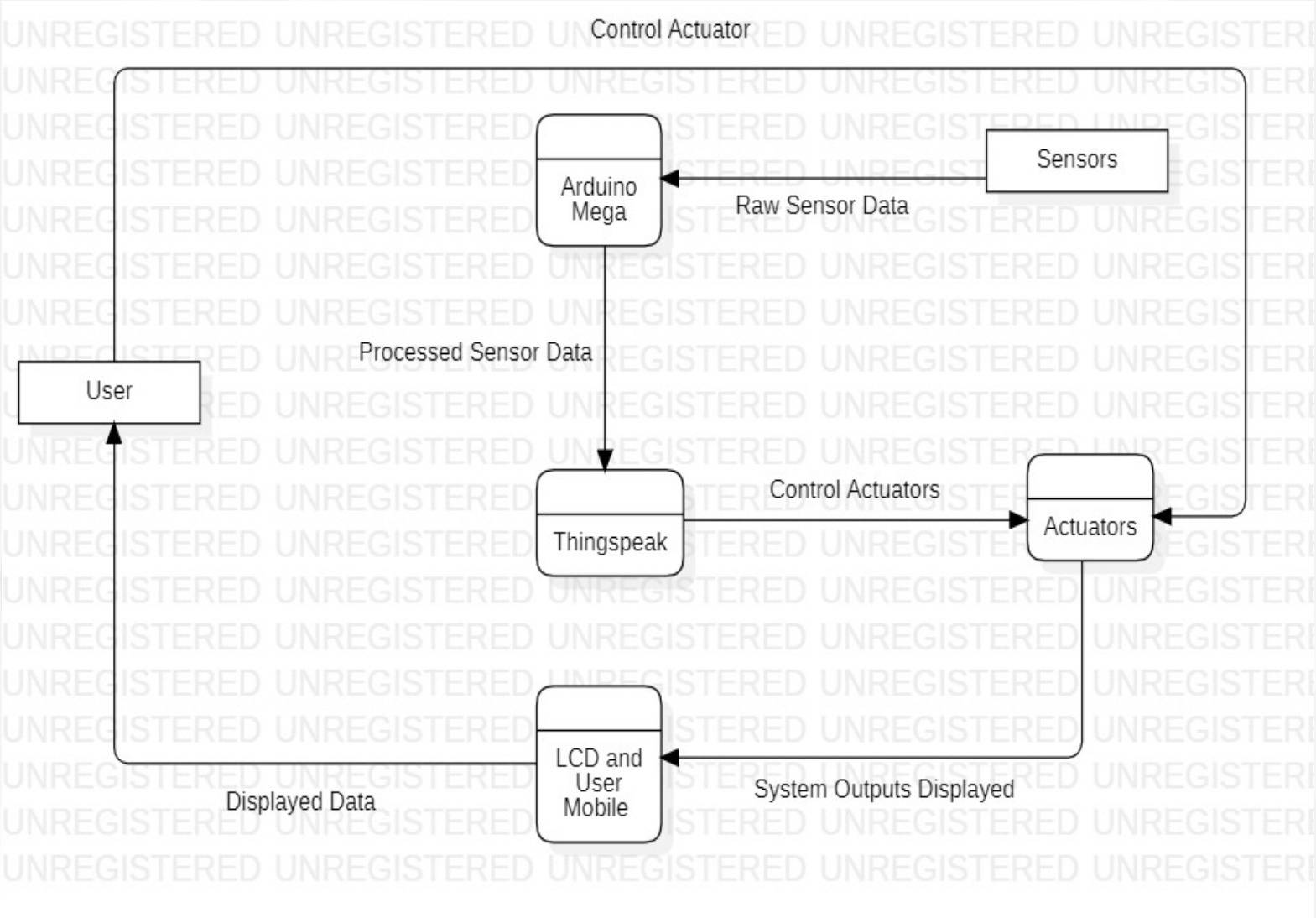

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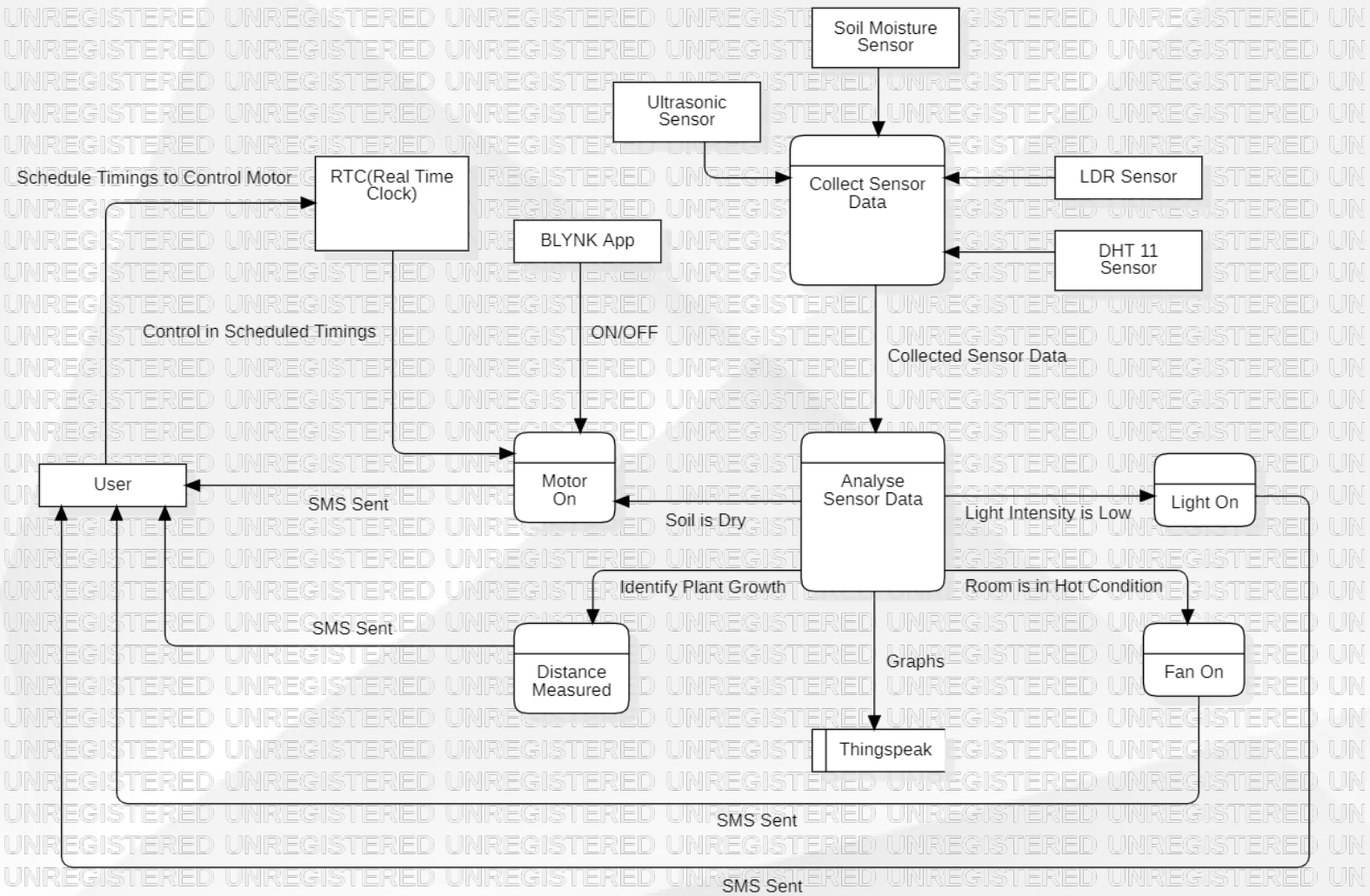

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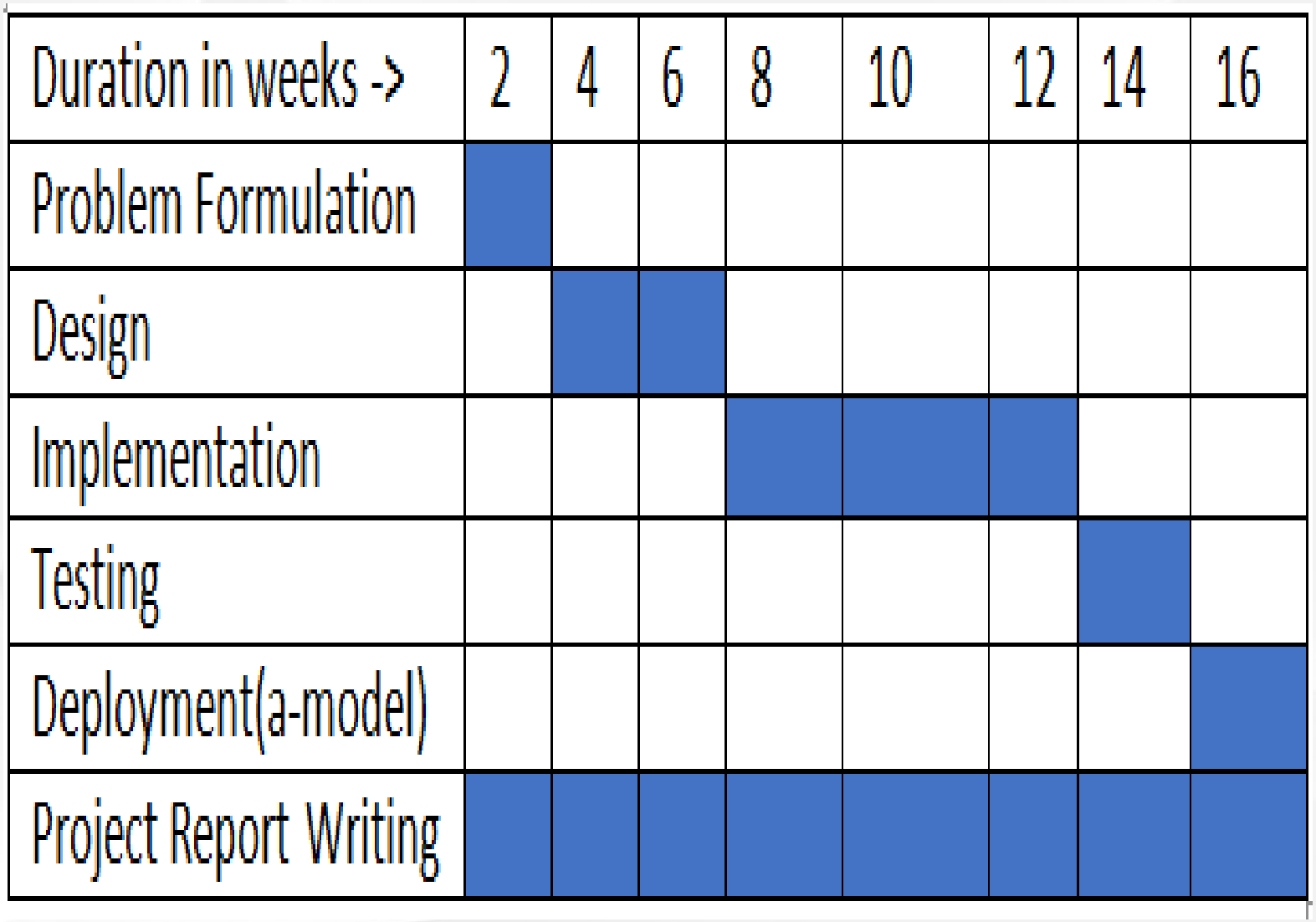
Duration in weeks ->
2
4
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14
16
Problem Formulation
Design
Implementation
Testing
Deployment(a-model)
Project Report Writing

LITERATURE SURVEY(PAPER-1)

Title, Author names	IoT based Automated Greenhouse Monitoring System: M. Danita, Blessy Mathew, Nithila Shereen, Namrata Sharon, and J. John Paul
Abstract	In this system sensors are used to monitor temperature and humidity. The system activates actuators if the actual values are more than the threshold values and stores these values in the cloud database, enabling them to be accessed from anywhere, anytime. The system also provides automatic control over the climatic conditions inside the greenhouse, making it easier to grow different seasonal crops under certain conditions.
Objective	The main objective is to design and implement an IoT based Automated Greenhouse Monitoring System that can monitor and control the temperature, humidity, and moisture levels inside a greenhouse automatically.

Conclusion	The conclusion of the paper is that the proposed system is a viable solution for automating greenhouse monitoring and control, and can provide several benefits such as improved crop yields, reduced labor costs, and optimized resource usage. The authors also note that the system can be easily customized and expanded to meet the specific requirements of different greenhouse operations.
Result	The results of the paper demonstrate the successful implementation of the proposed system in a greenhouse setting, with accurate monitoring and control of environmental parameters. The system was able to collect and analyze data in real-time, and provide remote access to the greenhouse environment through a user-friendly web interface.
Limitations	Limited Sensor Options and High Cost

LITERATURE SURVEY(PAPER-2)

Title, Author names	Green House Monitoring and Control System Using IoT: Sharvari Dandekar, Ravindra Burriwar, Ambarish Deshpande, and Mrs. Archana Khandait.
Abstract	The paper aims to address the challenges faced in agriculture by developing a system that enables the increase in crops being cultivated all year round in the comfort of a small space like home and also reduces human interaction in a small-scale greenhouse environment. The paper highlights the advantages of this system over existing systems by reducing power consumption, maintenance, and complexity.
Objective	The objective of this paper is to present a greenhouse monitoring and control system using IoT technology. The system acquires data on temperature, humidity, and soil moisture from the field, logs it in a database, and uses it for supervisory control. The paper also highlights the advantages of this system over existing systems by reducing power consumption, maintenance, and complexity.

Conclusion	The system using IoT can help increase the efficiency and productivity of greenhouse farming by providing real-time monitoring and control of environmental parameters. The system can also help reduce human intervention and minimize losses due to unfavorable environmental conditions.
Result	The collected data was visualized on a web-based dashboard for easy monitoring and analysis. The system also provided control over the greenhouse environment by controlling devices such as fans and water pumps through the cloud server.
Limitations	By using ATmega8A the system performance, pin count, and memory are Limited.

PROPOSED SYSTEM

The proposed system is an IoT-based greenhouse monitoring and controlling system that automates the monitoring of various environmental parameters using sensors and a microcontroller. It sends alerts to the user's mobile phone if any parameter exceeds the specified threshold and enables the automation of tasks through a real-time clock i.e this user can schedule the timings of the water pump to on/off. The Blynk application allows for the control and monitoring of the soil moisture sensor, while ThingSpeak provides real-time graphical representations of the data. Overall, the proposed system offers a more efficient and accurate approach to greenhouse monitoring compared to existing manual methods.

HARDWARE REQUIREMENTS

- Arduino Mega Board
- Node MCU
- DHT11 Sensor
- LDR Sensor
- Soil Moisture Sensor
- Ultrasonic Sensor
- DC Motor
- Cooling Fan
- LEDs
- GSM Module
- RTC
- Relay

MICROCONTROLLERS USED

Both NodeMCU and Arduino Mega are used in this IoT-based greenhouse monitoring and controlling system. NodeMCU is a better choice due to its built-in Wi-Fi support, on the other hand the project requires a large number of sensors and actuators, so the Arduino Mega may be a better choice due to its increased I/O capabilities.

MONITORING SYSTEM

Inside this system, all the sensors are used, combined collect the data from different type of sensors like (DHT11 for temperature measurement and humidity measurement sensor, soil moisture reading sensor, and LDR-light sensor, Ultrasonic Sensor) with the help of sensors and we provide signals to the system module NodeMCU and after processing the collected data the output of the module is used for controlling these parameters. The information about the sensors used in the system are as follows-:

- **Temperature and Humidity Sensor:** With the help of these sensors, we can measure the inside temperature of greenhouse.DHT11 sensors are widely used because of giving serialized digital signals outputs of the measuring parameters.
- **Soil Moisture Sensor:** In this model the material being the soil with varying amounts of water content in it.
- **LDR Sensor:**The Light detecting sensor is nothing but a resistor without any polarity The sensor(LDR) is made up of Cadmium Sulfide (CdS) because of that the resistance becomes inversely proportional to the amount of sunlight or any other artificial light falling on it.
- **Ultrasonic Sensor:** An ultrasonic sensor is a device that uses ultrasonic waves to measure distances to objects

CONTROLLING SYSTEM

- **Temperature and Humidity control system:** For maintaining the temperature in greenhouse ventilating is useful.Ventilating with fan helps us double by allowing fresh and cool air inside and exhaust hot air outside the room. this system works all weather conditions.
- **Soil Moisture Control System:**For controlling the soil moisture we used a different type of irrigation technique to provide water to the field in the greenhouse. Whenever the soil moisture sensor measures the water content present in the soil is below the desired level of water. Then the motors are automatically switch on to fulfill the water needs up to a sufficient level.
- **Light Controlling System:** In this system artificial lights are used for growing plants in these artificial lights can be used in both the purposes for regulating the photoperiod of plants and maintaining and controlling the temperature inside the greenhouse.

SOFTWARE REQUIREMENTS

- Arduino Integrated Development Environment
- BLYNK App
- Thingspeak

ARDUINO IDE

Arduino is a popular microcontroller platform that is often used in Internet of Things (IoT) projects, including greenhouse monitoring and control systems. The Arduino IDE (Integrated Development Environment) is a software application that is used to write, compile, and upload code to the Arduino board in C and C++ programming language. In an IoT-based greenhouse monitoring and controlling system, the Arduino IDE can be used to program the microcontroller to perform various tasks, such as collecting sensor data, controlling actuators, and communicating with other devices.
examples of how the Arduino IDE can be used in an IoT-based greenhouse monitoring and control system:

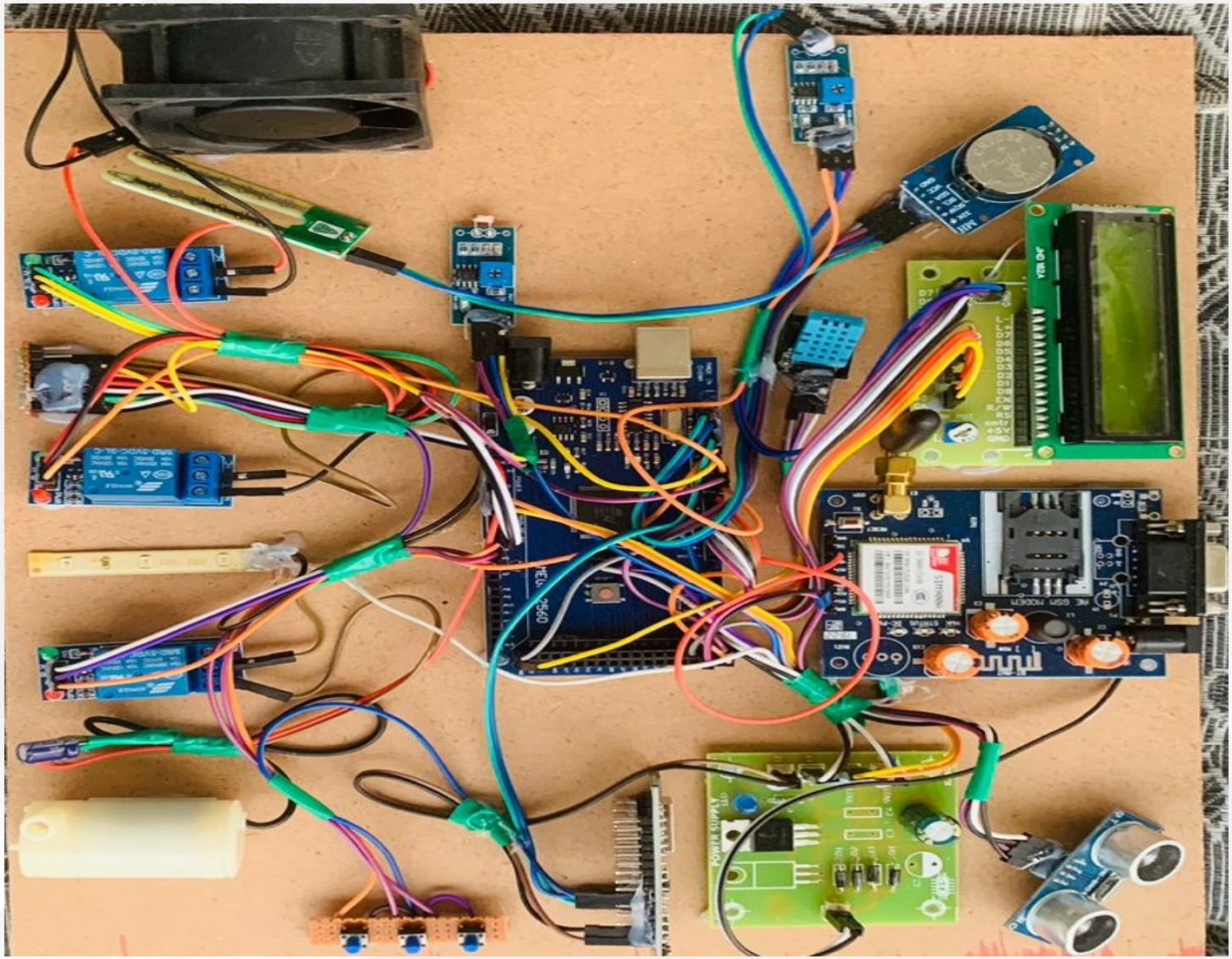
1. Collecting sensor data
2. Controlling actuators
3. Communicating with other devices

BLYNK APP

- The Blynk app is a mobile application that allows users to control and monitor their IoT devices remotely. In an IoT-based greenhouse monitoring and controlling system, the Blynk app can be used to provide a user interface for controlling various parameters such as temperature, humidity, light, and water level.
- Using the Blynk app, the user can view real-time data from the sensors and control the actuators (such as fans, heaters, or water pumps) to adjust the conditions inside the greenhouse.
- The Blynk app can be integrated with an Arduino or ESP8266-based microcontroller board, which communicates with the sensors and actuators inside the greenhouse.
- The app can be downloaded from the App Store or Google Play Store and can be used on both Android and iOS devices.

- Using ThingSpeak, the data from the sensors such as temperature, humidity, and light can be collected and analyzed to identify patterns or trends in the data. The data can be displayed in graphical or tabular form, allowing the user to monitor the conditions in the greenhouse over time.
- ThingSpeak can be integrated with an Arduino or ESP8266-based microcontroller board, which communicates with the sensors and actuators in the greenhouse. The data is sent to the ThingSpeak server using HTTP or MQTT protocol. The platform is accessible through a web browser, and it offers various APIs and interfaces that allow users to build custom applications or integrate with other services.

EXPERIMENTAL RESULTS



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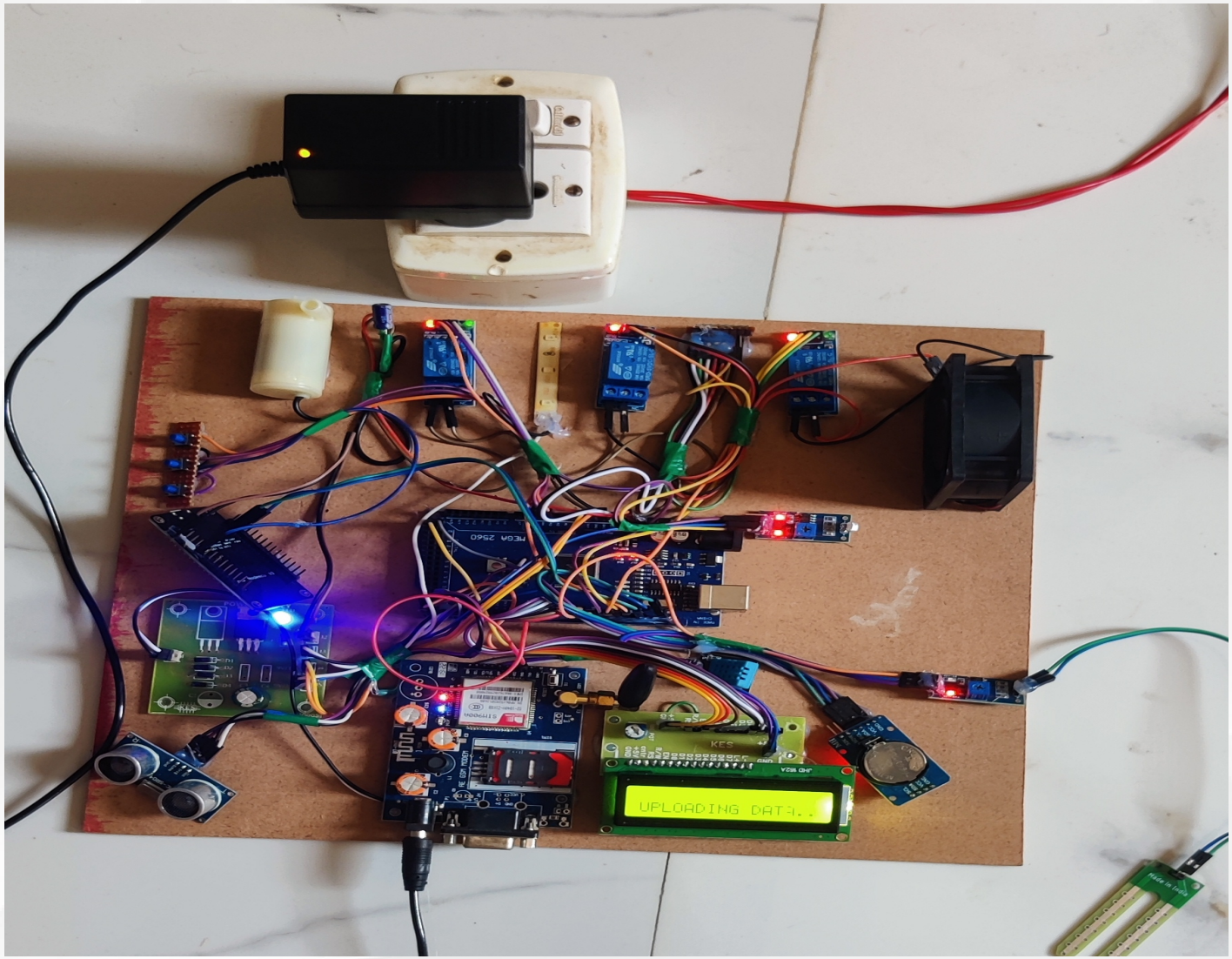

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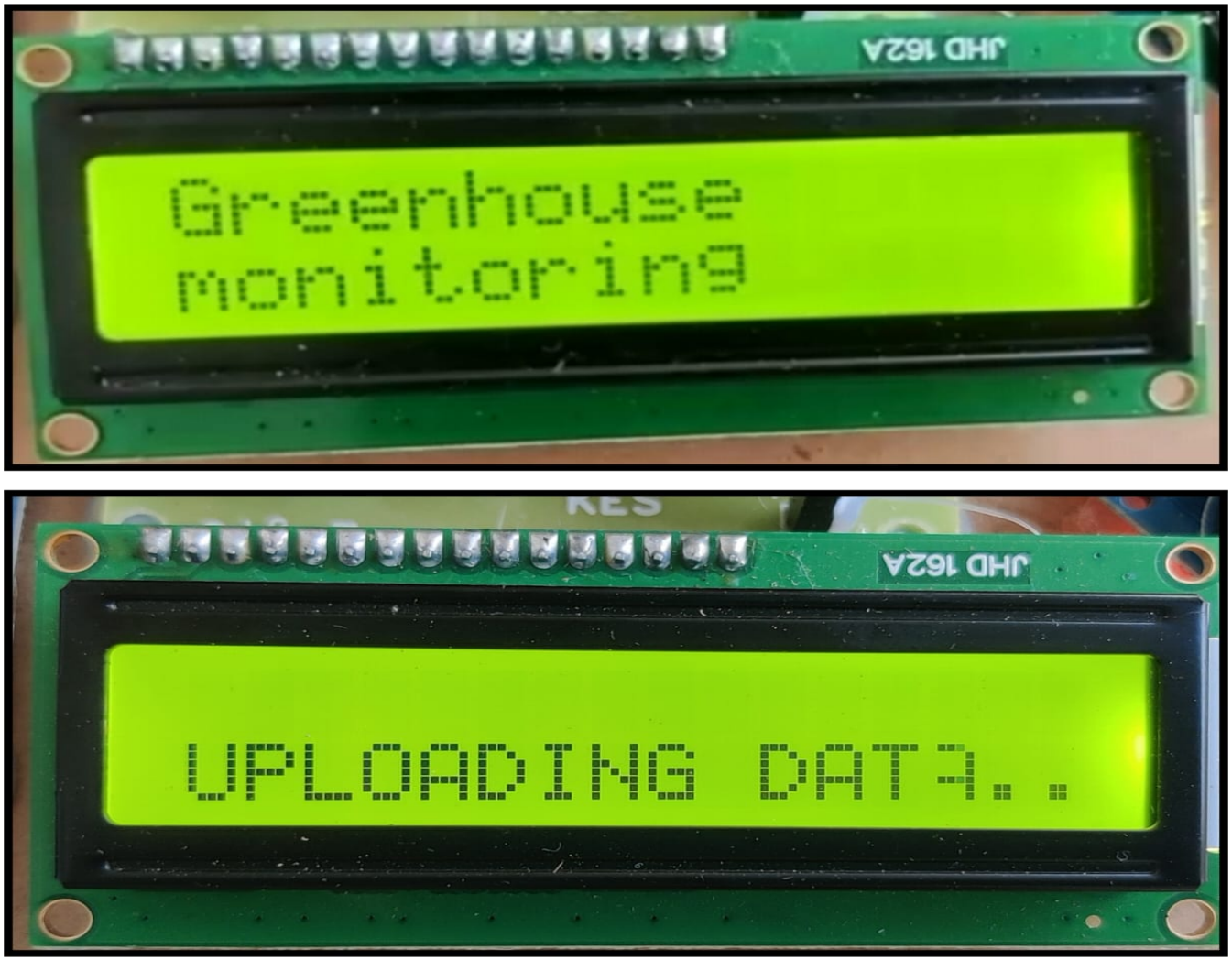

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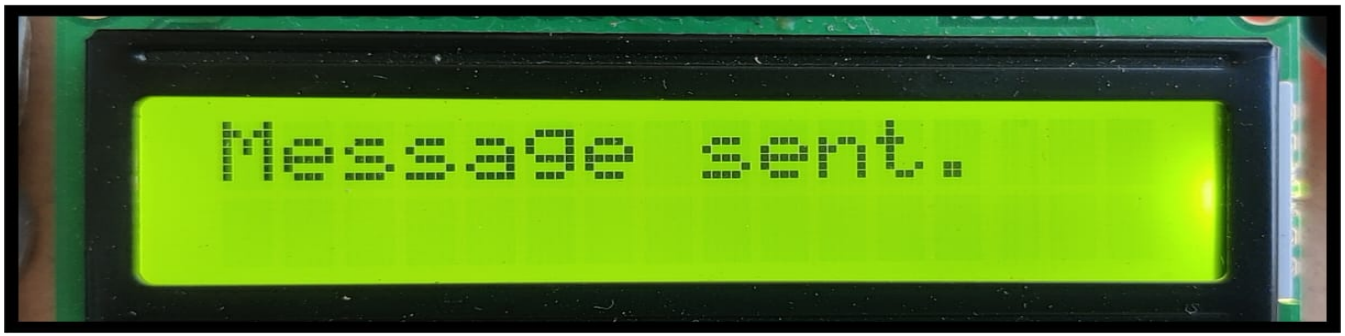

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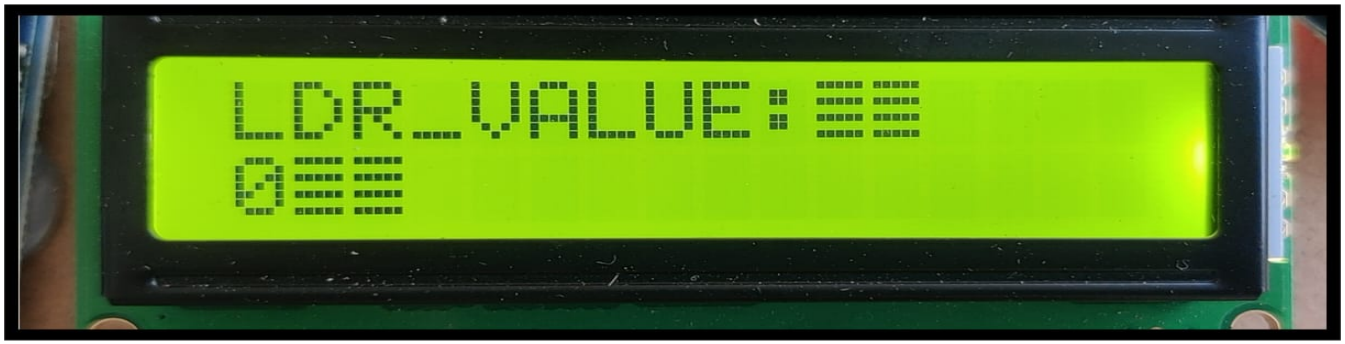

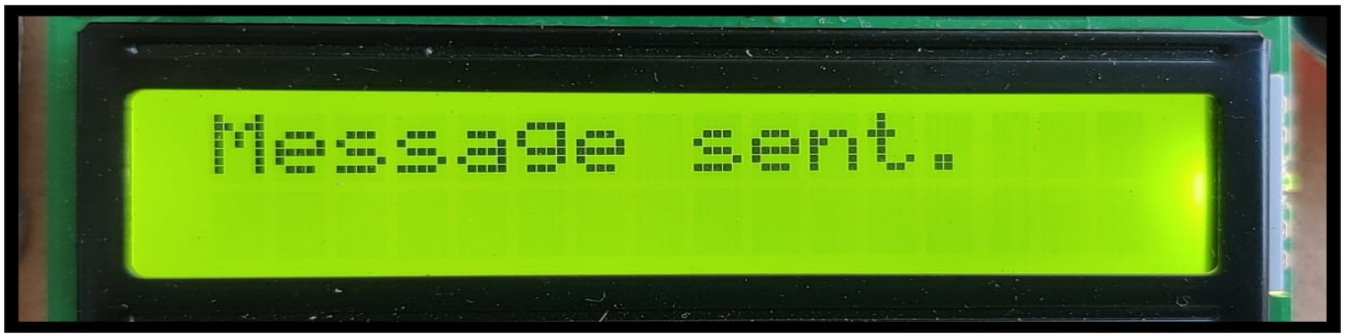

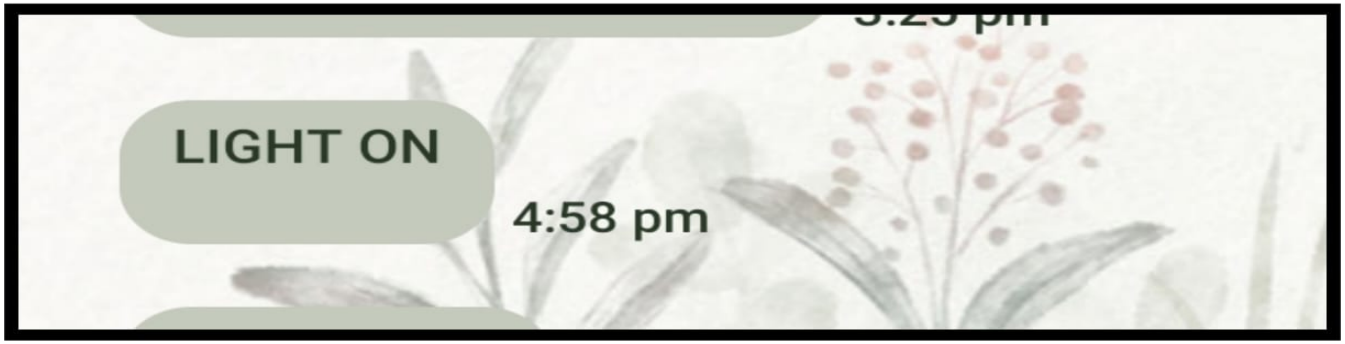

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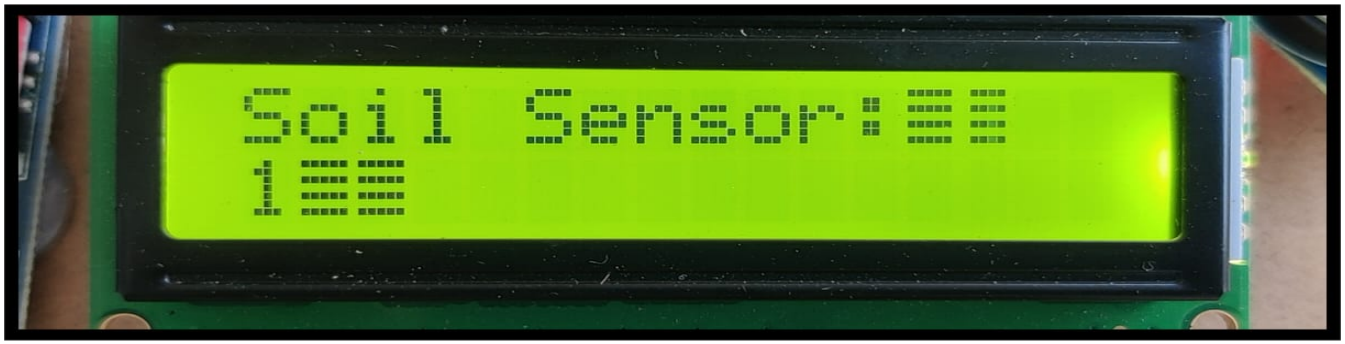

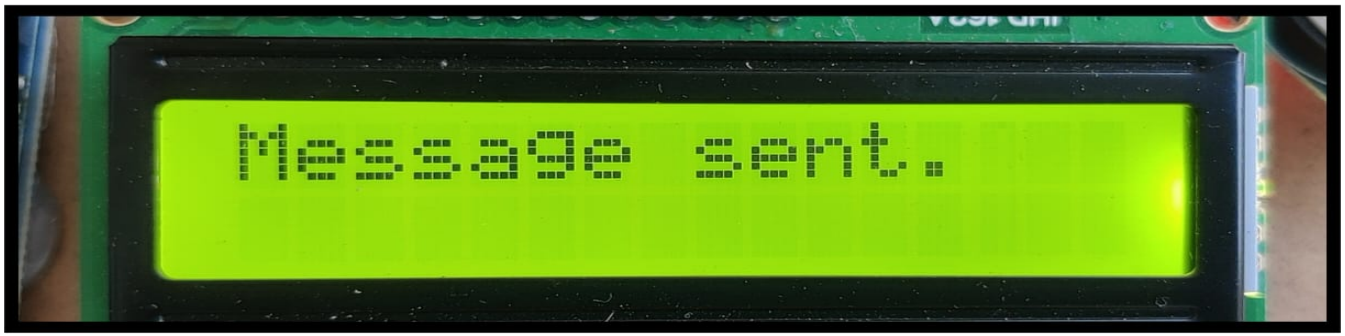

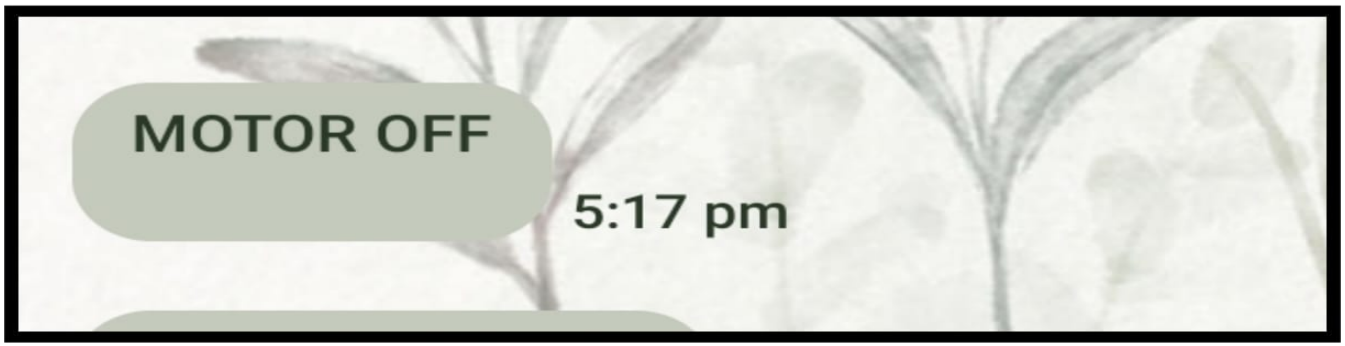

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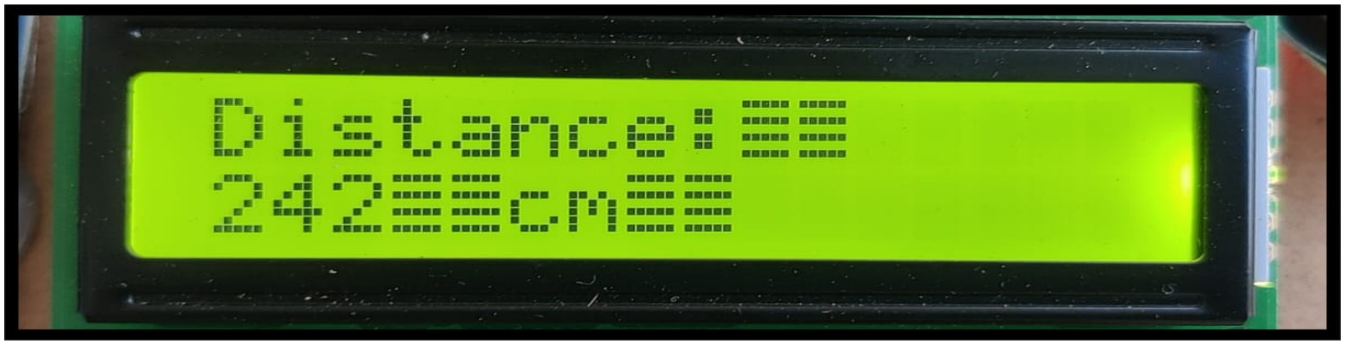

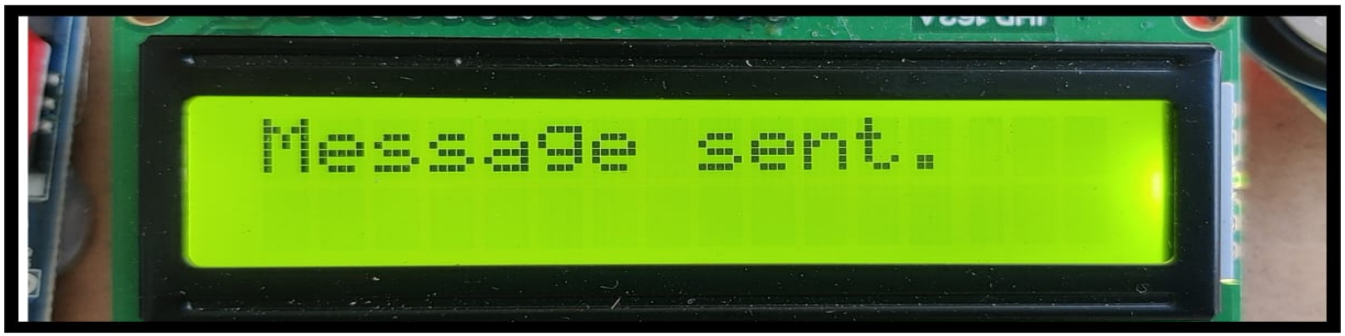

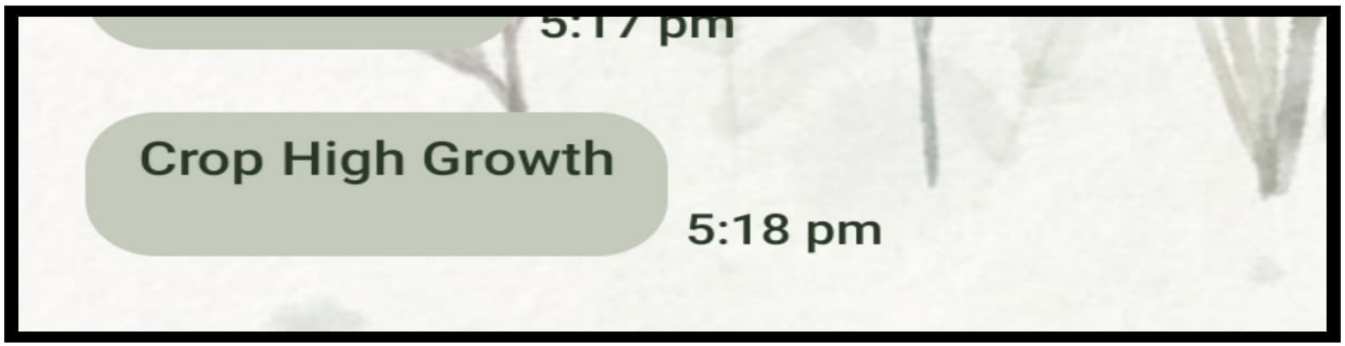

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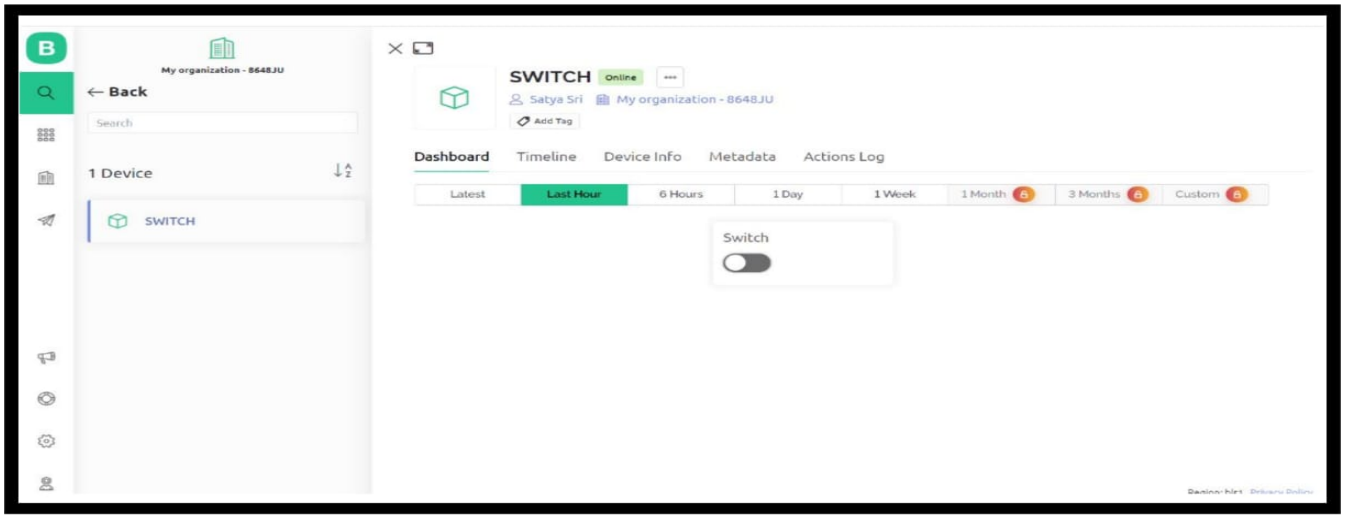

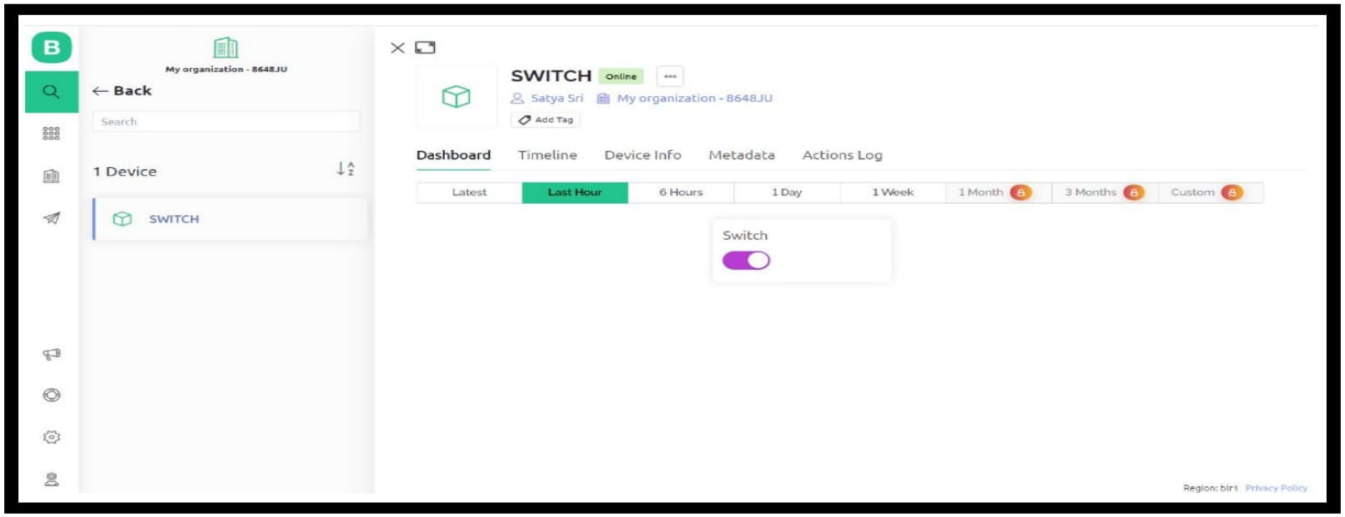

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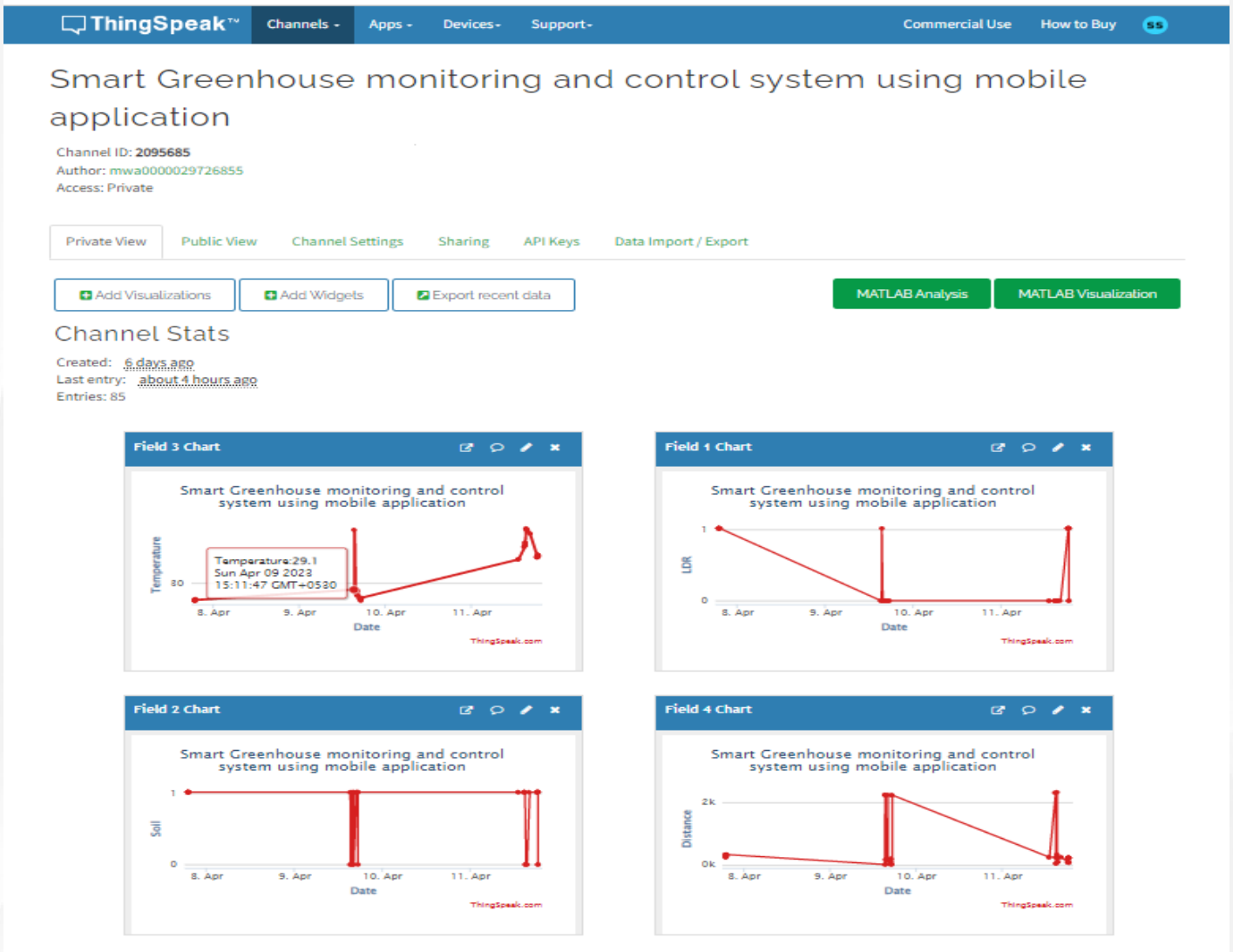

CONTRIBUTION OF THE CANDIDATE

Project Associate (PA)	Problem Formulation	Design	Implementation	Testing	Deployment	Project Report Writing
PA1 19K61A1216	Yes	Yes	Yes	Yes	Yes	Yes
PA2 19K61A1239	Yes	Yes	Yes	Yes	Yes	Yes
PA3 19K61A1255	Yes	Yes	Yes	Yes	Yes	Yes
PA4 19K61A1249	Yes	Yes	Yes	Yes	Yes	Yes

COMPARISION WITH EXISTING SYSTEM

In existing systems they used different kind of modules like Fuzzy Logic, Zigbee module, Arduino UNO, Raspberry pi but in this IoT based greenhouse monitoring and controlling system Arduino Mega is used because

- More I/O pins
- More memory
- More processing power
- Real-time performance
- Lower cost
- Ease of use

CONCLUSION

IoT-based greenhouse monitoring and controlling system that aims to provide automated control and monitoring of environmental parameters such as temperature, humidity, light, soil moisture, and plant growth. The system uses various sensors to collect data and sends it to a microcontroller, which then processes and analyzes the data. The microcontroller also sends alerts to the user's mobile phone via a GSM module if any parameter exceeds the specified threshold. The soil moisture sensor is controlled and monitored through a Blynk application and The system also features a real-time clock (RTC) and a relay module that allows for the automation of tasks such as controlling the water pumping motor provides real-time graphical representations of the data through ThingSpeak.

FUTURE SCOPE

- The system can be made more sustainable by integrating solar panels to power the system, reducing the reliance on grid power.
- Automated nutrient delivery systems can be added to the system to ensure that the plants receive the required nutrients at the right time.
- Machine learning algorithms can be integrated into the system to analyze the collected data and provide predictive insights. This can help in optimizing the growth of plants and reducing energy consumption.

REFERENCES

[1] https://www.ijera.com/papers/Vol5_issue10/Part%20-%203/F51033541.pdf

[2] https://www.sciencedirect.com/science/article/pii/S187705091731709X

[3] https://ieeexplore.ieee.org/document/8342795

[4] https://ieeexplore.ieee.org/document/7384072

[5] https://ieeexplore.ieee.org/document/5565120

ANY QUERIES?

THANK YOU