Remote Measurement and Control system for Green house based on GMS -SMS

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Abstract

In agriculture, the need for precise Greenhouse monitoring and control to overcome the variable climate is undeniable. This research project delves deep into the core of this challenge, exploring the potential of GSM technology and embarking on the journey of Software to revolutionize greenhouse management. The work's primary goal is to ensure greenhouse internal parameters are suitable for plants. We noticed that the resources are wasted and the plants don't grow well. That's why technology like GSM bridges plant growth by developing a remote measurement and control system for the greenhouse. To tackle the challenge, we employ a set of methods, including different sensors to monitor temperature, humidity, light and soil moisture, integrating GSM to Send SMS. The data collected by these sensors allows the SMS to control irrigation ventilation via SMS Command.

Introduction

As the world faces increasing climate variability and resource shortage, the need for Precise greenhouse has become crucial. These enclosed structures enable farmers to control over crucial environmental parameters like including temperature, humidity, light intensity and soil conditions, fostering optimal plant growth. The efficient management of greenhouse demands Continuous monitoring which can be challenging when operations are remoted. We delve into the development, implementation of a remote measurement and control system for greenhouse. Our methodology Combines the édge technology and sensor integration. We utilized GSM technology for communication, allowing sensor data to be transmitted by SMS to a single or Multiple numbers for accessibility. Users Can also send SMS commands for remote control. Data visualization on the Thing speak Platform achieved through cellular Technology presents real-time sensor information with graphical charts. An automation system makes decisions based on sensor data and Arduino UNO with GSM technology.

Methodology
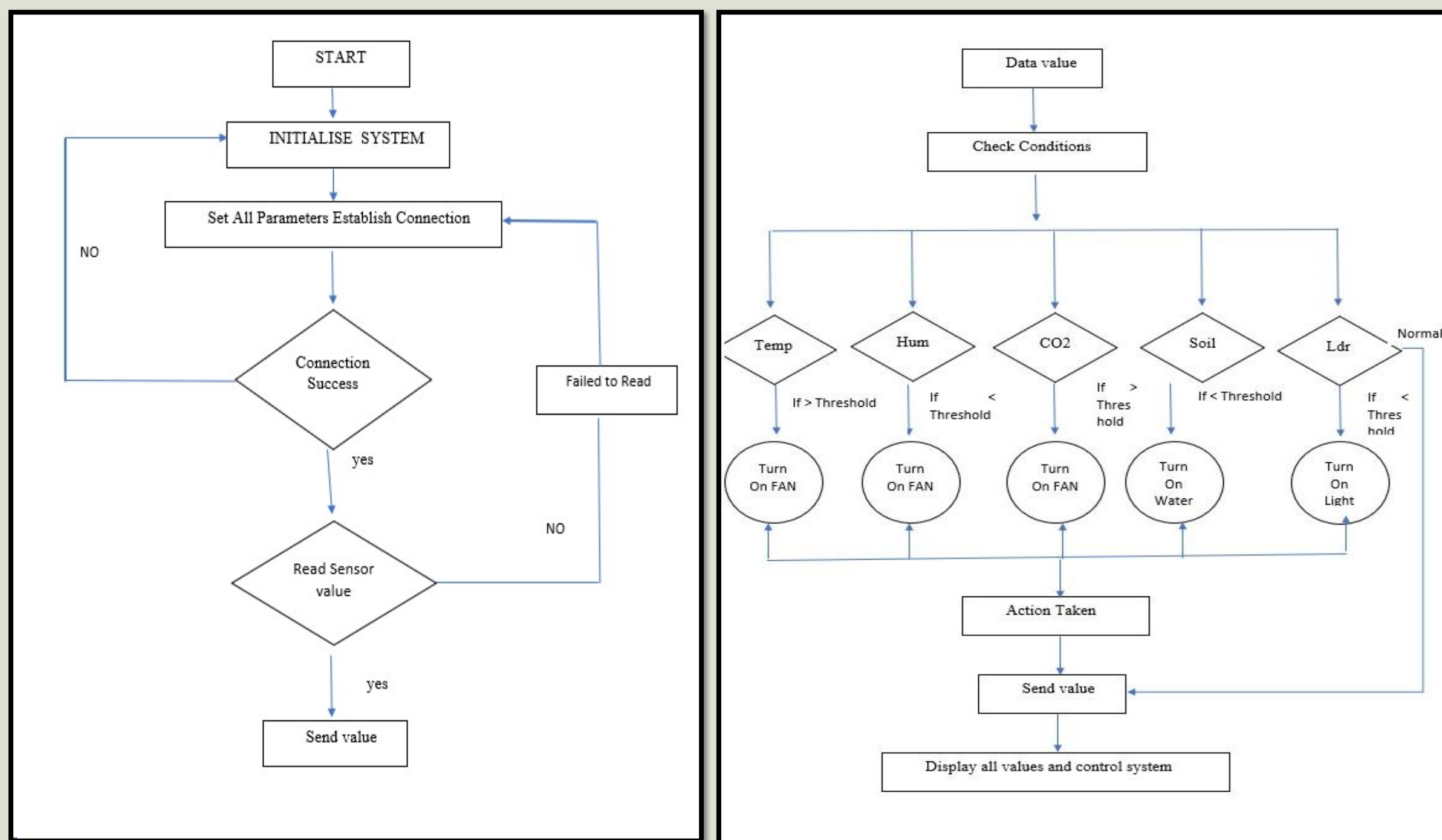
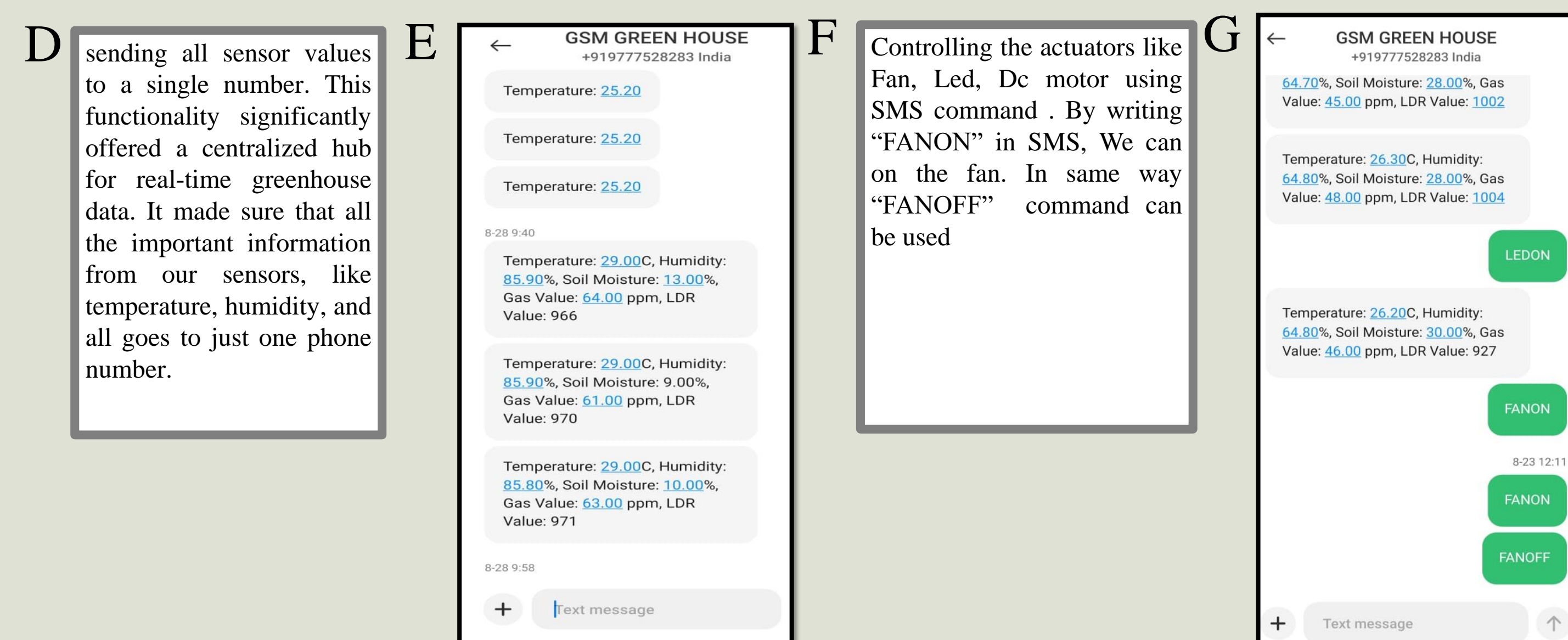- Flow chart contains two parts, sensing and control with condition part .
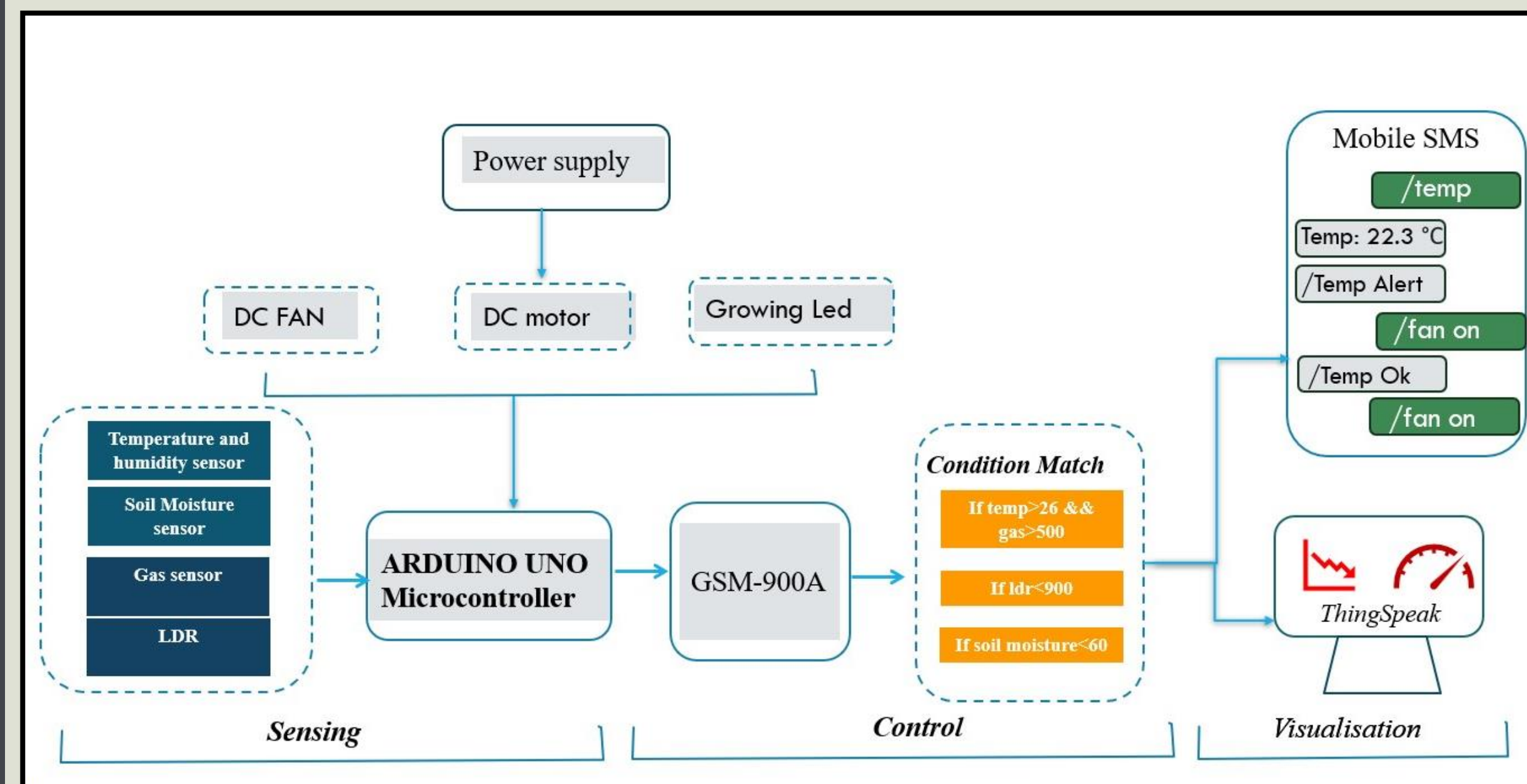
- Block Diagram contains the sensing, control and visualization part.

Results and Discussion

- **An effective way of monitoring and managing greenhouse conditions is by combining**
  - **Sending all sensors value to mobile device**
  - **Applying Conditions with function of actuators**
  - **Control system using SMS having threshold value**
  - **SMS to Single Number**
  - **SMS to multiple Number**
  - **Visualization Through Thingspeak**
  - **Fetching real data in CSV format**

Sending Sensors value through SMS and controlling

D — sending all sensor values to a single number. This functionality significantly offered a centralized hub for real-time greenhouse data. It made sure that all the important information from our sensors, like temperature, humidity, and all goes to just one phone number.

F — Controlling the actuators like Fan, Led, Dc motor using SMS command . By writing "FANON" in SMS, We can on the fan. In same way "FANOFF" command can be used

- If the temperature is greater than the set temperature, the DC FAN is turned on
- If the light intensity is lower than the set light intensity, the light is turned on
- If the humidity is lower than the set humidity, the Fan is turned on
- If the soil moisture is lower than the set soil moisture, the Pump is turned on to
- If the CO_2 level is greater than the set CO_2 level, the DC Fan is turned on to provide ventilation.

Visualization through Thing Speak using Cellular IOT
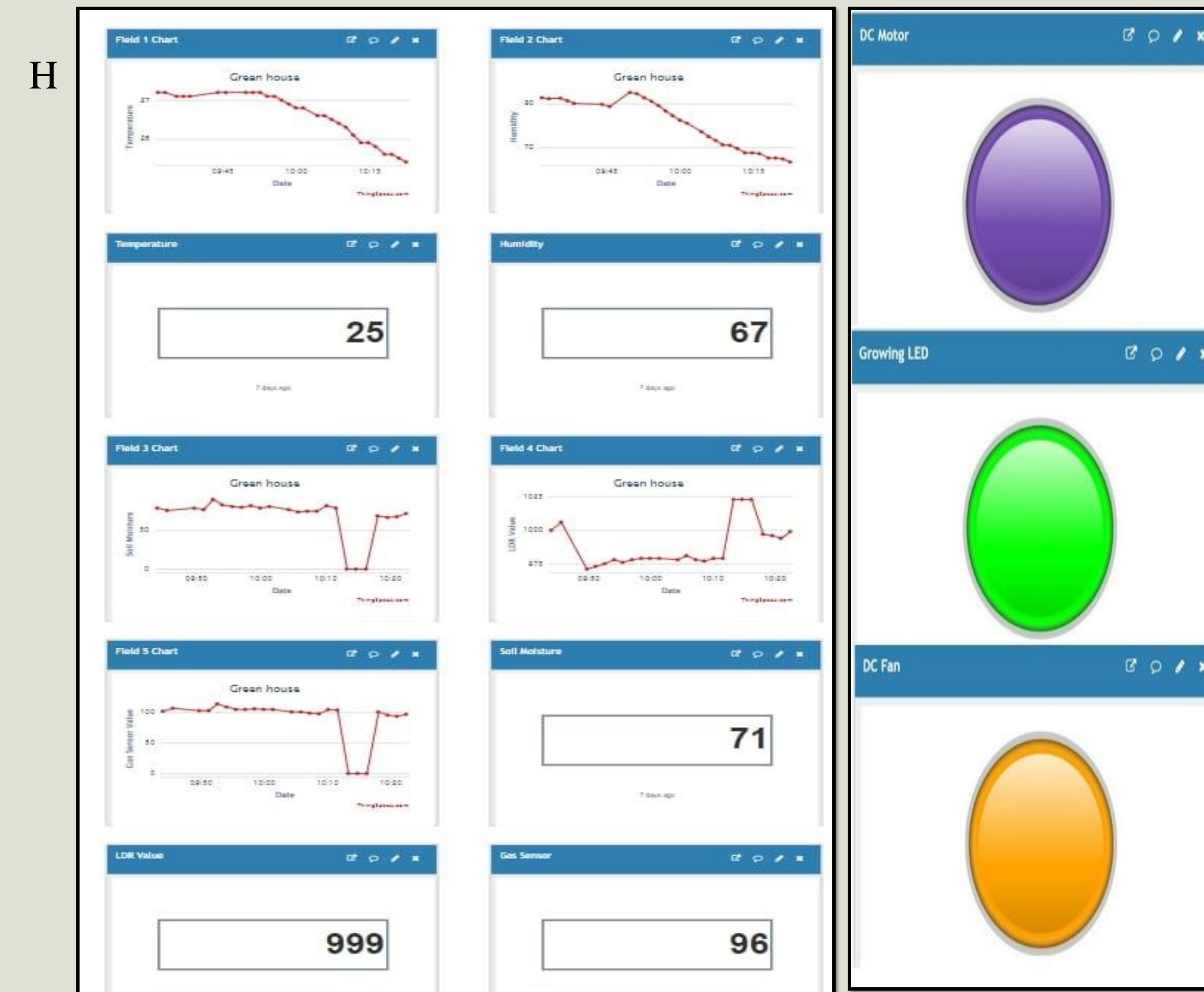
Visualizing data through Thing Speak using cellular technology takes our greenhouse management to the next level. We not only receive sensor data on our phones but also have the advantage of a web-based platform. Thing Speak allows us to create graphs and charts, making it easier to spot patterns and make informed decisions.

Sending SMS to multiple numbers and exporting data as CSV format
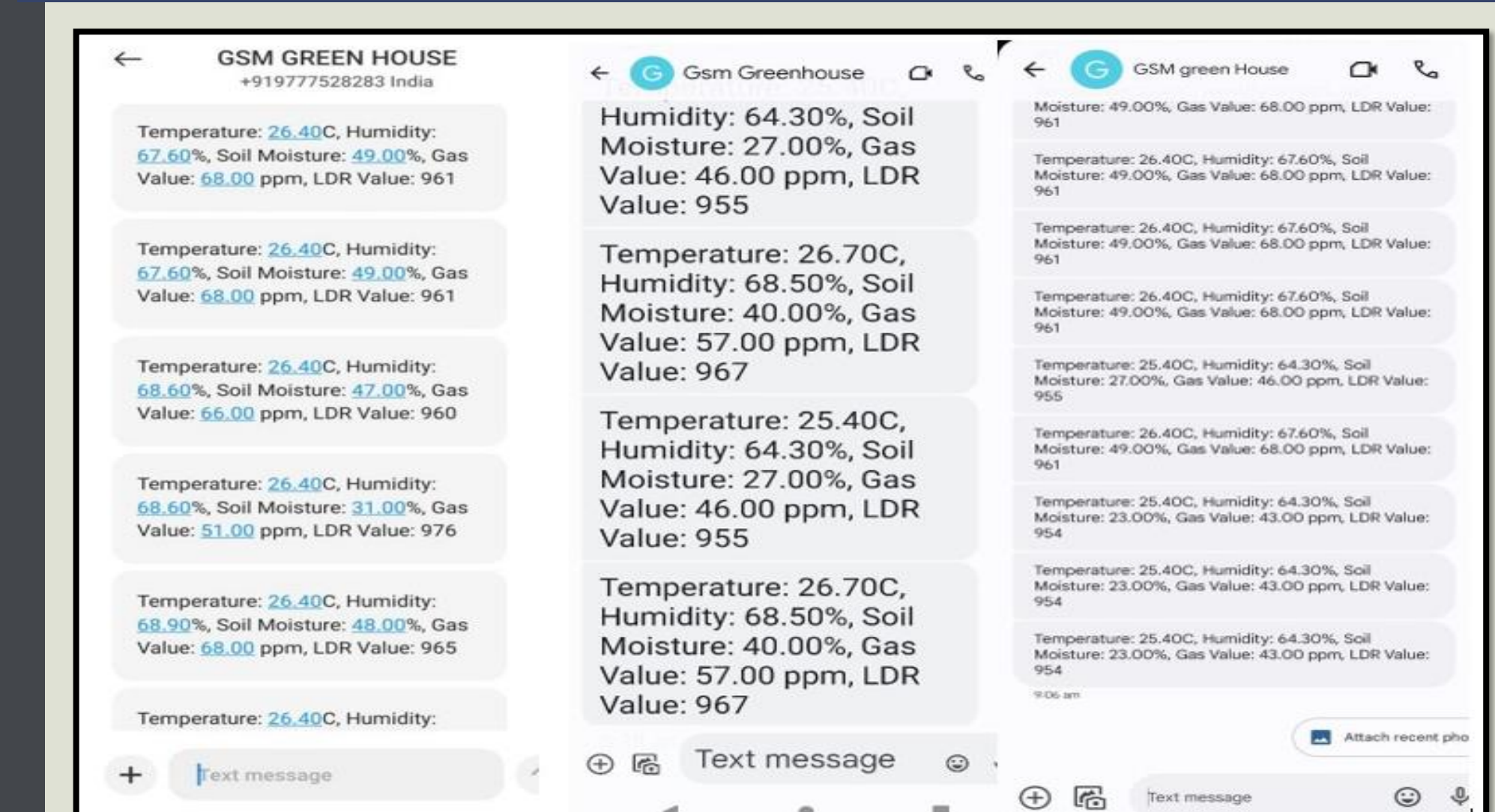
Instead of just sending sensor updates to one phone number, we made it possible to send them to multiple numbers. This means that not just one person, but a whole team or group of people can stay informed about the greenhouse conditions.

Integration of Thing Speak for data visualization provided a valuable tool for exporting data in CSV format which helps to fetch real time data . This data can be used for different machine learning prediction.

Conclusions

- This work has introduced an innovative remote measurement and control system for greenhouses using GSM technology and cellular communication.
- This system offers the agricultural sector a powerful tool for enhancing crop productivity, quality, and sustainability while reducing resource wastage and labour.
- Implementing these features demonstrates the potential for advanced farming practices, ensuring that greenhouses remain good for optimal plant growth and contributing to a more efficient farming future.

Future Scope

- Developing a mobile application will allow users to monitor and control the greenhouse directly from their smartphones.
- To make the system more energy-efficient and sustainable, integrating solar panels to power sensors, actuators, and communication modules.
- implementation of smart devices and sensors that can autonomously enter a low-power or sleep mode when not actively collecting or transmitting data.
- Additionally, incorporating voice or email alerts alongside SMS notifications can offer users multiple communication options.

Reference

[1] Gandhi, Vedant, Aditi Sardar, Paridhee Wani, Rakesh Borase, and Jayanand Gawande, "IOT Based Wireless Data Technology Using LORA and GSM." In *ITM Web of Conferences*, vol.44, p. 01006. EDP Sciences, 2022.
[2] Cristea, Mario, Mihai Gabriel MATACHE, Claudia IONIŢĂ, Lucian Andrei PERIŞOARĂ, Robert Dorin CRISTEA, And Vlad Nicolae ARSENOAIA, "GSM WiFi MOBILE COMMUNICATION SYSTEM FOR AGRICULTURAL VEHICLES." *INMATEH-Agricultural Engineering* 67, no. 2, 2022.
[3] Jena S.P., Pradhan S. K., "Wireless Temperature Humidity Monitoring Controlling and Analysis of Multiple Room", *Indian Journal of Natural Science*, 10(60), 2318-23423, 2020.
[4] Jena S.P., Biswal P, Singh D., Nayak, P., Pradhan, S. K., "Remote Monitoring Controlling and Automation of Protected Environment Cultivation", *Indian Journal of Natural Sciences*, 10 (60), 23319-23326, 2020.