



Smart Commercial Greenhouse

Team: khaled alzahrani(COE), Ahmed Alosif(COE), Abdulaziz Abu Awwah(ISE), Mohammed Bawazeer(ISE), Hassan Obaid(EE), Hassan Durais(EE).

Coach : DR. Akram F. Ahmed.



GoGreen

introduction

The Smart Greenhouse merges solar power, hydroponics, IoT for efficient, sustainable farming with a mobile app for assisting and monitoring.

Problem Statement

Saudi Arabia, dealing with water scarcity, imports 70% of its food. Smart Greenhouses could help increase local production and reduce imports.

Constraints

- 1- Budget: 6,000 SAR.
- 2- 12-volt system for electronics.
- 3- Server uptime: 99.99%+.
- 4- Internet: 4G bandwidth minimum.
- 5- No real-time image processing in hardware.

Target Specifications

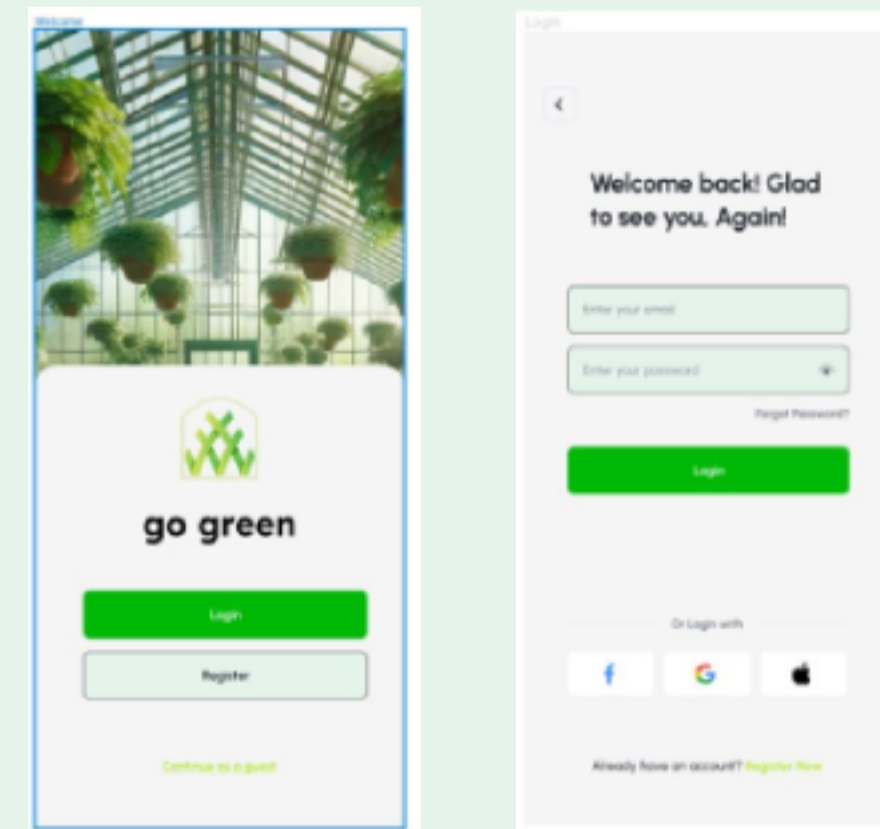
1. The task requires fewer than 5 steps.
2. App's response time <1 second.
3. Use no electricity from the grid.
4. Structure can survive up to 10 years.
5. Monitoring plants every 5 minutes.

Microcontroller

- 1- Utilized Arduino Mega and Raspberry Pi 4.
- 2- Arduino Mega: Controls temperature, humidity, light, and water in the greenhouse.
- 3- Raspberry Pi 4 provided IoT for remote control, data processing, and AI plant health monitoring.

Mobile app

- 1- Smart Greenhouse App: Offers real-time data and remote control.
- 2- Enables easy management of greenhouse settings via smartphones.



Energy Systems

The project uses sun-tracking solar panels in a greenhouse for sustainable, eco-friendly agriculture.

Structure

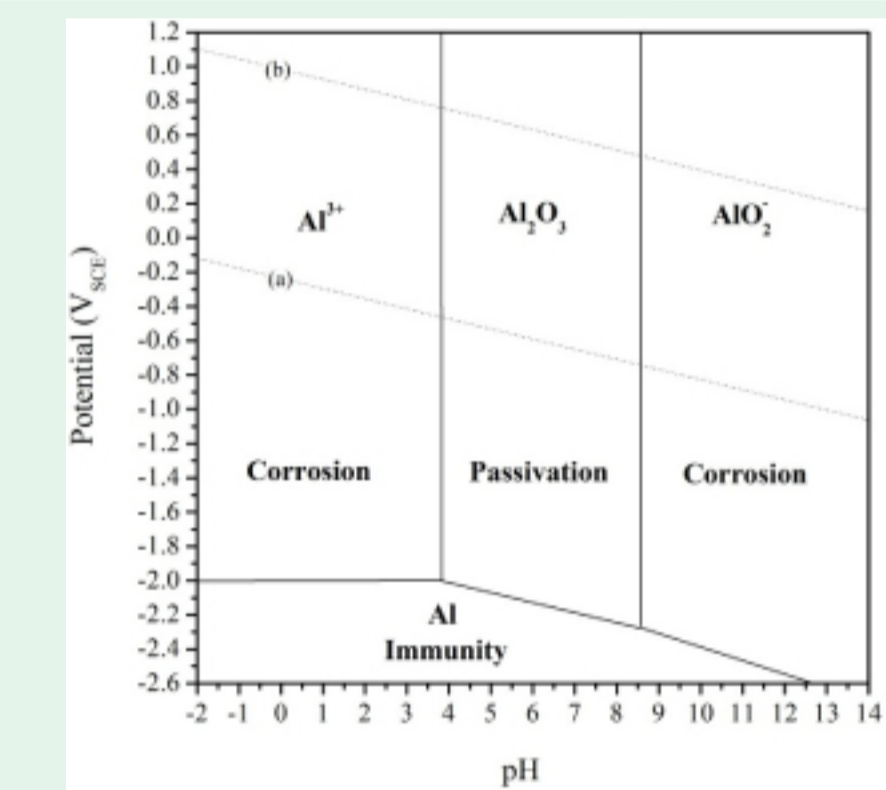
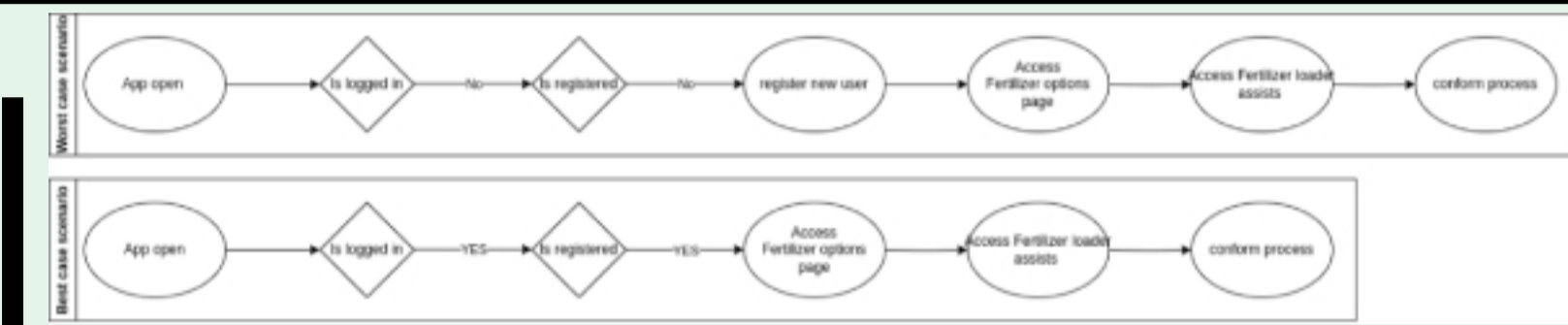
- 1- Aluminum frame.
- 2- Polycarbonate glass.
- 3- Wood for hydroponic supports.
- 4- Plastic Pipes for hydroponic.

Server

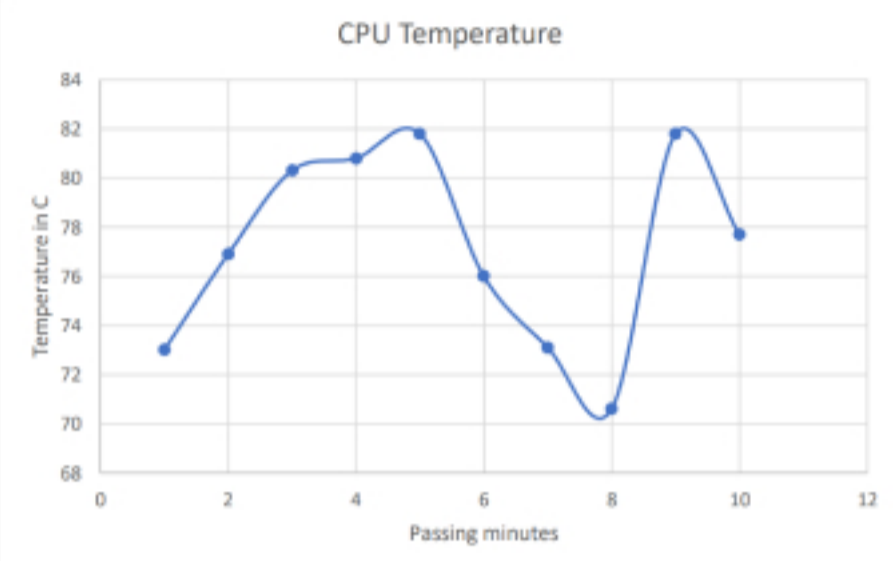
The project utilizes AWS for backend support, essential for data management, storage, and scalability.

Testing / Validation

- 1- The app meets the task performance criteria in four steps in the user journey diagram.
- 2-The app's response time meets the standard, taking only 267 milliseconds for communication and processing.
- 3- Camera Monitoring: The system reliably monitors plants every 5 minutes, as confirmed by stress test data.
- 4- Aluminum's resistance to corrosion, as shown in its Pourbaix diagram.



AWS Region Name	Region Code	Mean	Median	Min	Max	Test 1	Test 2	Test 3	Test 4	Test 5
Middle East (Bahrain)	me-south-1	114 ms	98 ms	78 ms	191 ms	90 ms	78 ms	92 ms	191 ms	110 ms



Conclusion

The Smart Commercial Greenhouse project blends sun-tracking solar panels, batteries, and IoT/AI for sustainable farming, showcasing technology's role in eco-friendly food security and future agriculture.

