Herb Chamber

SDP 21 Team 28
Simon, Nam, Duoc, Christian
Advisor: Prof. Siqueira
Problem Statement

Many people are thinking about becoming more self-sufficient and growing some of their own herbs at home but are stopped at the starting point due to many requirements they need to care for the plants. Even without a green thumb, the Herb Chamber can monitor every factor that is needed to grow a garden successfully and take care of it for you, such as soil moisture, air temperature, air humidity, lighting duration and more. Herb Chamber can send you a reminder when it is time to harvest and will allow you to see your home garden from anywhere in the world. This allows you to cross the threshold without needing to do much work yourself.
System Specifications

1. Compact indoor form that fits on most tables
   a. 4 Soil containers
   b. Compact tent enclosure 23” x 23” x 42”
2. Power supply
   a. Low cost, low power system that delivers 50W
3. IP65 water and dust resistance rating
4. Water system
   a. 1x 12V DC pump with ½ inch tubing
   b. 4x 12V DC solenoid controlled watering channel with ½ inch tubing
5. Light System
   a. Indoor grow light
6. Sensor System
   a. humidity/temperature module
   b. moisture sensor
7. Product app interface
   a. Connected with a wifi module allowing remote access
   b. Alarm notification when set harvest time is approaching
   c. Displays various measured parameters
   d. Adjustable water/light given to plants
   e. Default plant directory for optimal growth
Duoc’s CDR Deliverables

Worked with:

- DHT11 humidity and temperature Sensor
- Capacitive soil sensor
- ESP8266
- Arduino NANO

Using what I was working with for MDR, I created an app with similar uses to the one shown during the MDR demo.
Duoc’s CDR Deliverables

Using Android Studio with Java
Simon’s CDR Deliverables

- Integrating the code from the other subsystems and ensuring they work together.
- Implementing the PCB functionality on breadboard
- Arduino code to C code that can run on the ATMEGA328P chip.
Integrated System

1. Arduino and sensors
2. PCB and relays
3. ESP and Firebase realtime data
4. User’s app
Christian’s CDR Deliverables

My Deliverables include:

- Altium Research
- PCB

I will primarily be focusing on the PCB design, making sure I incorporate all the necessary components needed for our system and making sure it looks nice and clean. I will need to do a major amount of research to gain a better understanding of Altium and how I will be able to use it in our project.
Christian’s part with the PCB

- A lot of research to learn how to use Altium and how to navigate through it.
  - went through the M5 youtube series
  - went to the altium review sessions
  - google very helpful

- PCB Schematic
  - finding all the components
  - wiring everything together
  - correct values for resistors and capacitors

- PCB design
  - creating initial board
  - placement of parts
  - looks nice and clean in my opinion
PCB Schematic and Board layout
Nam’s CDR Deliverables

- **Stable power supply source**
  Added a 5V DC to DC converter
  Added diodes between power and ground channel of the solenoids

- **Arduino and ESP8266**
  Finalized the serial communication between the Arduino and ESP8266
  Successfully sending data to the cloud from the ESP through baud rate of 115200

- **DHT 11 humidity, temperature, and soil moisture sensors**
  Calibrated the sensors output and display to the cloud with a better format so they are easier to read.

- **Extra work**
  Assisted Christian with PCB Schematic and PCB layout population
  Participated in the debugging process of the working prototype
Sensors data are read from the Arduino and transmitted to ESP8266
Firebase cloud connection is then established in the ESP code
Sensors values are then converted into strings and get pushed to the cloud by Firebase.setString
**Hardware Diagram**

**Power Unit:** 12V, 5A

**Control Unit:** Arduino

**Cloud Unit:** ESP8266

**Sensors:**
Capacitive Soil Moisture
DHT11 Air Temperature and Humidity

**Relay Unit:** Controlling fans, heating pads, light, and pump solenoids
**Software Block Diagram**

- **Send Sensors Data Through Serial Communication**
  - ESP8266 NodeMCU

**Startup Program**

- Check on growing stage
  - Stay on for x hrs based on the stage status
  - Is it almost time to harvest?
    - Send notification to user through the cloud.
  - Check threshold values...
    - air: 80F
    - soil: 25%
  - Send signal to Pump/Fan/heating Relay:
    - Turn on pump
    - Turn on fans
    - Turn on heating pads

**Establish connection with the Cloud**
- (Google Firebase)
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<td>Garden Soil</td>
<td><a href="https://www.homedepot.com/p/Amaca-Gro-Model">https://www.homedepot.com/p/Amaca-Gro-Model</a></td>
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**Total:** $445.00
Demo
FPR Plan

Full Integration of both hardware and software
Consolidation of User APK
Conversion of Arduino Code to C
Fail Safe System
Finalized PCB that is populated
Nam: Team Coordinator/Upgraded System Integration & Partial App Control

Simon: Budget Lead/System & Code Integration

Duoc: Cloud Server/Application Lead

Christian: PCB Population & Debugging