Automated Indoor Nursery

Department of Electrical and Computer Engineering
University of Central Florida

Middle Term Demo
EEL4915 - Fall 2022
Group 10

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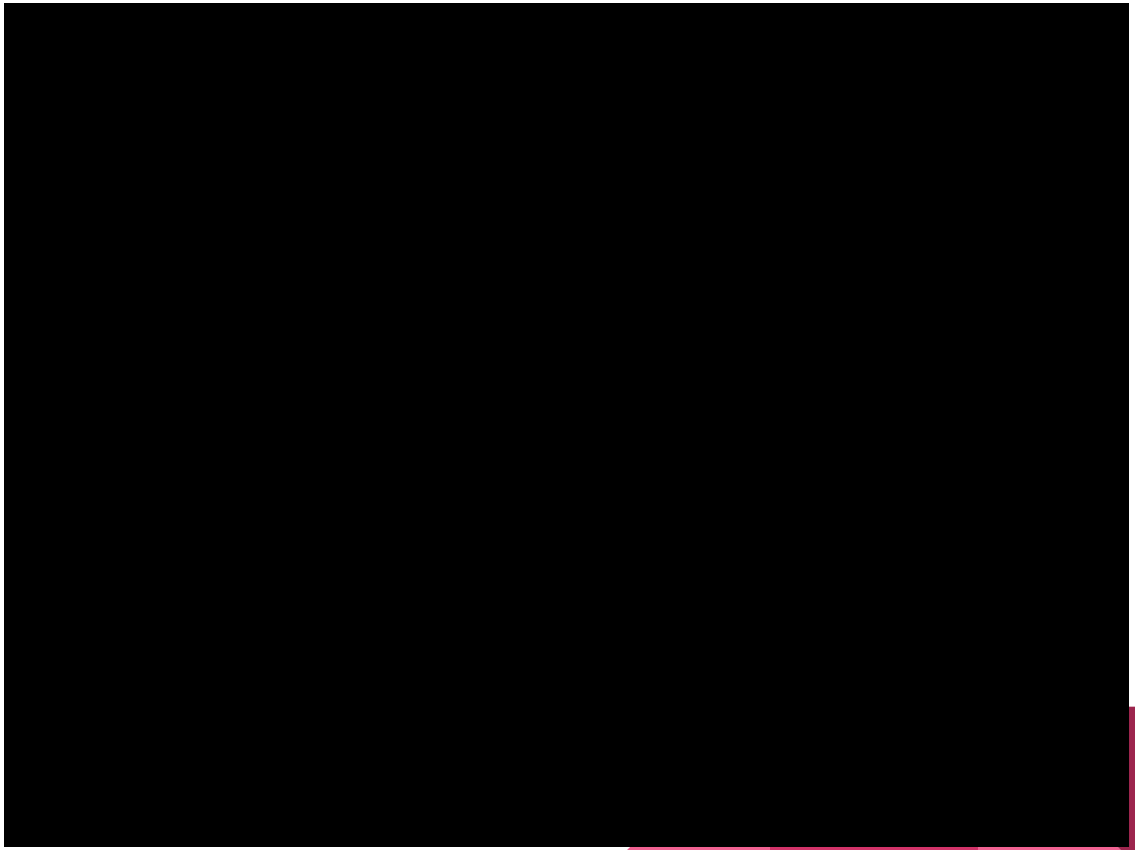
Contents

Part I. Automated Indoor Nursery Design

Basic Structure

- PVC Pipe with elbows and T-fittings
- Corrugated Sheets
- Vinyl
- Drain Pan
- Drip Irrigation System
- Pots
- Tubing



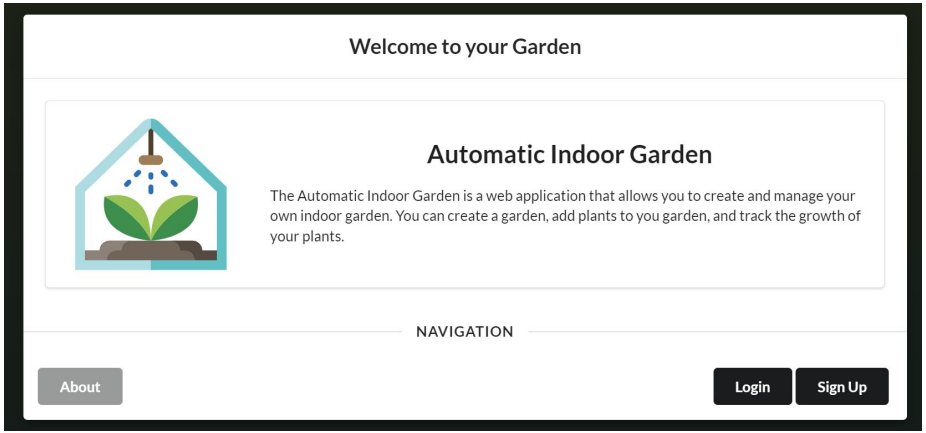
Design

- Weather shield - (Temp/pressure/humidity)
- Light sensor
- Camera module
- Water level
- pH sensor
- Wifi module

Advanced Design

- Web Application
  - MERN Stack Application
  - NoSQL Database - MongoDB
  - React Application
  - Progressive Web Application
  - Deployed through Heroku

https://automatic-indoor-garden.herokuapp.com/



Part II. Key Engineering Specifications

Market Specifications

- Weight TBD
- Size: 24” x 26” x 26” = 9.39 cubic feet
- Drain Pan: 24” x 24” with 2” depth
- Maximum input voltage = 12VDC
- Website displays necessary data

Market	Value
System must be of reasonable weight	<30 lbs
System must be of reasonable size	<10 cubic feet
System must moderate pH level	Approx. 1 degree of precision
System must hold an approximate voltage supply	Approx. 24 VDC
System must hold a reasonable power consumption	<400 Watts
System must treat segments of water to send to the herbs	2 Gallons
Software must display the necessary data	Water amount, light, pH levels, humidity levels
System shall be able to communicate with a device for controls and data and control system remotely	WiFi Module
Unit must not leak	N/A

Engineered Specifications

- Still figuring out the correct readings via recalibration
- Require individual power supplies for each 16x16 light
- WiFi Module to be tested upcoming week with new PCB
- Water is controlled through drip system
- Water must be filled to a certain level for pump to continue working

Engineering	Value
System must be able to change and detect pH levels	Approx. 1 degree of precision
System must measure and control ambient light	Approx. 3 degree of precision
Units must be able to communicate information back through the system	WiFi Module
System must control flow of water	1-2 Gallons per minute (GPM)
System will be able to monitor the quantity of water in the reservoir	Approx. 0.5 gallons of precision

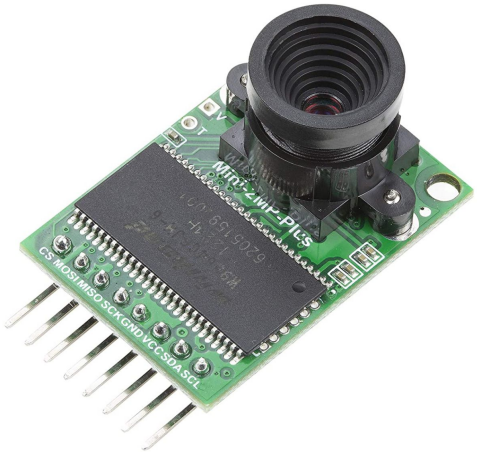
Functionality: WeatherShield

- Temperature
- Humidity
- Pressure

Functionality: Light Sensor

Functionality: Camera

- Still a work in progress
- Brought in required packages for integrating the code
- Front end UI and data storage still needs to be created to handle images
- Testing methodology through image bitbucket vs base64 encoding



Functionality: Drip Irrigation System

Test Run	Pot 1 Response Time (sec)	Pot 2 Response Time (sec)	Pot 3 Response Time (sec)	Pot 4 Response Time (sec)
1	10.92	13.5	9.95	10.17
2	10.98	9.4	10.65	10.89
3	11.12	9.06	10.12	11.02
4	10.87	9.67	10.32	10.65
5	11.07	9.75	10.7	11.24
6	10.86	9.63	9.46	9.26
7	10.96	9.4	9.82	9.89
8	10.7	9.71	9.63	9.74
9	10.32	9.95	10.02	9.87
10	10.5	10.02	9.96	10.04
Average	10.83	10.009	10.063	10.277

Results for the Drip Irrigation System Demo. The average for each pot to receive an inch of water was approximately 10.29 seconds.

Functionality: pH Sensor

- Dipped in -
  - regular water: 10.40
  - soap water: 9.03
  - lemon water: 10.35

Functionality: LED Lights

Liquid Level Sensor

Functionality: Website

- Persist Data
- React state loading data to reduce page reloads
- Website caching through webpack
- Page load time optimizations
- Progressive web application for an optimized mobile experience

Part III. Overall Functionality Design

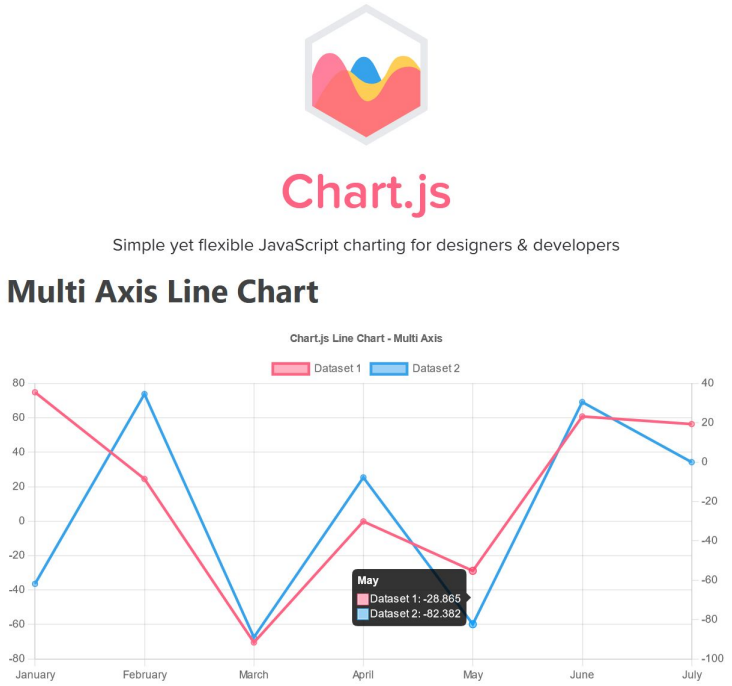
Website

- Demonstration
  - Individualized users with authorization function (login)
  - Adding multiple devices
  - Adding multiple plants
  - Data stored in database
  - Optimized desktop experience through PWA

Demonstration video in upcoming slide

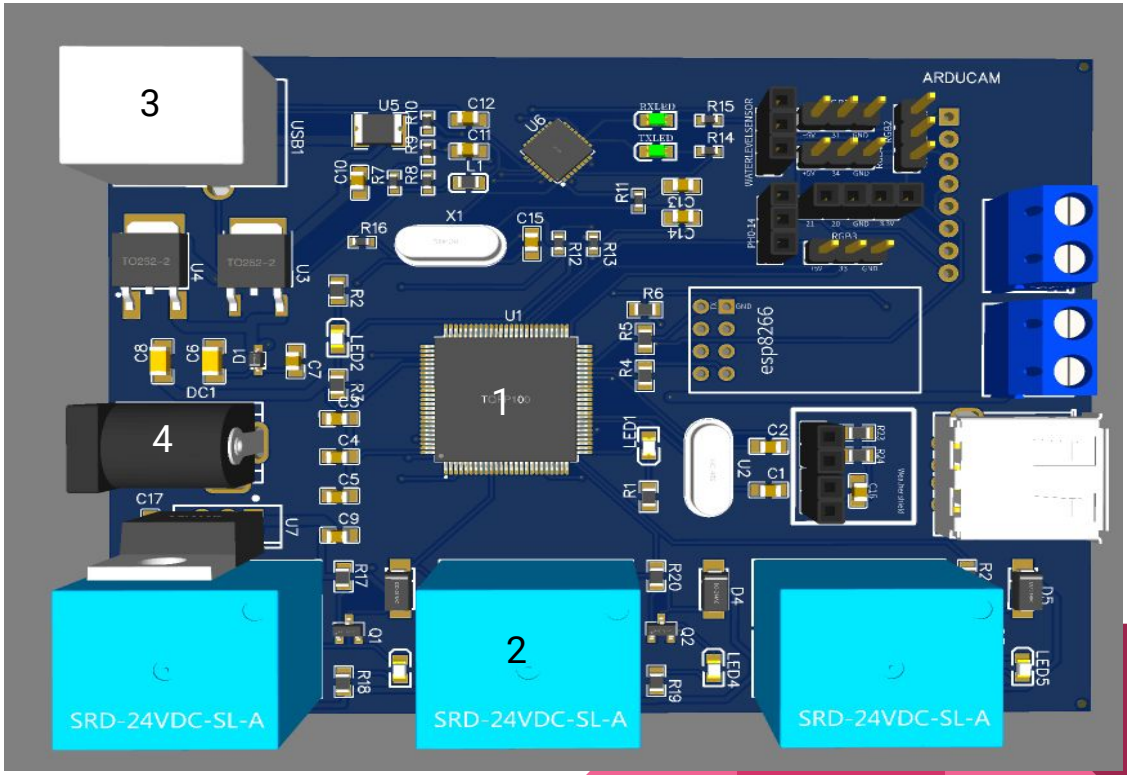
Chart functionality

- Still part of our final goals
- Requires up to date sensor data to use with our application
- Database in place to ingest data from sensor to apply to our charts
- UI and page can be designed once live sensor data is sent to the website via the Wi-Fi module



PCB functionality

1. MCU - Arduino 2560
2. Relays
3. USB type B - Flashing
4. Barrel plug



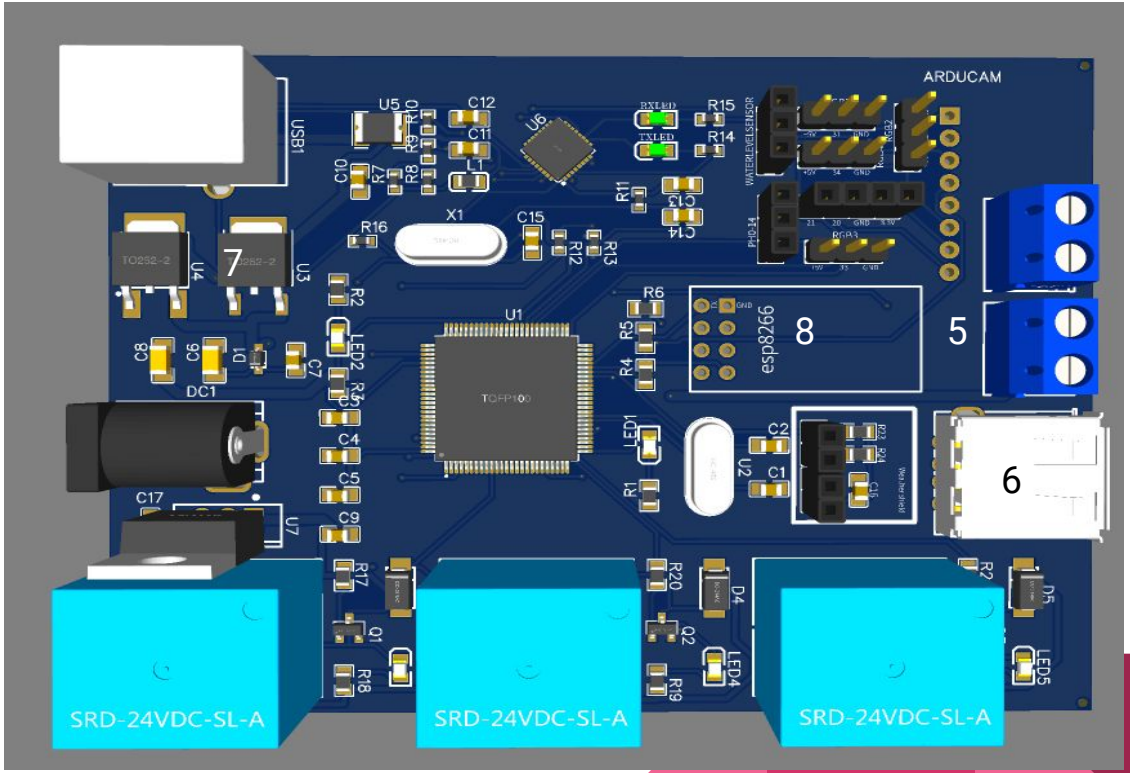
Functionality: PCB

5. 5v peristaltic pump and RGB squares

6. 5V water pump

7. Voltage regulators

8. Wifi module



Thank you for watching our presentation we hope you enjoyed it!