Plant Nanny

Senior Design 1
Divide & Conquer

Group 8:
Ajay Emmanuel - CpE
Chris Jordan - EE
Clayton Szoke - CpE
Gabriel Rodriguez - EE

Project Identification

Our proposed project for Senior Design is the **Plant Nanny**, a self care mini indoor garden that takes away the worry and anxiety of remembering to care for your household garden plants. The team members that will be diligently working to bring the product to life are: Ajay Emmanuel, Christopher Jordan, Clayton Szoke, and Gabriel Rodriguez. Ajay and Clayton are both computer engineering majors while Christopher and Gabriel are electrical engineers. As of the writing of this document, no sponsors are currently involved in the funding of our project.

Project Motivation

We realize that gardening is a very popular hobby that many do not have the luxury of enjoying due to circumstances that may be out of their control, we wanted to ease the burden of constantly looking after your plant. This project will be purely for educational and marketing purposes, to combine talents from multiple professions to implement a working model of a plant incubator. Our motivation for this project is to provide our customers with a cheap and easy alternative for those who cannot afford the maintenance of a full-fledged garden. The idea came to us when of our group mates lamented at his inability to successfully grow a healthy plant, leading us to search for ways to alleviate his concerns. Our goal is so that users of our product will only have to buy the soil and water once and then stand back as they watch their plant bloom under the care and attention of our **Plant Nanny**.

Plant growth systems like **Plant Nanny** are commonly big and bulky, we aim to fix this with an all new light-weight and minimalistic model that will provide the plant with the essentials.

Project description

Plant growth systems like **Plant Nanny** are commonly big and bulky, we aim to fix this with an all new light-weight and minimalistic model that will provide the plant with the basics. The **Plant Nanny** will contain the most essential part a flower requires which is a water reservoir, allowing for simple installation and usage unlike many of other competitors. Leave the plant alone and onboard sensors will alert you through mobile for a refill leaving the more impatient and forgetful customers happy.

Project Requirements & Specifications

The idea is to have a small scale indoor garden with a sleek design that takes care of itself. The garden will take power from a standard wall outlet or battery. That power will drive a small DC pump which water will flow through to water the plant in question. A voltage regulator will be needed to control the voltage feeding our microcontroller and sensors that we decide on. A moisture sensor is used to sense when the plant would need to be watered. By communicating this information to our microcontroller, the controller will utilize a relay circuit which in turn switches on our DC pump. Once the soil of the plant becomes well saturated as determined by the sensor, the controller will shut off the pump and return to standby mode.

In order to offer better control over our automated system we hope to implement an Android/iOS device application to enhance the users experience. With the app the user will be able to see vital information such as: reservoir water level, moisture level of the plant, and provide an override function that turns the pump on at will. At the time of this paper we are unsure which technology we will ultimately go with, but either a bluetooth or wifi connection will be used. To make functionality of the application possible, a wifi or bluetooth module will be required. While an application for both platforms would be ideal, iOS requires xCode on a mac device to be developed, and so the initial application will be developed for android only.

Stretch Goals

For the purpose of our Senior Design project our goal first and foremost is to create a working, functional device to the requirements mentioned above. Given enough time, however, we would like to provide additional features to our design. These features may include additional sensors to provide our users with more information regarding their plant. Sensors we are considering are: pH level, humidity level, atmospheric pressure, ambient temperature, and a rain sensor.

Budget & Financing

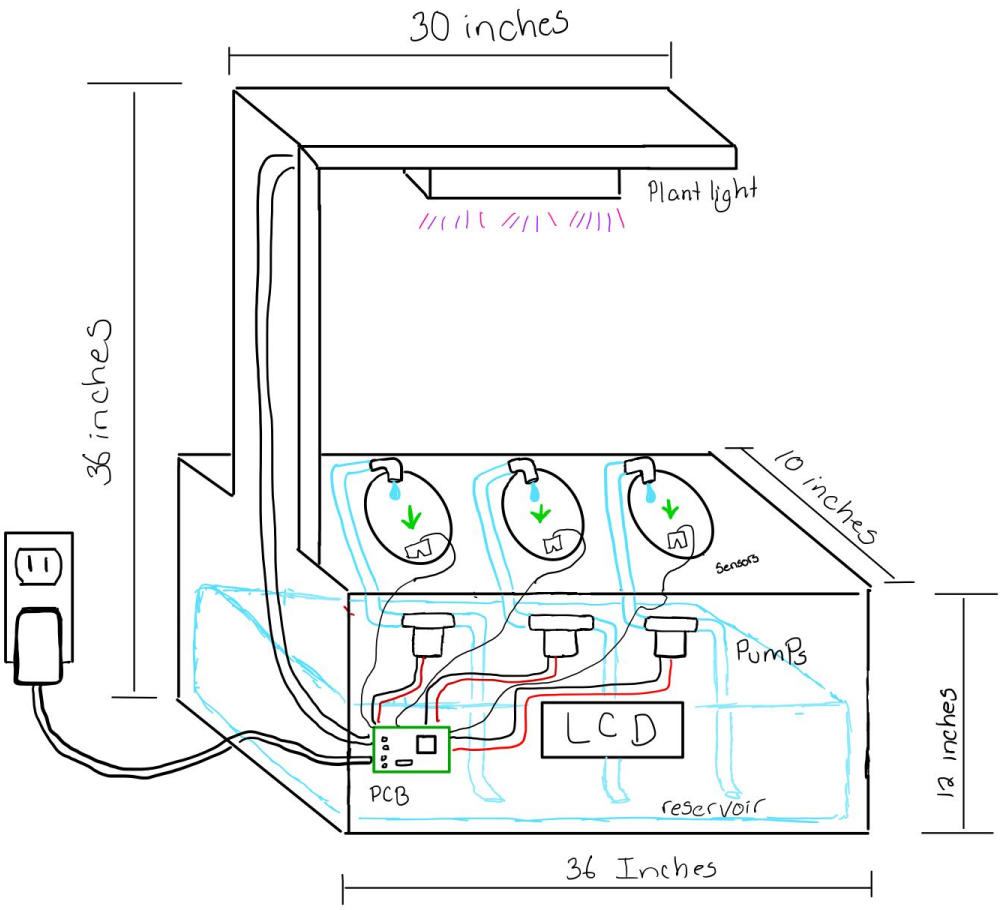
The group does not have any sponsorship or outside help for the funding of the project. Each team member will be equally financing the total cost of the project. Since no outside funding will be received, keeping costs to a minimum will be highly prioritized except where absolutely necessary.

Budget Table

These are all rough estimates on what exactly the final product will cost. This is all dependent on what is incorporated into the project. The addition of multiple sensors will require more power. The following parts might have variable ranges for their price points because of the uncertainty towards how large this project will become. The UV lights presented in the budget table are donated items, but these will work for the purpose of this project. Most other supplies have not been procured at this present moment.

Design Components	Price
AI Sol UV Lights	$400.00
Woodworking Supplies	$40.00
Voltage Regulator	$8.00
Microcontroller	$10.00
Water Pump	$5.00
Water Reservoir	$19.00
Tubing for Water Reservoir	$20.00
Soil Moisture Sensor	$6.00
pH Soil Sensor	$20.00
Temperature and Humidity Sensor	$10.00
Wifi Module	$14.00
Circuit Components	$15.00
Total	$567.00

Rough Draft Design



Design Specifications

The specification below are the basic requirements for this project in order to meet the design goals.

- Plant Light
    - Dimensions
        - Length: 11.875 inches
        - Width: 5.375 inches
        - Height: 2.35 inches
        - Weight: 4.125 lbs
    - Power
        - Power Output: 75W
- Unit Housing
    - Dimensions

        - Length: 3 feet
        - Width: 10 inches
        - Height: 3 feet
        - Weight: 30 lbs
- Water Pump
    - Motor
        - RPM: 5000RPM
        - Volts: DC 12V
        - Flow Rate: 0-100ml/min
- Reservoir
    - Dimensions
        - Length: 32 inches
        - Width: 8 inches
        - Height: 6 inches
        - Weight: 2 lbs
- Microcontroller
    - Specs
        - I/O: Greater than 10
        - Operating Voltage: 1.8 - 5.5V
    - Memory/Speed Features
        - 4/8/16/32KB of In-System Self-Programmable Flash Program memory
        - 256/512/512/1KB EEPROM
        - 512/1K/1K/2KB Internal SRAM
        - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
- Wifi Module
    - Power
        - Power Output: 0.774 Watts
        - Volts: 3.3v
    - Memory/Speed Features
        - 80MHz
        - 64KB instruction RAM
        - 96KB data ROM
        - 64K boot ROM
        - 1MB Flash Memory
- Water Tubing
    - Size
        - Length: 6 feet
- Humidity/Temperature Sensor
    - Power

        - Volts: 3 - 5V
- Moisture Sensor
    - Power
        - Volts: 3 - 5V

Senior Design 1 Milestones

Senior Design Process	Start	End	Due Date	Complete
Senior Design Ideas	5/14/19	5/16/17	5/21/19	100%
Initial Project Documentation	5/21/19	5/25/17	5/27/19	100%
Meeting with Professor	5/30/19	5/30/19	5/30/19	100%
Divide and Conquer 2.0	5/30/19	TBD	6/7/19	100%
Table of Contents	5/30/19	TBD	6/14/19	0%
Microcontroller Research	5/30/19	TBD	6/7/19	0%
Sensor Research	5/30/19	TBD	6/7/19	0%
Water Pump Research	5/30/19	TBD	6/7/19	0%
LCD Screen Research	5/30/19	TBD	6/7/19	0%
Android Application Research	5/30/19	TBD	6/7/19	0%
Programming Language Research	5/30/19	TBD	6/7/19	0%
Wifi Module Research	5/30/19	TBD	6/7/19	0%
Led Lights	5/30/19	TBD	6/7/19	100%
60 page Completed	5/30/19	TBD	7/7/19	0%

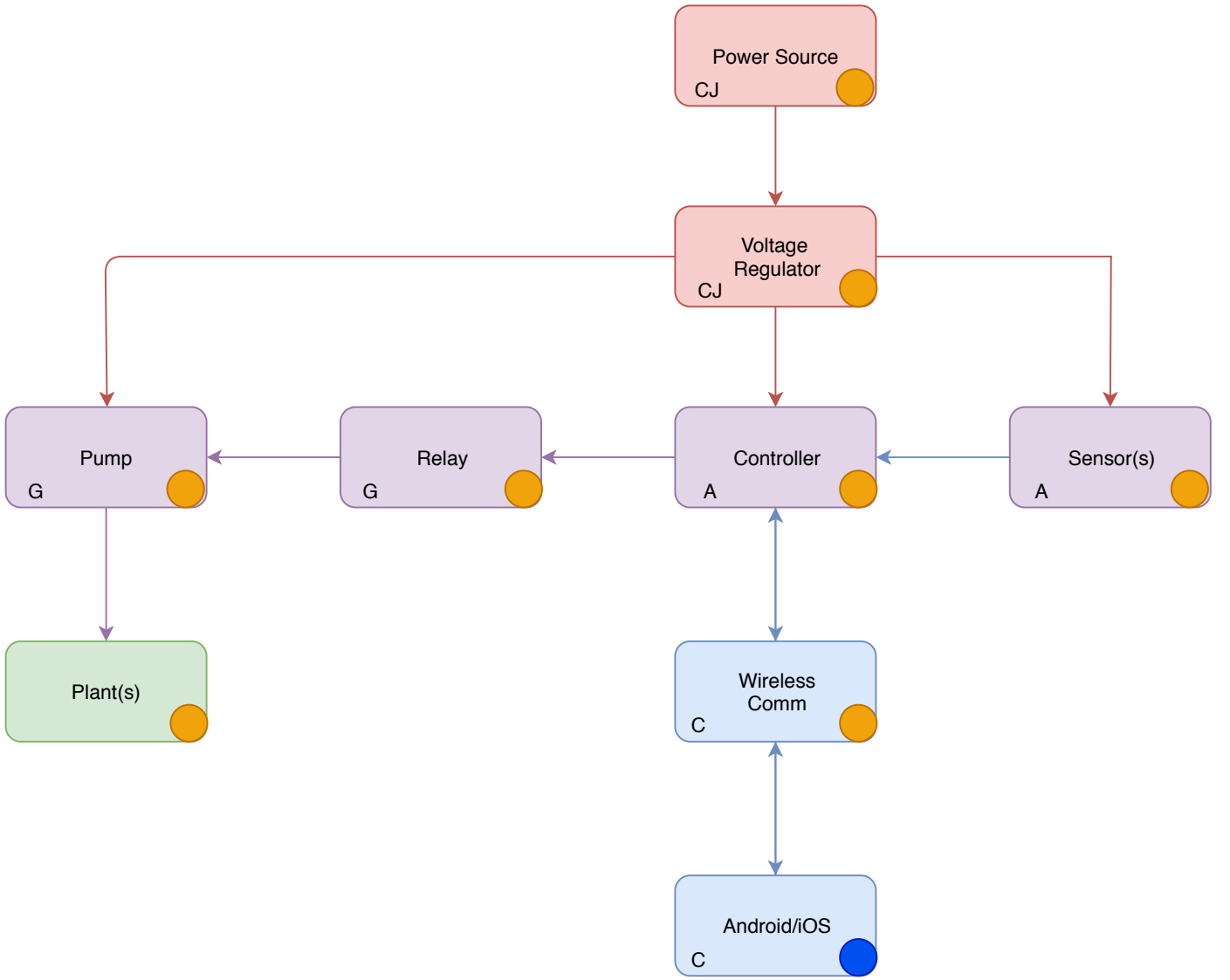
90 page Completed	5/30/19	TBD	7/21/19	0%
120 page Completed	5/30/19	TBD	8/2/19	0%

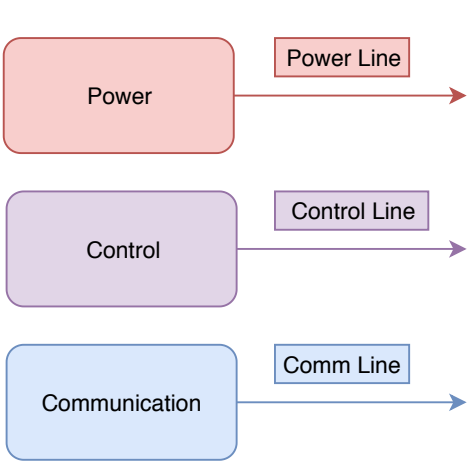
Senior Design 2 Milestones

Final Design Process	Start	End	Due Date	Complete
Ordering Components	7/30/19	TBD	TBD	0%
Breadboard Testing	9/1/19	TBD	TBD	0%
PCB Design	8/26/19	TBD	TBD	0%
Build Prototype	9/1/19	TBD	TBD	0%
Testing Prototype	9/1/19	TBD	TBD	0%
Final Documentation	11/14/19	TBD	TBD	0%
Display Design	11/8/19	TBD	TBD	0%
Finalize Project	10/29/19	TBD	TBD	0%

Design Obstacle

First obstacle is going to be understanding the water requirements for each plant and ensuring accurate measurement to keep plant alive. Next obstacle is to understand if plant was originally given enough water as this will help determine the amount of water needed to initiate the process. Third obstacle would be the amount of light. Each plant has a different need for both water and light and determining how much of each is crucial to the plant life, too much or too little will be harmful. Planning accurately of how long to leave the light on will allow for a better projection of the watering schedule. Another obstacle that is going to be encountered is the effectiveness of the applications communication with the actual watering device. Effective communication consist of, the time watering schedule, the sensor readings, and the amount of water that was dispensed.





A - AJAY
CJ - CHRIS
C - CLAYTON
G - GABRIEL