Herb Chamber

SDP21 Team 28

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Advisor: Prof. Siqueira

Problem Statement

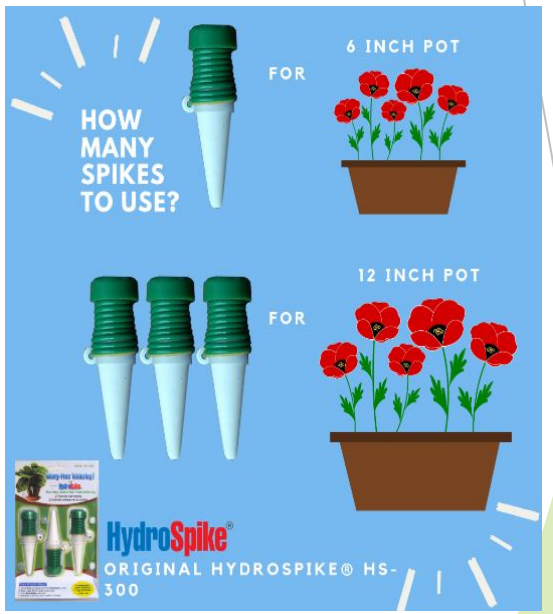
Many people are thinking about becoming more self-sufficient and growing some of their own herbs at home but are stopped at the starting point due to many requirements they need to care for the plants. Even without a green thumb, the Herb Chamber can monitor every factor that is needed to grow a garden 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. Bed size 23” x 5.25” x 6”
    b. Compact tent enclosure 24” x 24” x 36”
2. Power supply
    a. Connect via wall outlet to a 150W 12V 12.5A power supply
3. IPXX dust and water resistance rating
4. Water system
    a. 2, ½” 12V - 4W pump
    b. 6 ½” 12V - 5W solenoid controlled watering channel
5. Light System
    a. 45W 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 nutrient/water/light given to plants
    e. Default plant directory for optimal growth

Water Spikes with detached reservoir

- Manufacturers offer spikes with attached tubing and a nearby reservoir. You fill your spike and attached tube with water. This tube connects directly into a water reservoir, like a faucet. As your plant uses its soil moisture, a natural capillary action occurs within the tube. Water molecules adhering to the tube walls climb up into the water spike to rejuvenate the missing moisture..



Water Spike with attached reservoir

- If you have a relatively large pot, you can use a spike with attached plastic bottle. Commonly requiring a 2-liter size bottle, you screw the bottle onto the spike and fill the bottle with water at its cut end. As the soil dries, water moves slowly downward using gravity as its major force.

- The spike completely pressed into the soil.

- Some of the spikes come with a special absorbent gravel to slow down the water movement, so that you won't need to refill the bottle as much.

Maintenance for water spikes

- Plant watering spikes do not need much maintenance unless they are used frequently throughout your home and garden. Algae buildup occurs inside the spike and tubing, if applicable. Periodic spike and tube rinsing should help keep the algae at bay. Any soil sediment that accidentally invades the spike and attached system needs to be removed as well; sediment clogs the spike and creates plant drought conditions.

Drip Watering System

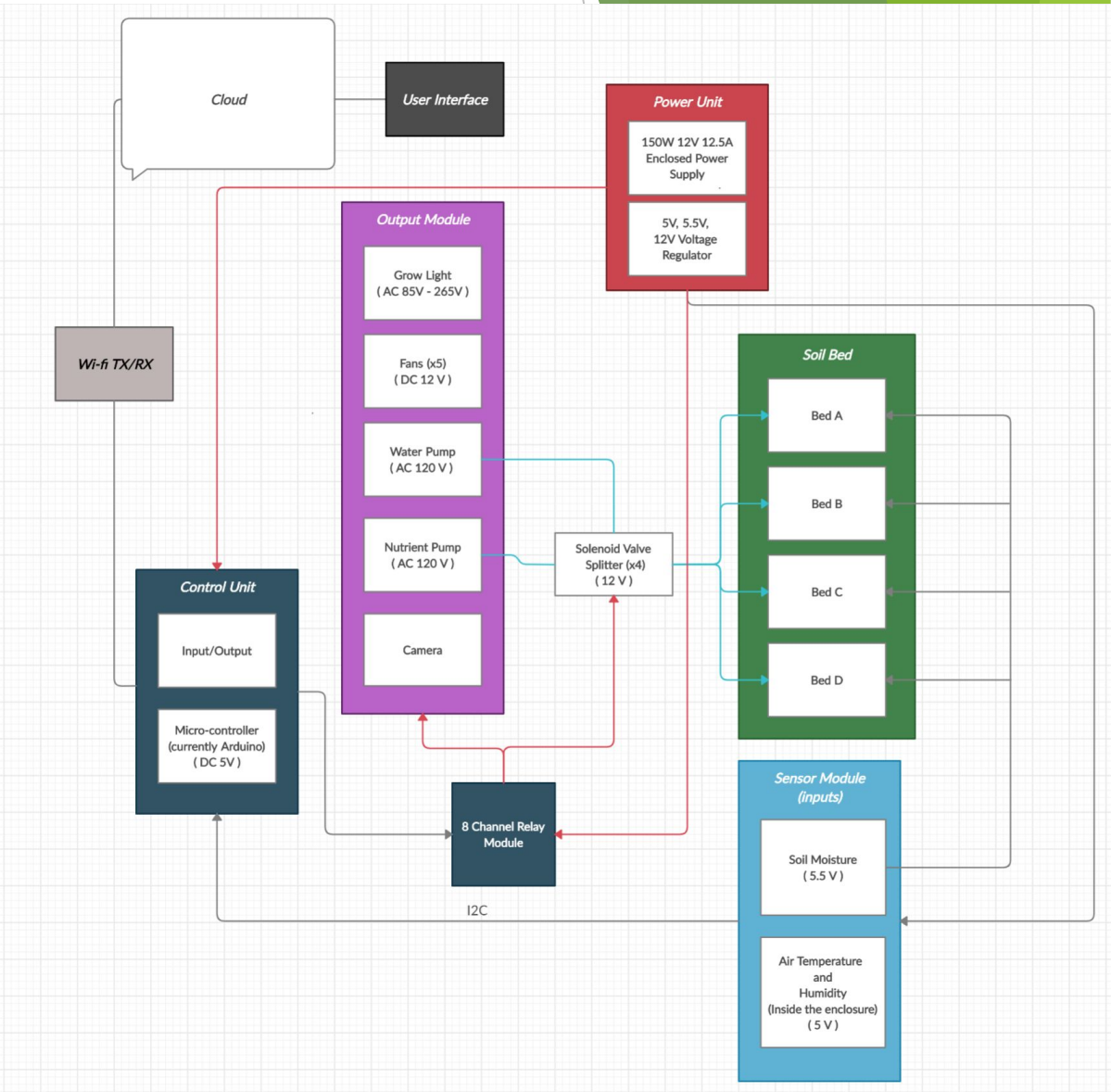
- run a drip system and set a timer. It is low maintenance. It deposits water where it is needed, prevents water from being wasted and saving you money.
- It doesn't cast a wide spray or steady stream over large area, it dribbles out tiny quantities of water in specific places.
- need to set a timer to stop and start the flow of water, to prevent overwatering

Self Watering Systems

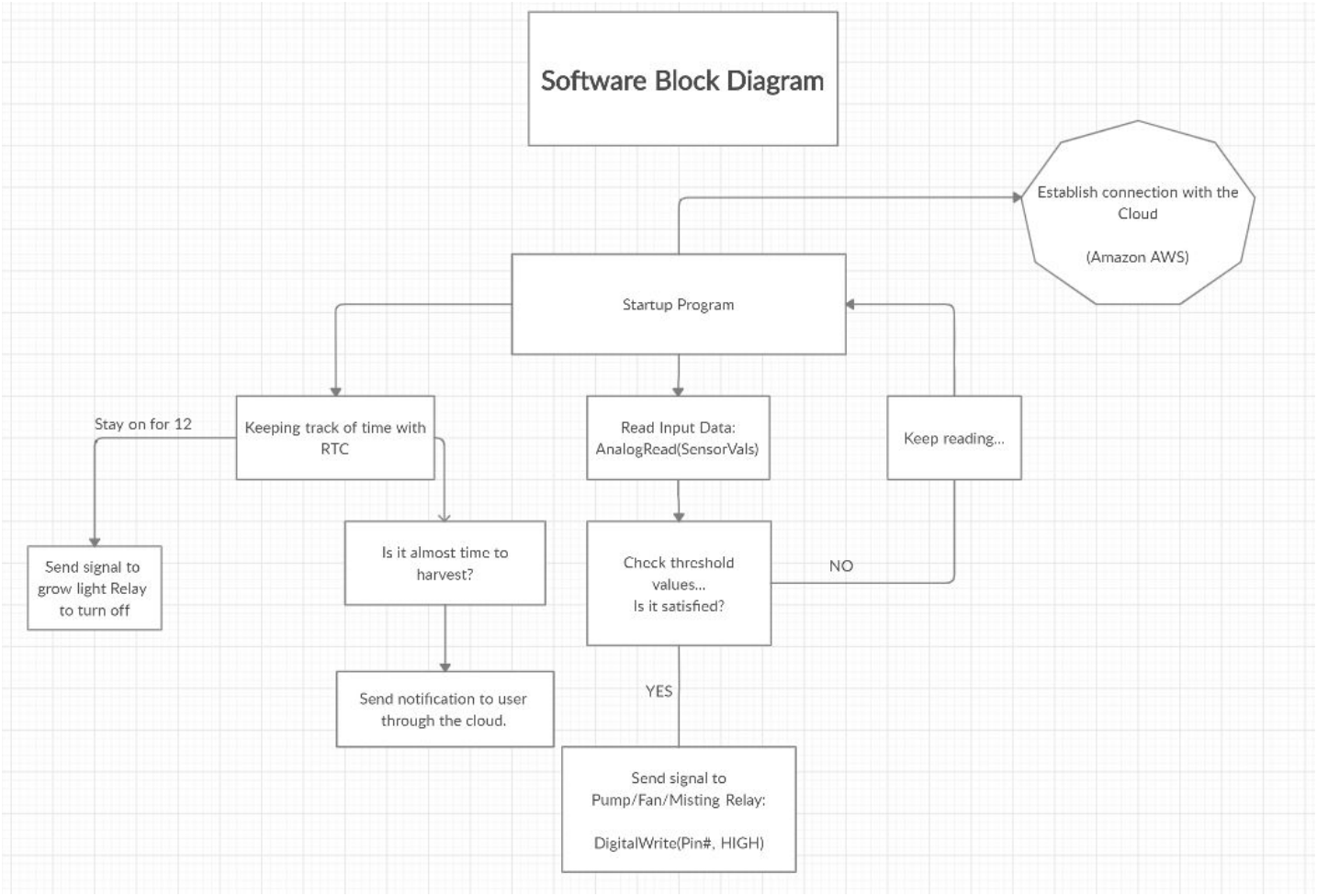
- A “self watering” container doesn't water itself. It is a watering system using planters that contain a reservoir of water at the bottom. This reservoir connects to the area where the plant is with a soil “foot” or a fabric “wick”. With a soil foot system, the plants send roots down into the foot, and draw up as much water as needed. In a wick system, water is drawn up the wick via capillary action into the soil of the main pot. Either way, if there's water in the reservoir, the plants have access to water. This allows you water less frequently and still have healthy plants.

System Block Diagram

https://app.creately.com/diagram/eqHdbolWe6i/edit



Software Block Diagram



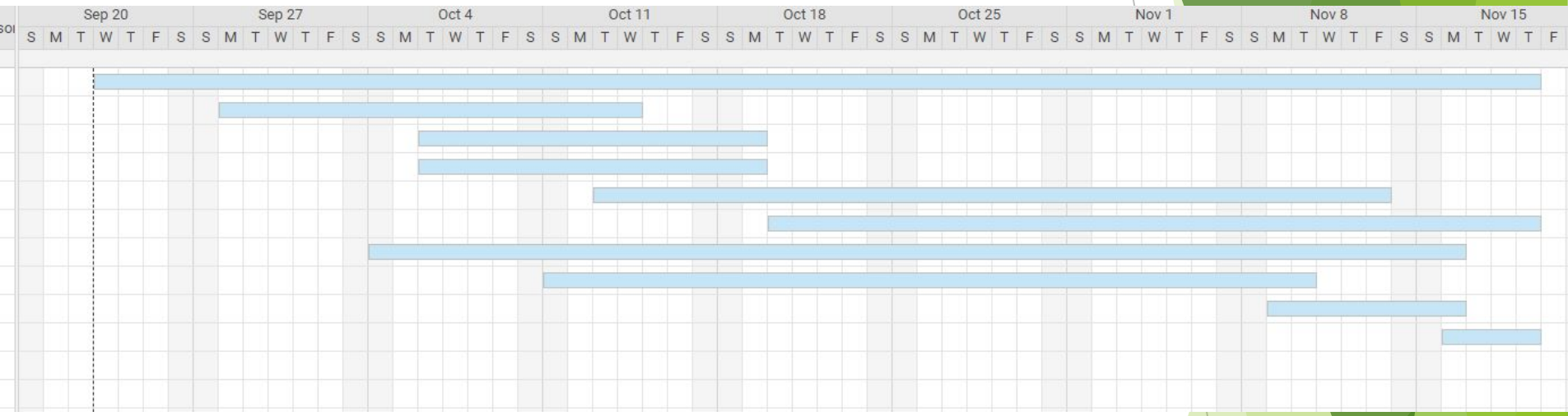
Hardware Budget

Hardware	
Microcontroller	$0.00
Relays	$11.00
Power supply	$25.00
PCB revisions	$18.00
Solenoid valves (x6)	$30.00
Moisture sensors(x4)	$34.00
Humidity sensor	$13.00
Temperature sensor	

15	Miscellaneous	
16		
17	Tent	$65.00
18	Lights	$27.00
19	Fans	$26.00
20	Soil	$15.00
21	Tubing	$8.00
22	Pumps	$10.00
23	Nutrients	$30.00
24	Woods	$20.00
25	Tanks	
26		
27	Estimated Total	$332.00
28	Given Budget	$500.00
29		

Project Management

Task Name	Duration	Start	Finish	Predecesso
Viable cloud server resea	42d	09/23/20	11/19/20	
Hardware purchase	13d	09/28/20	10/14/20	
Bed construction	10d	10/06/20	10/19/20	
Assemble water system	10d	10/06/20	10/19/20	
Bed subsystem Assembly	24d	10/13/20	11/13/20	
Subsystem debugging	23d	10/20/20	11/19/20	
Sensor communication	32d	10/04/20	11/16/20	
Power subsystem	23d	10/11/20	11/10/20	
MDR Presentation	6d	11/09/20	11/16/20	
MDR Report	4d	11/16/20	11/19/20	



Team responsibilities:

- Simon
  - Power and sensor communication
  - Hardware Budgeting
- Nam
  - Coordinator
  - Bed and Water Systems
- Christian
  - Power and control system
  - Circuit design
- Duoc
  - Bed and Water Systems
  - Cloud research

MDR Deliverables

- Assembled main structure and water system
- Communication with sensors and actuators
- Working power subsystem for components