Water Root Group

Zoie Leo, Daniel Abadjiev, Nilay McLaren

Massachusetts Academy of Math & Science at WPI

Motivation

To make the process of watering a kitchen house plant accessible by designing a garden maintenance system that will promote gardening independence for people with limited mobility.

Target Audience

People with limited mobility that can use a mobile application, along with people who have busy lives and/or are unable to water their house plants regularly.

Requirements

- Device can water the plant at the push of a button
- App can use a timer to schedule an automatic watering
- Device endures continued use and maintains water tightness
- Device is visually pleasing
- App includes a water log to record watering history

Competitors

AiHihome

Pros	Cons
Can be attached to any reservoir that is convenient for the user	Pump stops working after a few uses according to reviews
Costs $40	Timer does not work all the time
Waters up to nine plants at a time	Cannot be operated by a mobile phone

Grovio

Pros	Cons
Controlled with a timer and has a 1.6-liter reservoir	Costs $99.99
Has sensors that can monitor air temperature, humidity, and light	Can only water one plant
Operated by a mobile application and can set reminders	Has a somewhat small reservoir

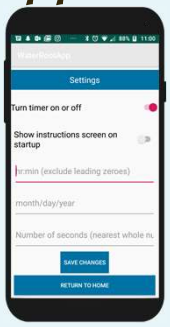
Gro

Pros	Cons
Controlled manually or autonomously with a mobile application	Costs $99.99
Good customer reviews	Cannot water individual plants

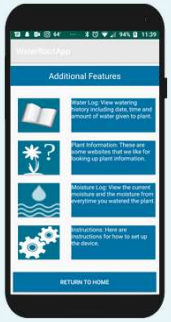
Water Root App Features

Button and Timer (1)

Startup Instructions (2)



Settings (3)



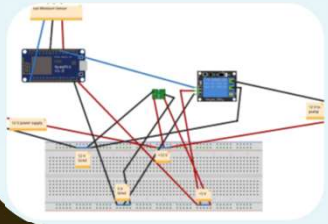
Additional Features Page (4)

1. Feature 1 [MVP]: The ability for the user to activate the device with the push of a button. Alternatively, automatic watering can be scheduled with a timer.
2. The startup instructions pop up when the app is opened for the first time.
3. The settings page allows the user to set a specific date and time for a scheduled watering.
4. The water and moisture logs, along with links to information on gardening.

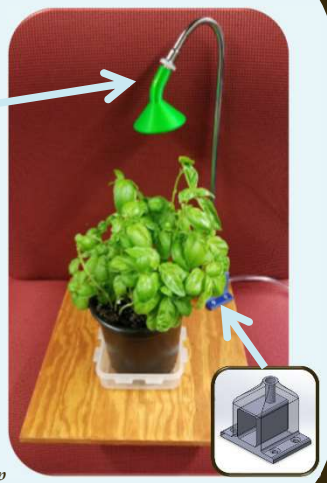
Water Root Hardware

To the right are the iterations of the device head. The spray patterns were adjusted based upon a hydrodynamics design study.

The parts of the device were modeled in Solidworks and printed using a Prusa printer with PETG filament, which is water resistant. The thin metal tube was bent to give the device a shower like appearance.

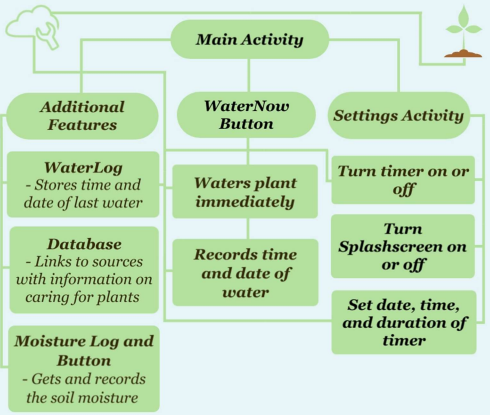


To the left is a diagram of the electronic components. The NodeMCU board connects to Firebase and subsequently controls the pump and the soil moisture sensor.



The Water Root device with a basil plant

App Structure Diagram



Conclusions

- The device was able to meet and exceed the MVP features.
- The current version of the showerhead is the most hydrodynamic of the shower heads.
- The device is able to sustain water tightness over the time of the project and does not leak.

Future Extensions

- The aesthetics of the device and application would be improved.
- The integration of additional features of this app could be strengthened such as the moisture sensor.
- More copies of this device could be built.
- A larger variety of nozzle spray patterns could be investigated.

Citations

Chamberlain, L. (2016, June 29). Gardening makes you feel good. Retrieved from https://www.theguardian.com/lifeandstyle/gardening-blog/2016/jun/29/gardening-makes-you-feel-good

AiHihome Automatic Watering System with Digital Timer 12V DC Switch Auto Irrigation for Indoor Plant. (n.d.). Retrieved February 27, 2019, from https://www.amazon.com/AiHihome-Automatic-Watering-Digital-Irrigation/dp/B078Q78X1D

Timms, A. (n.d.). Grovio Personal Plant Assistant. Retrieved from https://thegadgetflow.com/portfolio/grovio-personal-plant-assistant/

10 Reasons Why I Love Gardening ., (2017, October 25). Retrieved February 27, 2019, from https://www.joyusgarden.com/10-reasons- why-i-love-gardening/Gro® 7 Zone Controller. (n.d.). Retrieved February 27, 2019, from https://www.scotts.com/en- us/products/gro-watering-solutions/gro-7-zone-controller

Monitoring Soil Moisture for Optimal Crop Growth. (n.d.). Retrieved from https://observant.zendesk.com/hc/en-us/articles/208067926-Monitoring-Soil-Moisture-for-Optimal-Crop-Growth

Sowing Chart: Vegetables, herbs and flowers | TheSeedCollection" Information Page.,Website Terms of. (n.d.). Retrieved from https://www.theseedcollection.com.au/Sowing-Chart