



The Watering Point – Team Mpologomas

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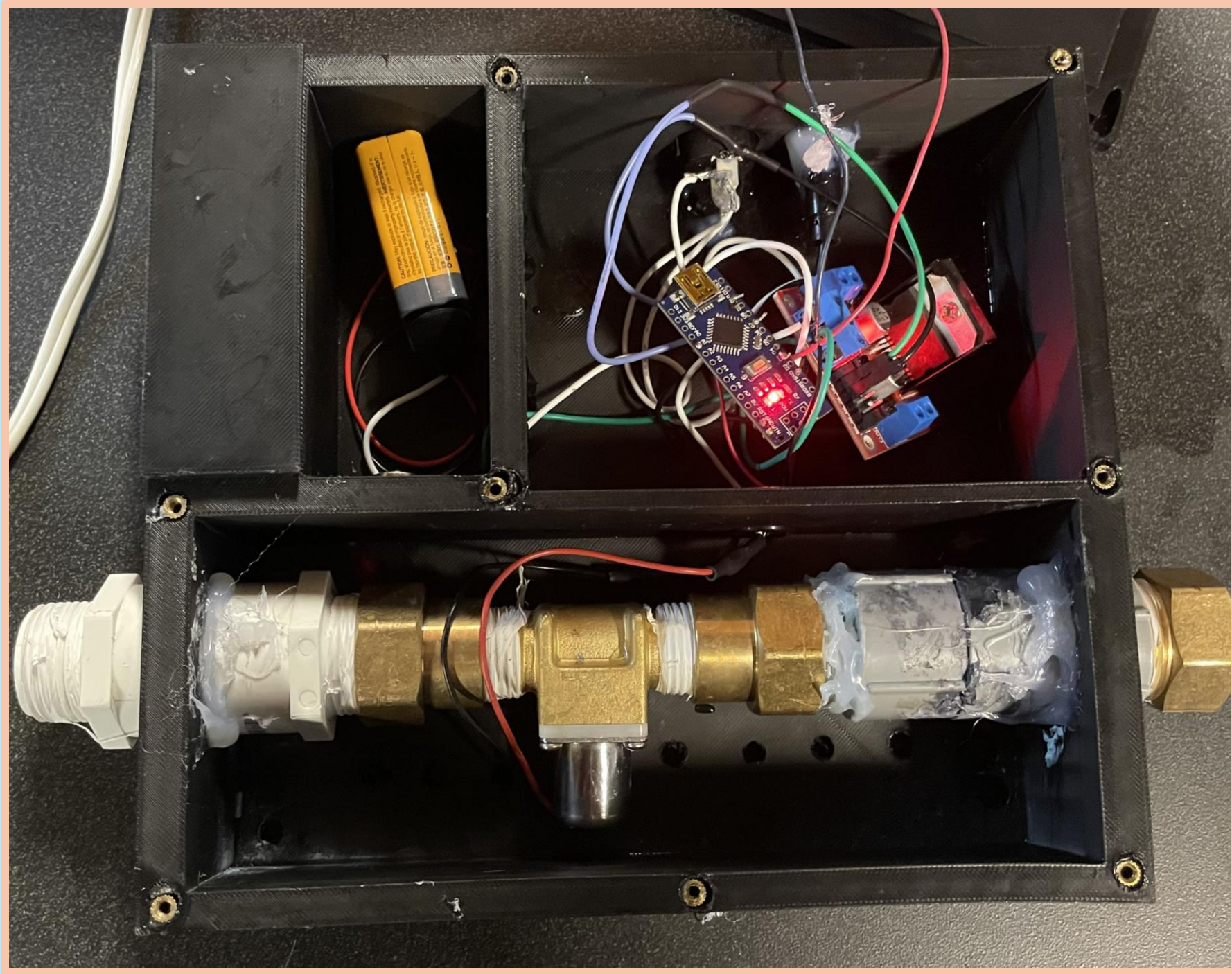
Problem Statement

Children who are born with Autism, Down Syndrome, or Cerebral palsy have limited physical capacities and are unable to perform tasks that require a certain amount of physical strength (Mayo Clinic, 2023). These tasks include watering plants in the garden. This is especially important at Seven Hills in Groton, because the guardians there want their residents to be proactive and engaged in daily tasks.

Requirements

Type	Level 1 Requirements	Y/N
Functional	The device should be functional even when water comes in contact with it.	Y
Functional	The device should be easy to maintain, causing no additional stress for the user	Y
Functional	The mechanism should be easy to use for all users	Y
Physical	The device should be durable	Y
Functional	The device should efficiently dispense water through the hose when the switch is clicked	Y

Current Design

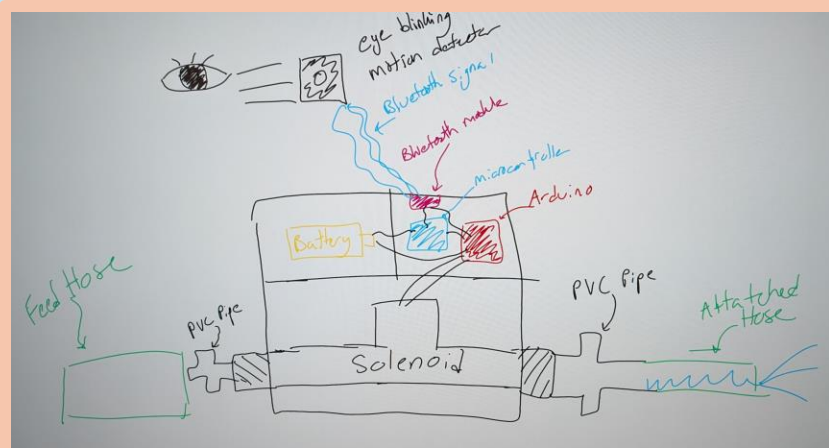


The current design utilizes an Arduino, a motor controller, a solenoid valve, a 9-volt battery, and a mono channel headphone jack. When the switch is connected to the box, the switch will be able to control the water flow of the hose with a click of a button

Design Studies

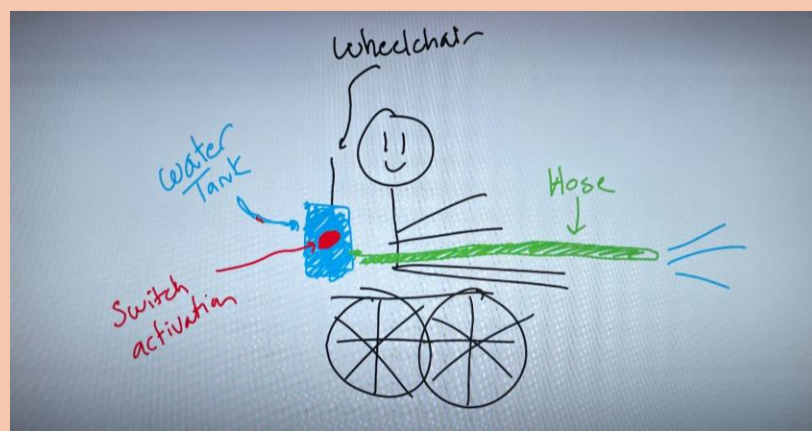
- Measuring delay of the device
 - This design study was conducted to ensure that there would be minimal delay in using the device
 - Minimizing delay is necessary to help the clients experience and develop a cause- effect relationship
- Measuring leakage of the device
 - This design study was conducted to ensure that there would be no leakage into the compartments of the device and that there would be minimal leakage out of the box
 - Preventing leakage into the other compartments is important to keep the device safe to use
- Qualitative measuring of user experience
 - This design study involved testing various features to ensure ease of use

Design #2



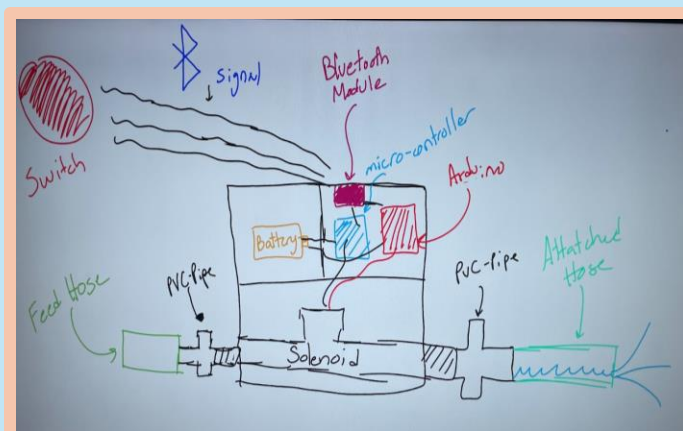
- Remote activation
- Not all clients may be familiar with an eye-activated switch

Design #3



- Most reliable connection to water
- Weights down the client

Design #4



- Can be activated from the greatest range
- Has delay in activation

Methodology

- Generated solutions to the client's problems
- Created design sketches that address the problem statement
- Ordered necessary materials to build the prototype
 - M3 threaded inserts, Arduino Nano, Solenoid Valve, etc.
- Started the 3D model of the CAD in OnShape
- Assembled the prototype box with the solenoid valve, Arduino, and wires
- Attached the box with a hose spicket and tested to see if the water flow was controlled and functional
- Iterated the box to stop leakage and fix other problems

References

Adafruit Industries. (2025). *Brass Liquid Solenoid Valve - 12V - 1/2 Inch G / BSP Thread*. Adafruit.com. <https://www.adafruit.com/product/996>

Adapted Garden Spray. (2025, February 11). *Enabling Devices*. <https://enablingdevices.com/product/adapted-garden-spray/>

Amazon.com. *Rachio Smart Hose Timer with WiFi Hub for Outdoor Watering | Easy Faucet Install, Automate Water & Sprinkler Schedules for Lawn, Garden, & Yard Care*. (2025). Amazon.com. <https://www.amazon.com/dp/B0RWN7WJ1C/?tag=thewire06-20&linkCode=sn2&assubtag=F0401H7T1PCDNRKA67HMAH945BYM&th=1>

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Centers for Disease Control and Prevention. (2024, December 26). *Down Syndrome: Birth Defects*. CDC. <https://www.cdc.gov/birth-defects/about-down-syndrome.html>

Classic 83P Hi-Flow Retractable Hose Reel / Charcoal. (2021). HoseLink USA. <https://www.hoselink.com/products/83p-retractable-hose-reel-charcoal>

Mayo Clinic. (2023, September 28). *Cerebral palsy - symptoms and causes*. Mayo Clinic; Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/cerebral-palsy/symptoms-causes/syc-20353999>

Future Work & Conclusion

The device was overall successful at allowing for a switch-activated method of gardening while minimizing delay and leakage and prioritizing user experience

- Incorporating Bluetooth connection to the device to increase the range of activation
 - The Bluetooth connection will pose an additional challenge of more delay
- Addressing leakage issues
 - The device's leaks were primarily due to the hose, but investigating them could reduce leakage