

TEAM LOG10 PRESENTS

INDIVIDUALIZED HAND SOAP DISPENSER

IEEE FALL QUARTERLY PROJECT
2022 - 2023



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INTRODUCTION:

what's the big deal?

As new illnesses emerge and health crises rise, sanitation has become an extremely crucial part of our society. Therefore, efforts to increase efficiency of sanitation, especially in public spheres, is necessary to ensure the health and safety of the general population.

Our project seeks to fulfill this new push towards **productivity** in sanitation.

OUR MOTIVATION AND PURPOSE:

As regular users of public facilities and their restrooms, our team members have noticed that it often takes *multiple attempts at retrieving soap* from (both automatic and manual) dispensers. For busier areas, these extra pumps and seconds accumulate, and traffic may form. Furthermore, we took into consideration those *struggling with muscle deterioration* who cannot easily “go back for more.”

Thus, the goal of this project is to *minimize the amount of time users spend acquiring soap in public restrooms* while also helping institutions save money on sanitation resources. By allowing users to select their soil level, we hope that users will receive an adequate amount of soap upon their first use of the soap dispenser, rather than returning to the device to retrieve additional soap (as we have observed many do with existing automatic soap dispensers). Our design also seeks to reduce the frequency in which sanitation workers must refill soap dispensers, utilizing a rigid structure as the soap reservoir instead of a typical amorphous pouch. We hope to offer a more *cost and time efficient alternative* to the existing soap dispensing mechanism.

TIMELINE:

WEEK 1

- Outline project idea
- Planning roles, materials needed
(during Workshop 1)

WEEK 2

- Sketching ideas
- Brainstorming
- Starting CAD models

WEEK 3

- Experimenting & learning with Arduino
- Beginning official documentation
- Ordering parts

WEEK 4

- Running design by mentors
 - design flops
- Brainstorming again
(during Workshop 2)

WEEK 5

- Meeting with mentor (Neel) to run by design
- Finalizing design/CAD

WEEK 6

- More brainstorming
- Designs resembling final design

WEEK 7

- Finalized designs
- Exploring electrical planning of device

WEEK 8

- Finalizing electrical planning of device
- More brainstorming
- Finalizing Arduino code

WEEK 9

- Finalizing sketch & CAD models
- Printing improved CAD parts

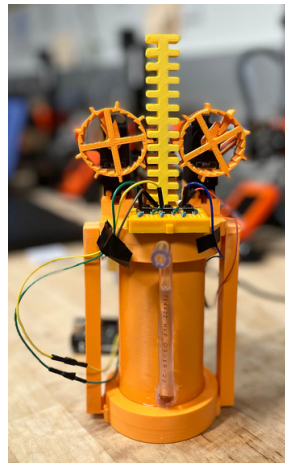
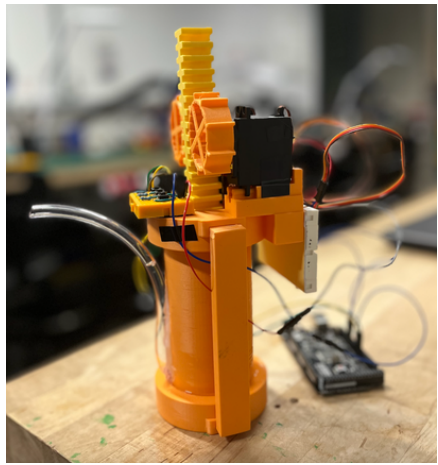
WEEK 10

- Putting together finalizing parts
- Testing device
- Showcase!

OVERVIEW

What is it?

An automatic soap dispenser that allows users to select a soil level-- light, medium, or heavy-- and receive an appropriate amount of soap in return.



How to Use It! (very user-friendly)

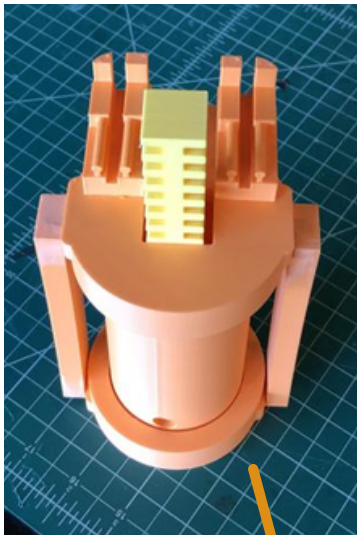
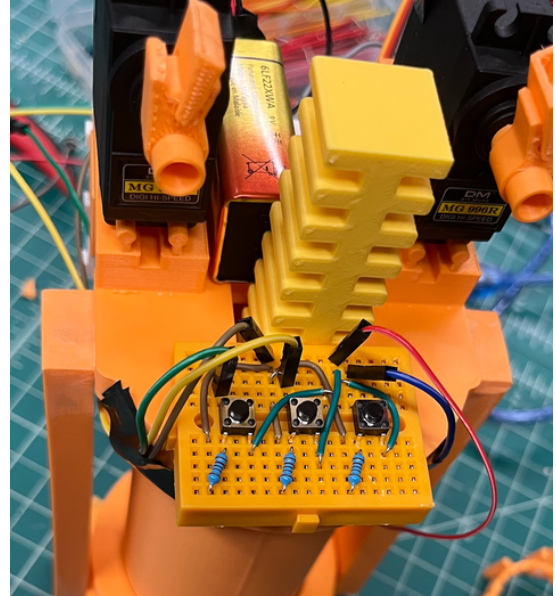
- 1) Place hand under nozzle with palm facing upwards
- 2) Select soil level
- 3) Watch as your personalized volume of soap dispenses! You will not have to go back for more!

DESIGN PROCESS:

how we made it!

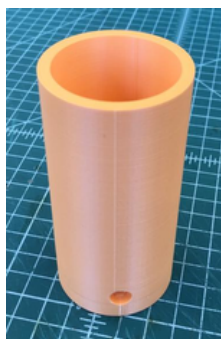
Using Arduino, we:

- 1) Created a system of buttons for users to select a setting
- 2) Set up the 55g servo motors to rotate gears that propel the main dispensing mechanism.



With 3D printing, we made the:

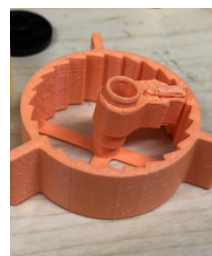
- 1) main body
- 2) "elevator" system/dispensing mechanism
 - toothed rod
 - circular press
- 3) freewheel & wedge



(main body)



(elevator system)



(freewheel
& wedge)



(toothed rod
& circular press)

TEAM MEMBERS:



PETER LI

Design/Electrical Lead

Peter introduced the ideas for a lot of the main components in our final design, and actually established the soap dispensing mechanism which we refer to as the "syringe design." In addition to contributing to our Arduino code, he facilitated a large portion of the electrical planning, and was highly involved in the fabrication of the device, volunteering days at a time at UCSD EnVision Maker Studio in order to operate the 3D printers.



PHILIP PINCENCIA

CAD Operator

Philip was our sole CAD lead, producing the 3D model for almost every non-manufactured part of our design. He was active in all discussions of design, and made numerous changes according to new ideas or obstacles. His work allowed the rest of our team members to better visualize our design and make crucial changes to optimize the efficiency of our device.



RANA SINGH

Lead Back-End Developer

Rana was responsible for the coding in Arduino that was necessary for our dispensing mechanism, as well as developing the circuitry that controls our motors and buttons. Given the ultrasonic sensors we could afford within the budget, he made our detection system as efficient as it could be, using some math and a lot of trial and error. He also brought up many pivotal ideas and criticisms that changed our design pathway.



DIANA DOAN

Construction Manager

Diana was heavily involved in the discussion of design and logistics, helping to hash out details regarding changes to our drafts and managing the flow of work. Her input regarding exact dimensioning and renovations of previous ideas is reflected in a lot of the final design. She was also responsible for budgeting, acquiring material, and organizing our official documentation.

CHALLENGES:

- 1 Managing meetings between schedules
 - testing season
- 2 Finalizing our design
 - we all had different ideas/criticisms
- 3 Quality of materials limited
 - we could not afford higher accuracy sensors and stronger motors, so we made do!

IMPROVEMENTS:

- 1 Higher accuracy of volume dispensed
- 2 Higher torque motors for faster dispensing
- 3 More ergonomic design

CONCLUSION:

This project started off with the goal of designing an *attachment* for existing soap dispensers, however, over time, we realized the only way to execute our vision was to completely redesign the current soap dispenser. That served as a hard lesson, as we practically needed to scrap our plan half-way through the quarter and hash out a new design. Nonetheless, we ultimately pulled it off with a great deal of communication, planning, and swift execution. The device works just as we imagined. There are several aspects of our design that can be improved, but we hope that this simple QP contributes to the conversation of increased efficiency in the sanitation industry.