

SteadyDose

A Compact Device for Accessible and Precise Dispensing of Liquid Medicine Dosages

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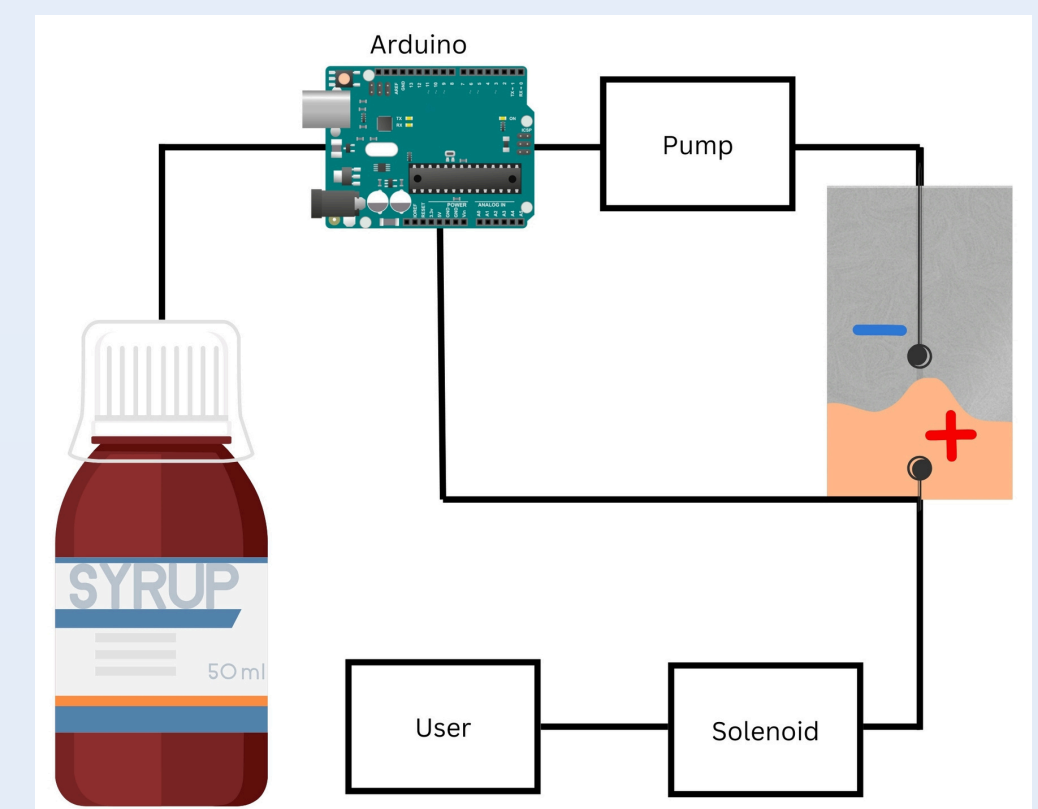
Problem Statement & Objective

Precisely pouring liquid medicine dosages is difficult and time-consuming for individuals who have trouble with fine motor skills, as well as busy families with young children (Maury, 2021). Given this, we designed an automated liquid medicine dispenser to assist these individuals with the medicine measuring process.

Requirements

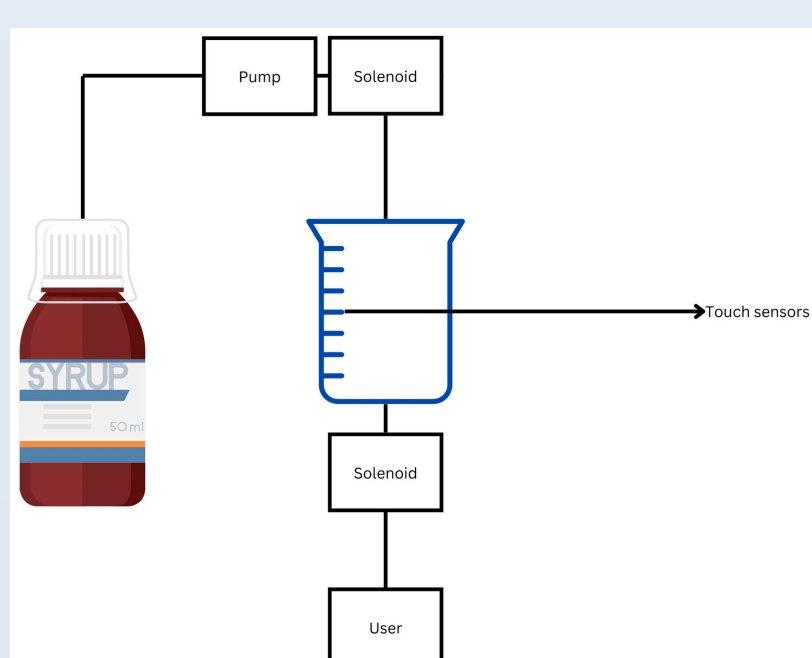
Type	Level 1 Requirements	Y/N
Usability	The device shall be easy for users to understand and operate	Y
Functionality	The device shall support a variety of medicines	Y
Functionality	The device shall have a secure and internal leak-proof design to prevent spills and maintain medication integrity.	Y
Functionality	The device shall dispense medicine within 0.5 milliliters of the specified dosage.	Y
Usability	This device shall be portable.	N

Current Design



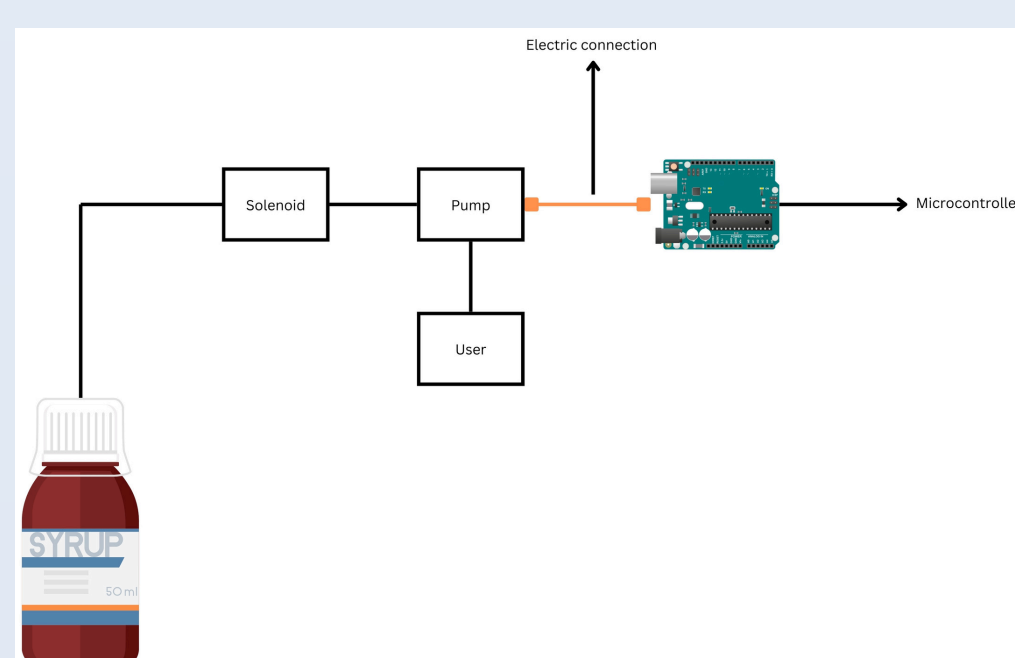
The current design utilizes an Arduino, peristaltic pumping motor, linear actuator, and solenoid. When the **wire on the linear actuator comes into contact with the positively charged liquid**, then the Arduino is triggered and the **liquid stops pumping**.

Design #2



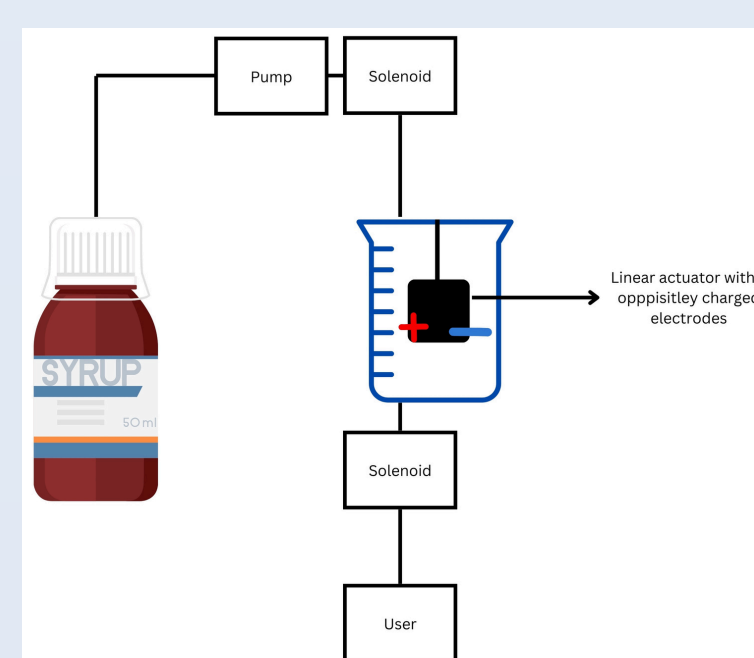
Utilized touch sensors to indicate when proper height of specified volume was reached.

Design #3



Calculated time needed for pump to dispense the exact amount of particular liquid based on its flow rate.

Design #4

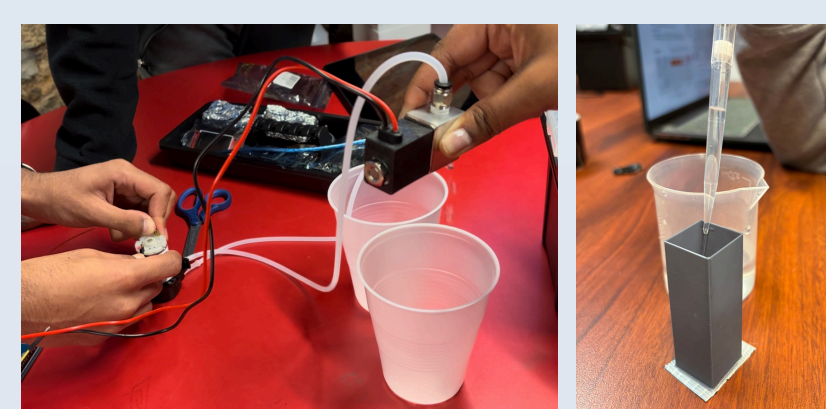


Used a linear actuator to indicate when height of specified volume was reached in known container.

Methodology

1. Generate solutions to problem statement
2. Gather information from client and their desires for the product
3. Order necessary materials (ex. solenoids and a linear actuator)
4. Flow control with the solenoids
5. Pump control with motor driver
6. 3D printing of container for medicine to be placed into once measured
7. Linear actuator to control measurement

Design Study



1) Finding ideal dimensions of the TMSU for optimal precision

- calculated most precise increment based on length and width and maximum volume based on height

2) Testing accuracy of dosage dispensation

- tested dispensed amounts at ten different specified dosages

3) Testing time taken to dispense dosage

- tested duration of time to dispense ten different specific dosages

Future Work

- Connect to cloud
 - trigger with voice assistant
- Dual dispenser with a pill dispenser attached to the liquid one

Conclusion

The SteadyDose device was able to effectively measure liquid medicine within a 5% accuracy rate, reducing the hassle of manually measuring the medication for busy families and individuals who lack fine motor skills.