

SURESTEP



Problem Statement & Engineering Goal

Traditional mobility-aid walkers are challenging for users to navigate stairs independently, requiring caretaker assistance and limiting autonomy. Our goal is to design an affordable walker that allows users to ascend and descend various types of stairs independently and comfortably.



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Level 1 Requirements

1. Allow the user to ascend and descend stairs without excessive movement
2. Be stable and safe for elderly persons use
3. Support a user weighing 300lbs or greater
4. Weigh less than 15lbs

DESIGN REQUIREMENTS

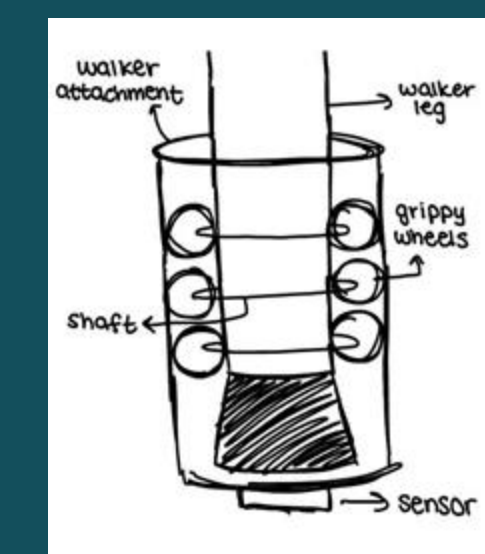
Level 2 Requirements

1. Be stable across stairs of varying heights, widths, and surface textures
2. Be made of less than \$120 materials
3. Be stable enough for one-handed level ground use to allow user to reach for and carry other objects

DESIGN ITERATIONS

1

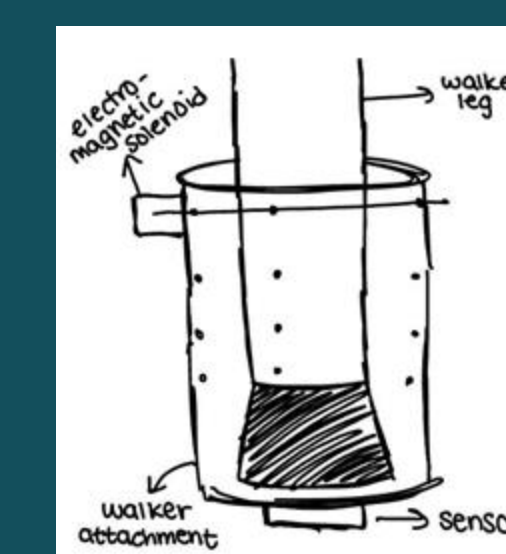
Exterior Tube w/ Grippy Wheel Locking Mechanism



Pros: Low cost, Accessible, Energy-efficient design
Cons: Doesn't provide enough friction to support a user over 300 lbs

2

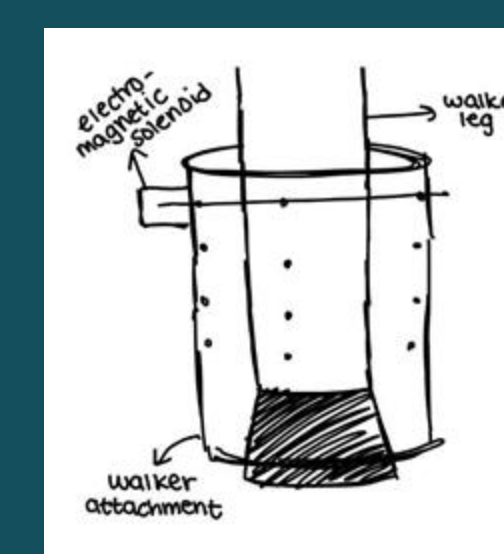
Solenoid Locking Mechanism w/ Exterior Tube Extension



Pros: Greater surface area and contact with ground, sturdier design
Cons: Less stable and requires more material

3

Solenoid Locking Mechanism w/ Interior Tube Extension



Pros: Affordable, Logical, Functional design
Cons: Requires gripping foot-end with greater surface area to provide stability

MEASURING MOVEMENT REQUIRED



Purpose: To determine which prototype design (control/no walker, walker with button, and walker with ultrasonic distance sensor) allows for the least possible movement.
Independent Variable: Main prototype designs
Dependent Variable: Angle at two pivots: hip and knee
Procedure: The angles will be measured using a goniometer placed at two joints.

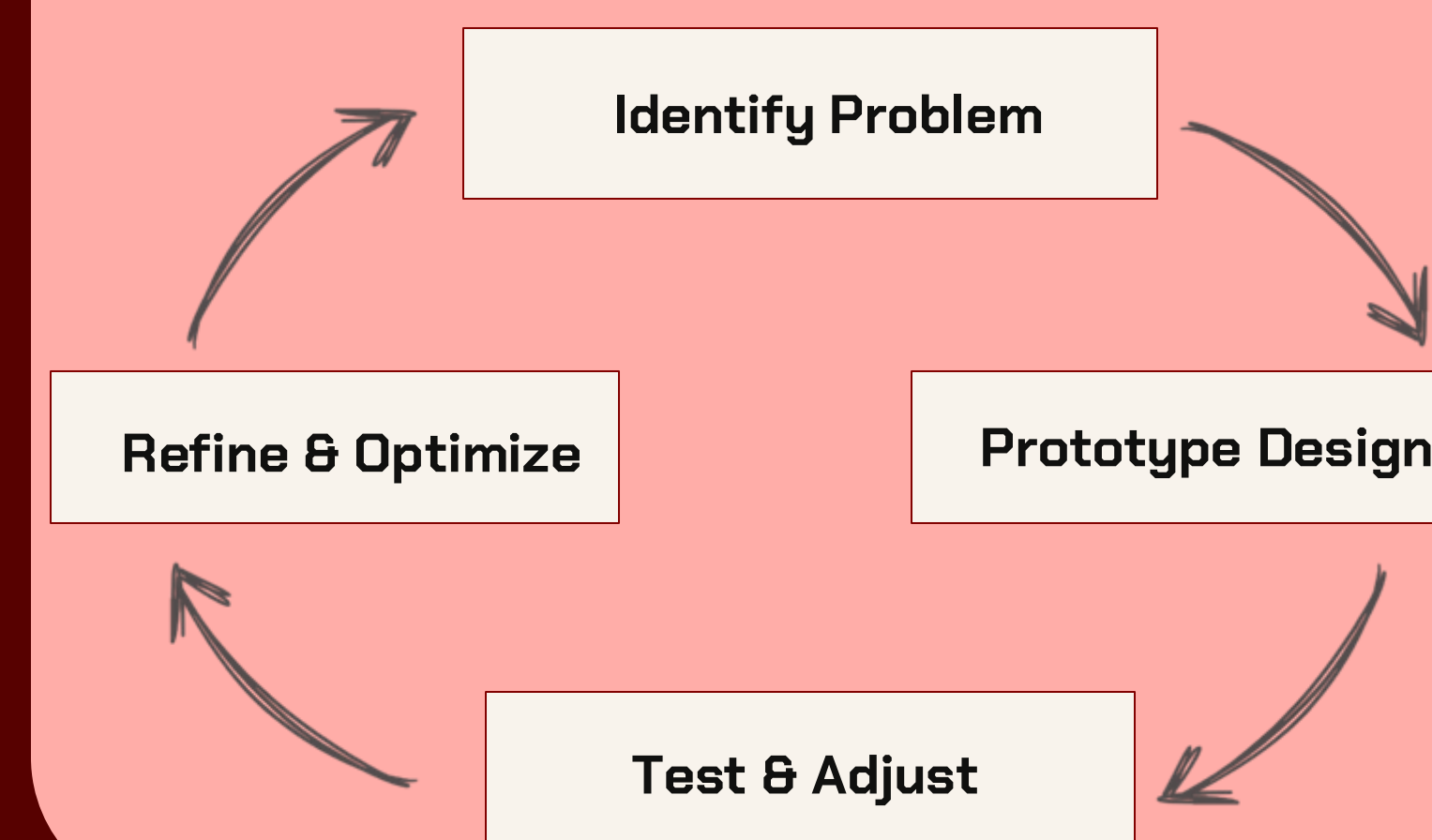
DESIGN STUDIES



VARYING FOOT TYPES FOR STABILITY

Purpose: To determine which rubber foot type/design is most optimal for overall walker stability and support.
Independent Variable: The foot type (circular, triangular, or rectangular designs)
Dependent Variable: The force required to horizontally move the walker from rest, or the static friction.
Procedure: The static friction will be measured using a large-scale force meter spring scale.

METHODOLOGY



CONCLUSION & FUTURE STEPS

The greatest challenge in our project was ensuring the linear actuator extended and retracted accurately in response to the button and sensor.

Moving forward, we aim to incorporate a motion sensor to automate the actuator's extension, enabling it to stop upon detecting contact with the ground.