RoboCart

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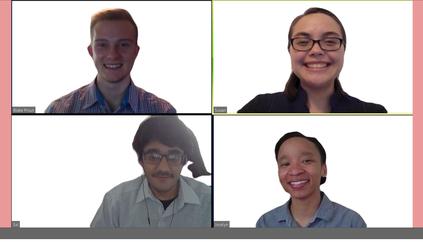


Project Scope

Background

Online grocery shopping is becoming more in demand resulting in grocery store workers to grab and retrieve items from the store. Automating the retrieval of groceries would result in cheaper and faster pickup for online shoppers.

Objective

Design and fabricate a smart object detection robot that grabs and retrieves items from a grocery store.

System Requirements

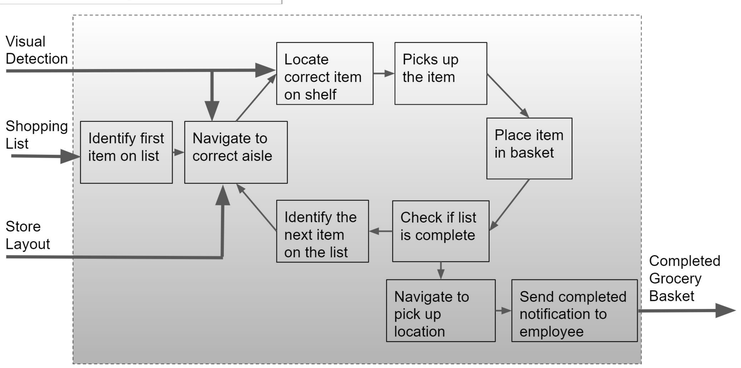


Figure 1: Functional Block Diagram

Key Requirements

- Robot must locate the correct item on the shelf.
- Robot must identify and distinguish between six distinct items.
- Robot must be able to pick up a variety of items to be able to complete the shopping list.

Mission Scenario

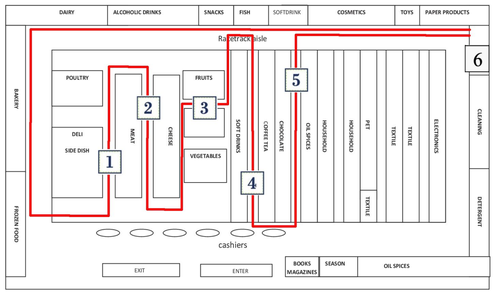
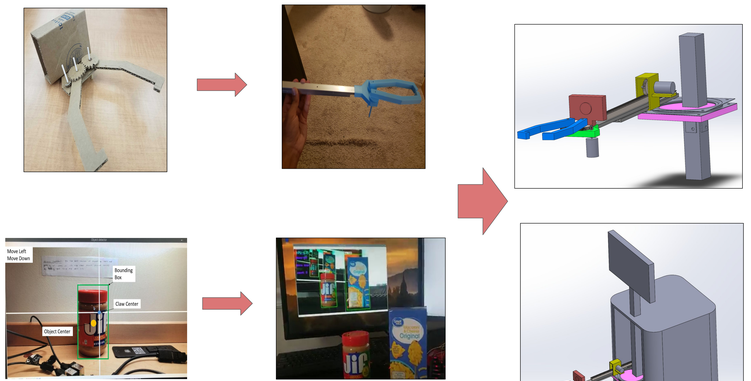


Figure 2: Mission Scenario Diagram

- Locations 1-5 are waypoints
- Location 6 is the unloading destination

Prototypes



Prototype 1:
Designed claw shape and visual detection

Prototype 2:
Integrated claw with arm and ensured the software differentiated between items

Final Design

CAD Analysis

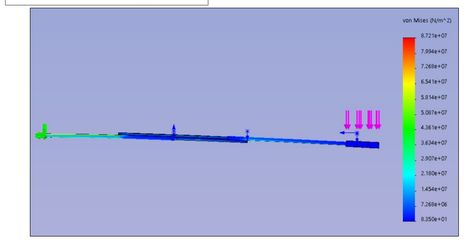


Figure 3: Linear Slide FEA Model

Solidworks Finite Element Analysis (FEA) of the linear slide mechanism. A factor of safety of 3 was obtained.

An FEA model of the 3D printed pinion gear for the claw obtained a factor of safety of 1.3 for the worst case scenario

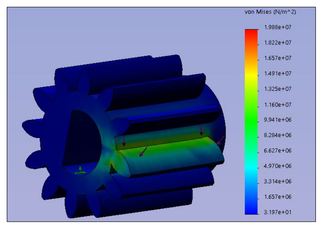
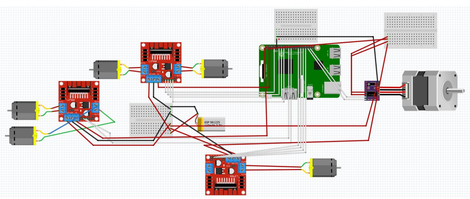


Figure 4: Pinion Gear FEA Model

Electrical Circuit

Figure 5: Electrical Circuit Diagram

- Raspberry Pi Controller
- 5 DC Motors
- 1 Stepper Motor



Future Work

- Increase size of pinion gear
- Order metal gears
- Fabricate final claw design
- Assemble physical robot

Acknowledgements

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