UCI Bottle Lift and Transfer Project

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UCI Samueli School of Engineering

Project Objective

Design and build a vertical lift system to transport a 16 oz plastic water bottle, maintaining its upright position, from a starting height no greater than 2 inches up to a platform positioned between 8 and 12 inches above the table surface. The system should be simple, compact, free-standing, easy to manufacture, quick, reliable, automated, battery-operated, and cost-effective.

Design Goals:

Design achieves the following attributes:

- Carry > 1.1 lbs
- Move in 2 directions, 12” vertically and 3” horizontally
- Minimal Space occupation
- Self supporting and functioning
- Complete task in <2 min w/a 90% success rate
- Total Cost < $250

Design Solutions

- **Binding Components:** Screws, Tape, and Superglue
- **Power Source:** 12V Battery Pack
- **Building Materials:** wood, PLA, and Metal
- **Vertical Motion System:** Rack and Pinion Lift
- **Horizontal Motion System:** Rack and Pinion w/claw and string
- **Sensors:** IR Sensor and Limit Switches
- **Software:** Arduino IDE
- **Electronics:** Functioning circuit

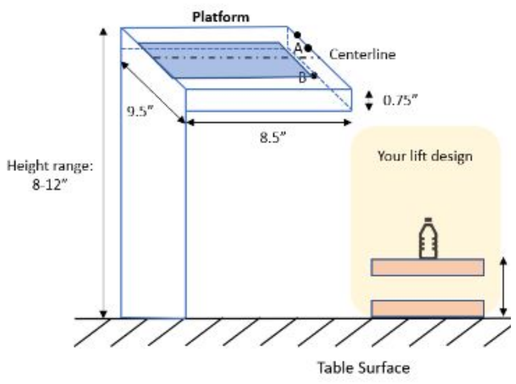

Figure 4: Design description of platform

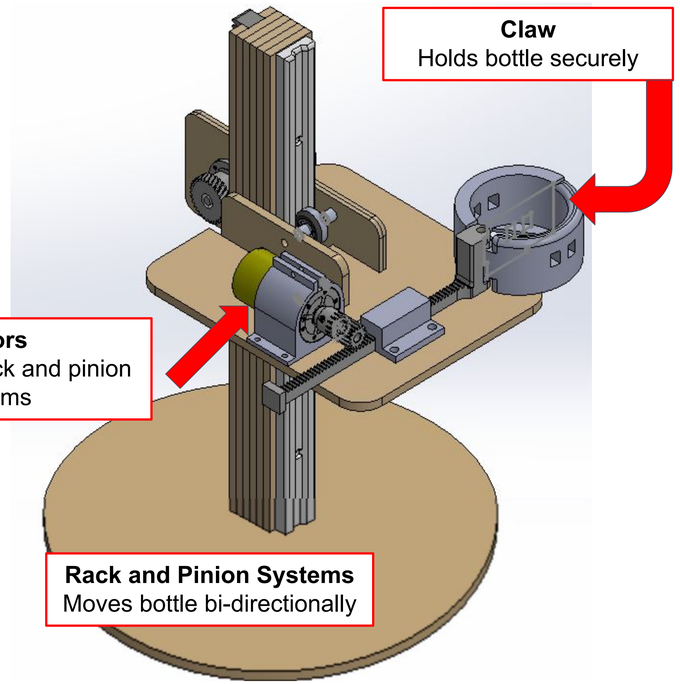

Figure 1: CAD of Bottle Lift.

FINAL DESIGN

- The assembly will use a rack and pinion mechanism to provide vertical lift for the the bottle.
- A horizontal rack and pinion will be used to bring the bottle forward onto the platform.
- Materials used consist of layered ¼” plywood to allow for slight flexibility while retaining sturdiness
- The claw will carry the bottle throughout the entire cycle.
- 12V motors include a 15 kg*cm vertical motor and 7.8*cm horizontal motor
- Arduino will power motors and sensors simultaneously.
- Both IR Sensors and limit switches will detect position of the lift.

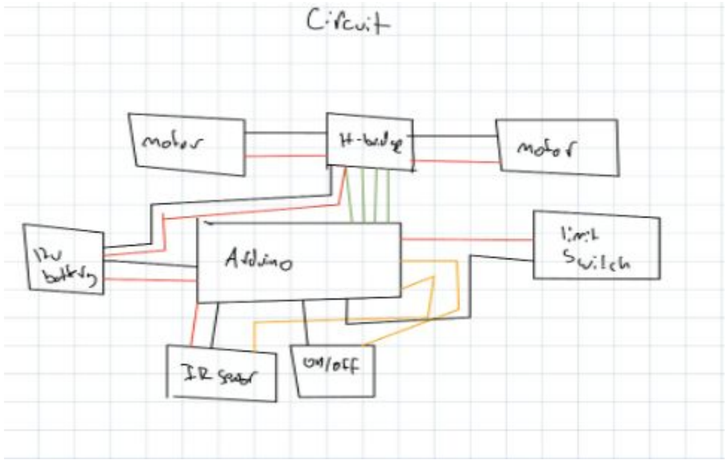

Figure 2: Full wiring for lift mechanism

Motor Analysis for Vertical Lift

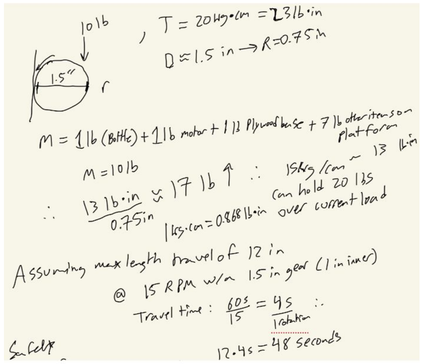

Figure 3: Calculations for vertical lift component

Summary:

Based on the design achievements listed in the overall success section, the design is able to efficiently place a 16 oz water bottle from a lower surface onto a platform in an efficient manner. As part of our MAE 151A class, the bottle lift project acts as a continuation of the former MAE 151 class project, in which different teams are formed to complete this objective. For future design improvements, further research can be done into improving the cost efficiency of the lift mechanism, as the rack and pinions cost half of out allotted $250 budget.

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