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Glide & Slide

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Glide&Slide

Gripper Claw

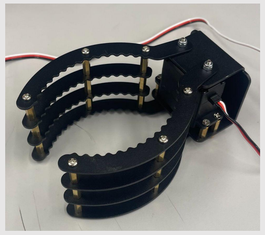

Figure 1: LewanSoul Gripper Claw

Horizontal/Vertical Movement

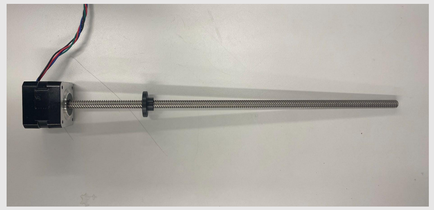

Figure 2: Stepper Motors

Current Model

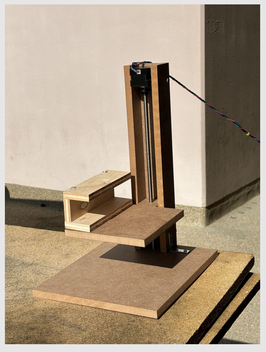

Figure 3: Isometric View

Figure 4: Side View

Analysis

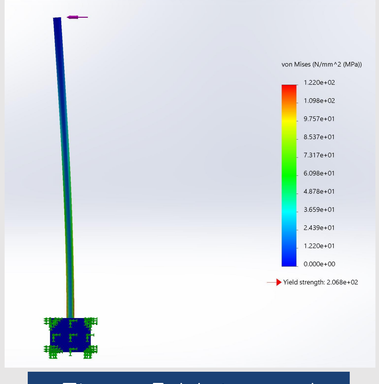

Figure 5: Motor and Lead Screw FEA

$$r_{screw} = 0.004m\,,\ Torque_{applied} = 0.34\,Nm$$

$$F_{Produced} = \frac{Torque}{r_{screw}} = \frac{0.34Nm}{0.004m} = 85\ Newtons$$

$$Weight = \frac{F_{Produced}}{g} = \frac{85\ N}{9.81\ m/s^2} = 8.67\ kg$$

$$Weight_{Transport} = 19.11\ lbs$$

Figure 6: Transport Weight Calculations

Executive Summary

The bottle lift device needs to be compact, free-standing, and battery-operated. It may not extend underneath the landing platform and must allow for the bottle to start no greater than 2" from the ground. The lift must maintain the bottle's upright position throughout the journey and landing on the platform. Once the water bottle is placed onto the landing platform within the landing box, the lift must return to its original position and be ready to repeat the motion. Our design aims to be cheap, efficient, and effective while providing the same features as traditional assembly line devices.

Key Features

- The Vertical and Horizontal Mechanisms
  - Consists of the stepper motor, lead screw, and rails
  - Move the bottle above and onto the landing area
  - Are able to move the bottle back to the starting point
- Gripping Mechanism
  - Consists of a gripper clow and a servo
  - Keeps the bottle upright during transportation
  - Compatible with horizontal and vertical mechanisms

Recommended Future Improvements

- The vertical and horizontal design can be further optimized to increase the performance and reduce budget
- The material strength of the structure can greater support the stress
- The system can be made of recyclable materials
- The sensing calibration and the feedback (code) of the system can be improved in terms of efficiency and accuracy

References and Acknowledgements

FYSETC Store. FYSETC Prus MK3S Nema 17 Stepper Motor. *FYSETC*
HiLetGo Store. HiLetGo IR Infrared Obstacle Avoidance Sensor Module for Arduino. *HiLetGo*
HiWonder. Robotic Claw with Servo, Full Metal Wave Edge Clamp Mechanical Robot Gripper. *LewanSoul*
BOJACK. BOJACK 3 Values 130 Pcs Solderless Breadboard. *BOJACK*
WWZMDiB. WWZMDiB A4988 Stepper Motor Drive with Heat Sink for Arduino, 3D Printer, CNC Machine, or Robotics. *WWZMDiB*

Final Prototype

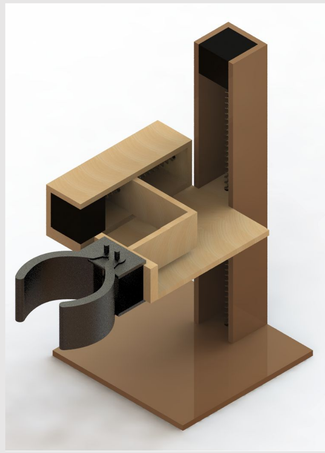

Figure 7: Final Prototype

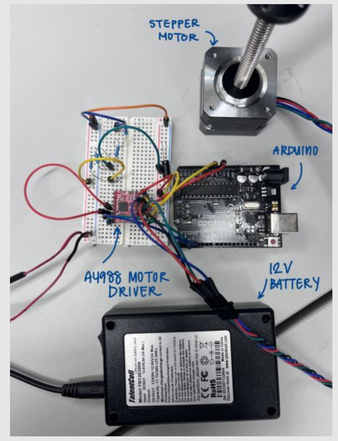

Figure 8: Wiring Diagram of Stepper Motor

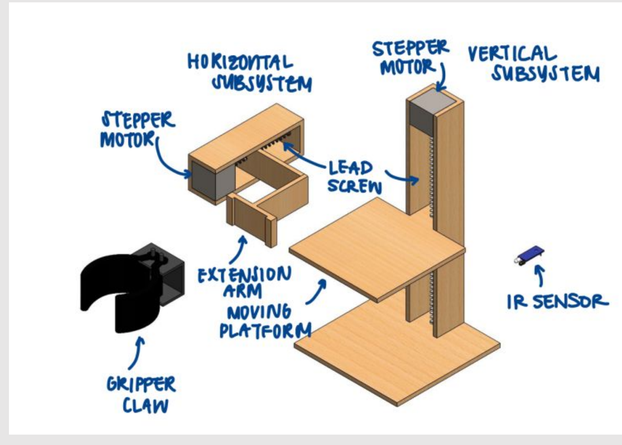

Figure 9: Exploded View of Prototype

- Final prototype shown in Figure 7
- Exploded view shown in FIgure 8
- Wiring diagram of the stepper motor with the A4988 motor driver shown in Figure 9
- Horizontal and vertical components use Nema 17 stepper motors with A4988 motor drivers
- Gripper claw holds the water bottle and releases over landing zone
- IR sensor determines height of platform and allows for autonomy