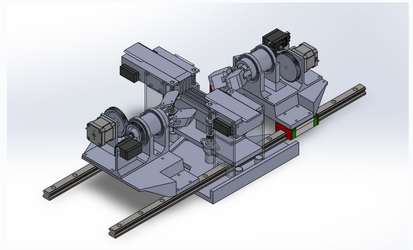
Department of MECHANICAL ENGINEERING
THE UNIVERSITY OF UTAH

Mrs. Twister SNACK WRAPPER



Automated Candy Wrapping Machine

Team: Andrew Carlson, Ryder Jordin, Landon Nipko, Ronan Sullivan, Brennan Beecher, Evan Rand, Cohl Tibbitts
Advisor: Dr. Todd Easton, University of Utah
Sponsor: Julia Simpson, Owner of Mrs. Twister Snack Wrapper

Intro

Our Problem: Candies like caramels and taffy are traditionally wrapped by hand, which is a time-consuming, inconsistent process that limits small businesses and home confectioners.

Our Objective: Develop a compact, automated countertop machine ("Mrs. Twister") capable of reliably wrapping a range of confectionery items with consistent, food-safe results.

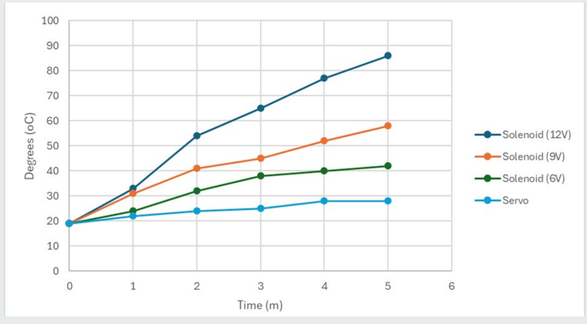
Design Metrics

Metric	Target	Actual
Machine footprint	< 36 x 36 x 24 in	9 x 32 x 20 in
Wrapping speed	< 10 s	9.81 s
Adjustable twist count	User interface	Yes
Candy removability	Safe & consistent	Yes
Manufacturability	Feasible for scale	Yes

Thermal Analysis

To identify safest and most reliable twisting mechanism, we evaluated servo motors versus solenoids positioned near candy path.

Measured Temperature Profiles: Solenoid vs. Servo

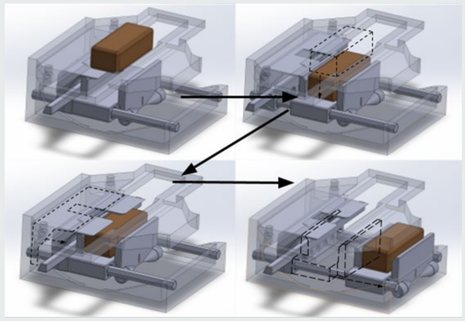


Thermal measurements revealed:

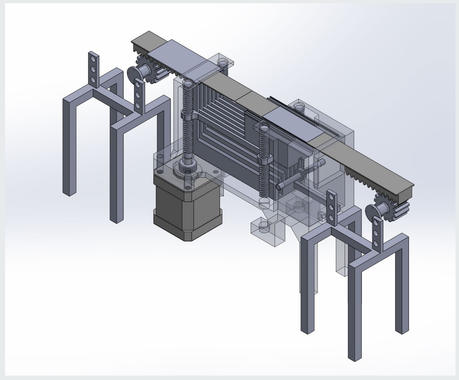
- **Solenoid (HS-1564B):** Rapid heat accumulation, reaching ~80°C at 36 W—posing risks to candy quality, food safety, and component lifespan.
- **Servo Motor:** Stable operation, remaining below 30°C in comparable conditions.

Conclusion: Servo motors offer a safer and more sustainable solution for continuous operation.

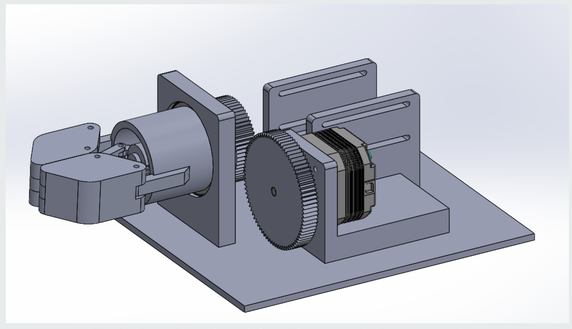
Design Iterations



Initial Wrapping Design



Rolling Overhaul for Electronic Automation

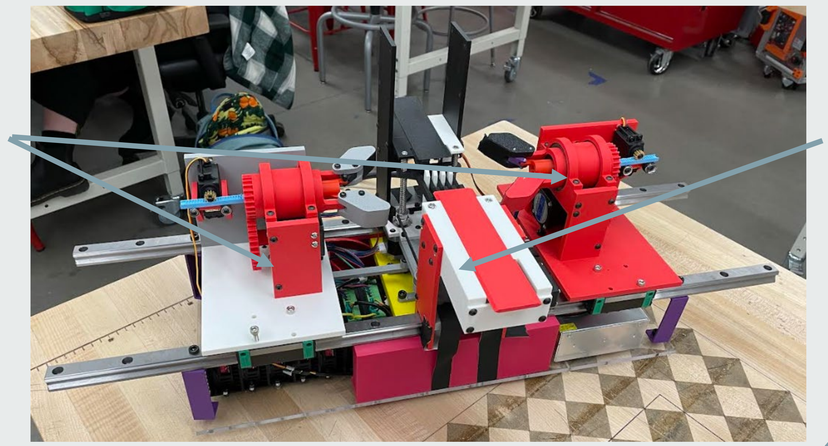


Twisting Overhaul for Electronic Automation

Using the engineering design process, we designed, fabricated, and tested multiple prototypes for each mechanism. The first prototype was a hand-operated model that demonstrated the ability to roll a wrapper around a caramel. We then transitioned to electronically actuated “rolling” and “twisting” subsystems, refining each iteration to improve alignment, consistency, and reliability. These optimized subsystems were ultimately integrated into a unified baseplate for the final design.

System Architecture

Twisting Module: Applies controlled rotational motion to twist the wrapper ends consistently and safely.



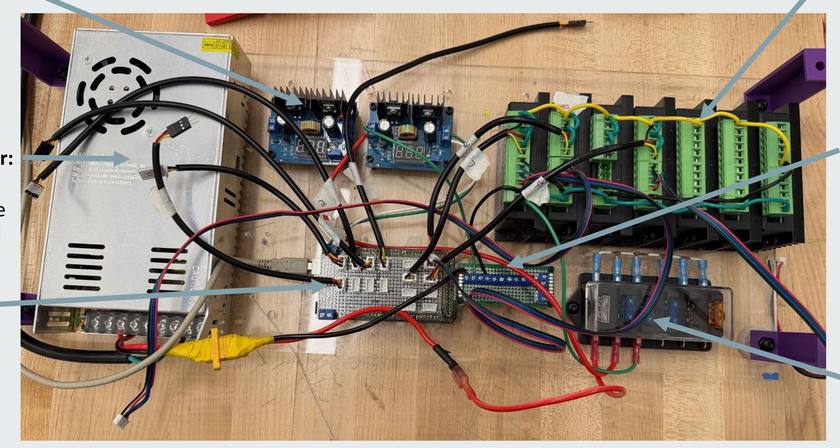
Rolling Module: Wraps the candy by folding the film around it prior to twisting.

Final System - Mechanisms

Buck Converters: Regulate and step down voltage to ensure stable power delivery to sensitive electronics.

AC-DC Power Converter: Converts wall outlet power into low-voltage DC for the motors and control systems.

Arduino Board: Coordinates actuator timing, sensor inputs, and control logic for the wrapping sequence.



Motor Drivers: Controls servo actuation and ensures stable motor performance.

Power Distribution Bus: Routes electrical power to subsystems while keeping wiring organized and safe.

Fuse Box: Protects the system from electrical faults.

Final System - Electronics

Design Process

Our development followed an iterative engineering workflow:

1. **User Need Identification:** Interviews and benchmarking with potential users.
2. **Concept Generation & Selection:** Evaluated multiple twisting, rolling, and feeding designs.
3. **Subsystem Prototyping:** Hand-powered prototypes for rolling and twisting mechanisms.
4. **Integration & Testing:** Combined mechanisms into a functional prototype.
5. **Thermal & Safety Analysis:** Ensured food-safe mechanical operation and temperature.
6. **Refinement:** Improved reliability, footprint, and usability.

Conclusion

Mrs. Twister is wrapping caramels with a 80 % success rate. The design is fully electronically actuated, wraps caramels faster than a person, and satisfies the footprint constraints.

Next Steps:

- Certify electrical and food-contact safety.
- Build packaging and consumer-ready UI.
- Implement final user interface with Raspberry Pi.
- Run cycle-life testing for durability.
- Validate usability with small-batch confectioners.
- Optimize design for mass manufacturing.