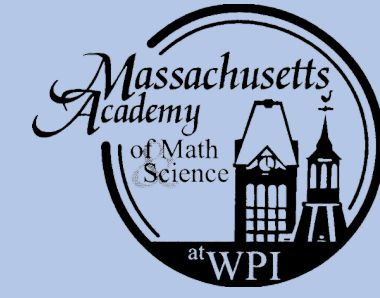


AN ASSISTIVE WHEELCHAIR-MOUNTED

FRISBEE LAUNCHER



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Problem

Due to mobility issues in the shoulder and elbow, those who use wheelchairs cannot throw a frisbee autonomously to play with their dog, friends, or family.

Objective

Design a wheelchair-mounted projectile-launching device to assist clients with throwing frisbees.

Systems Diagram

Wheelchair Mounting

Electronic Control System

- Launch button
- Arduino
- Relay
- Battery

Launch System

- Springs, clips, bearings, etc.

Launch System HAS-A Motor

Figure 1: Systems diagram of proposed design.

Designs

1 Initial cardboard launcher



Figure 2: Top view of proof-of-concept.

2 Manually-operated spring-powered launcher



Figure 3: Manual launcher being used to launch a frisbee.

3 Motorized launcher with plastic gears

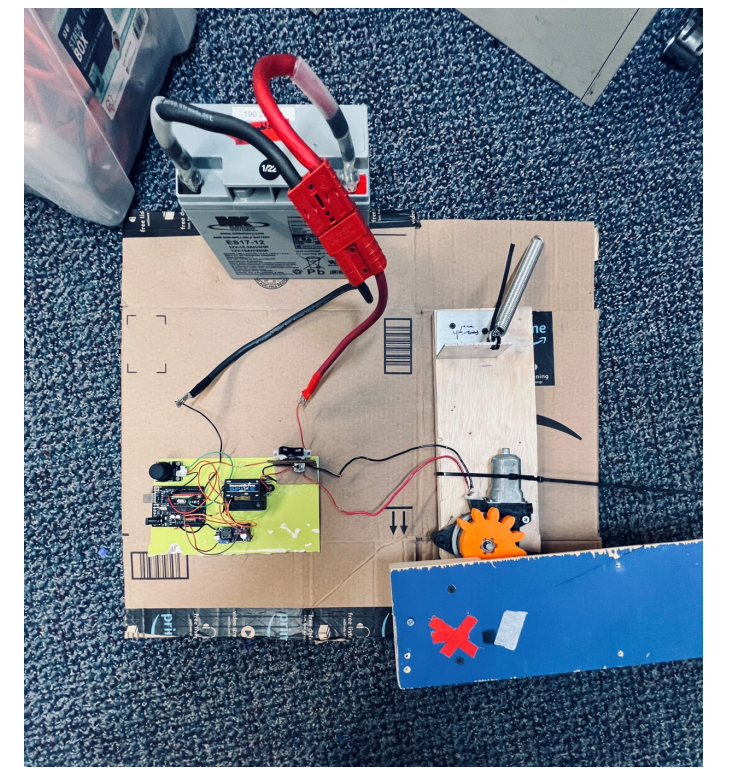


Figure 4: Motorized launcher integrated with electronics.

Requirements

Subsystem #1: Launcher

- The device must have a range of 20 feet.
- The device must not present hazardous parts towards the client.
- The device must be able to launch frisbees.

Subsystem #2: Mounting

- The client must be able to mount the device to the wheelchair independently.
- The device must stay mounted to the wheelchair during any movements.
- The device must maintain the balance of the wheelchair during any movements.

Subsystem #3: Electronics

- The switch must be operable with minimal hand movement only.
- The device must be powered with at most 1 primary battery.

Features

- Launches frisbees **up to 55 feet**
- Supports a **large range of frisbee sizes**
- **Switch adapted** and accessible
- Tested with **precision machining**
- Made with **easily obtainable materials** (wood, cardboard, acrylic, metal)

4 Motorized launcher with aluminum gears

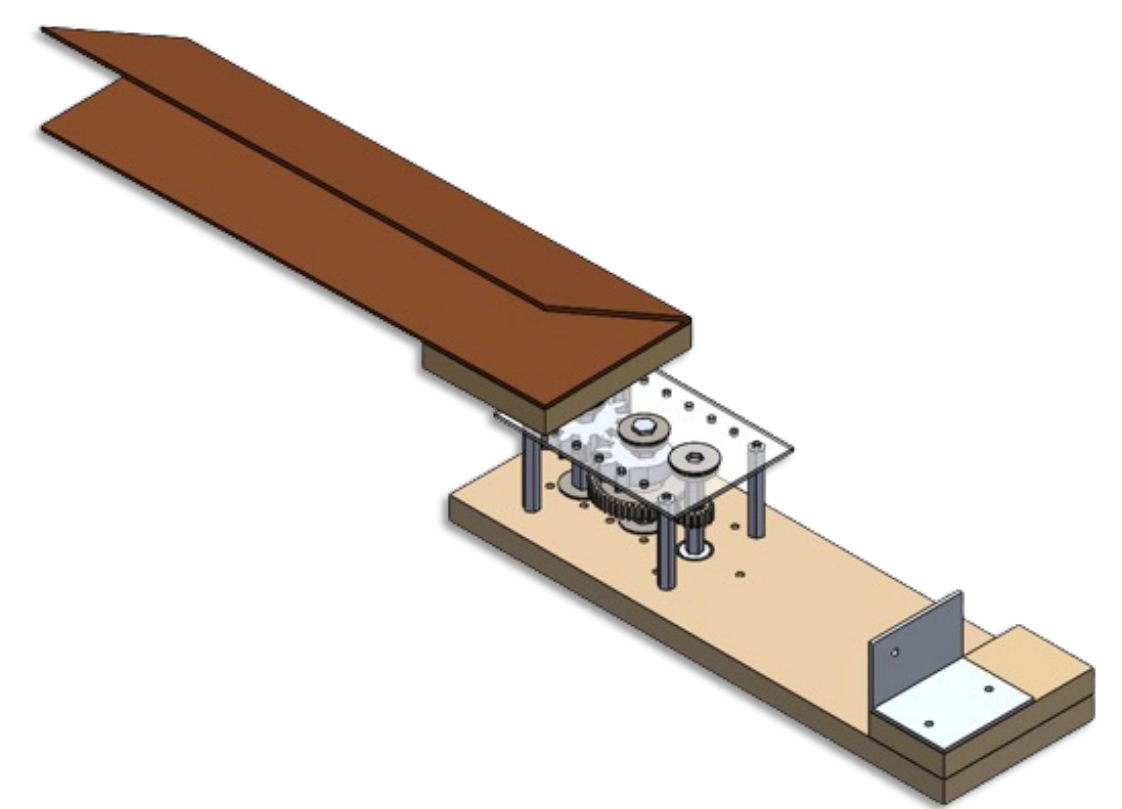


Figure 5: CAD assembly of motorized launcher.

Design Studies

Clip Testing

- 1 Measured launching distances of prototype with and without clip to improve stability without sacrificing power.

Spring Testing

- 2 Observed the impact of spring constant on launch distance by testing the launcher with springs of varying levels of strength.

Mount Stability Study

- 3 Tested the stability of two mounting systems by considering how well they supported weight.

Conclusions

- Device should ideally be manufactured with high-strength materials
- More measures required to ensure client safety

Future Extensions

- Adapt arm to other projectiles
- More robust and versatile mounting
- Casings/barriers to protect the user

