Child Robot

An automated ball thrower to engage children in physical activity.

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Abstract:

This project centers around the addition of a ball throwing mechanism to an existing robot.

This robot has been developed in and studied by Dr. Naomi Fitter's lab. Ball throwing is an excellent task to involve children in for several reasons. Fetching a thrown ball engages the child to interact with their environment, provides exercise, and improves hand-eye coordination and fine motor skills.

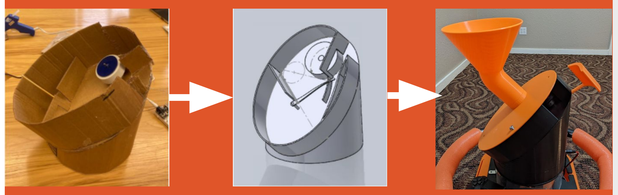

Figure 1: Our design going form prototype to CAD to final product

The design underwent 3 major iterations and many different minor iterations. The launcher consists of 3D-printed and off-the-shelf parts.

- The launcher is remotely activated using a Playstation 4 controller.
- The device meets ASTM standards for child safety.
- Stress tests were implemented and has successfully been used with children.
- The final product is a small launcher that is easy to operate and economical to reproduce.

Figure 6. Two types of balls used for launcher

Figure 3: A child playing with the robot and launcher

Child Testing

Several iterations have been tested with live children and feedback from that has made its way into the third version of the Throwbot.

Figure 5: A ball being launched

Production

- The Throwbot attachment is made from 3D printed ABS in the Oregon State University colorway.
- There are 9 total 3D printed parts that are assembled using a variety of bolts, inserts and glue. This method of manufacturing allows for rapid prototyping of additional elements in the future.
- Wiring of the electrical system requires some knowledge of soldering as wires need to be spliced together. The system utilizes a Raspberry PI Pico to communicate with the Raspberry Pi onboard the assistive robot as well as drive the motor controller and servos. A schematic of this system can be seen in the figure 2.
- The total cost for one unit to be produced is $71.65. This was well below the target of $150.00 for production cost.

Launching mechanism

- The launching mechanism incorporates a 12V DC motor with a wheel attachment, two servos, a raspberry pi and a L298 motor driver.
- Once a ball is placed into the funnel at the top of the system, the user presses a button on the PS4 controller to turn the servo arm, pushing the ball towards the motor-wheel attachment. The motor spins at half power (6V) and launches the ball through the exit hole. Another servo arm is situated on the outside of the exit hole to close the exit once the ball leaves.

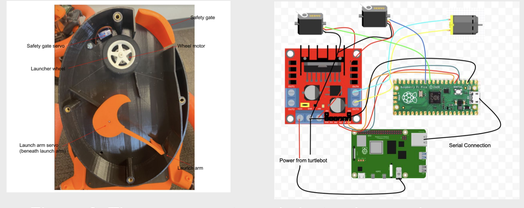

Figure 2: The components and electronics used

Conclusion/Future Implementation

The team set out to create a safe and economical ball launcher that could integrate with an available robot base and increase activity in children. The result is a mostly 3D printed launcher that can shoot balls 8-10 feet. This launcher meets industry standards for child safety. Preliminary use with children showed that they enjoyed interacting with the launcher. Additionally, the client was very happy with the final product. All of the initial requirements for the product were met and all parties involved were satisfied, making this a successful project.

The current solution completely satisfies the client's wants and needs. However, extra features could be added to further engage children. Some potential additions that have been discussed are lights and sounds activated by the placement of a ball into the funnel. This could be done with the addition of a sensor to detect the ball placement and the addition of LED lights. The robot base already has a speaker present that would need to be activated. The exact manner in which this would be done is at the discretion of future engineers on the project

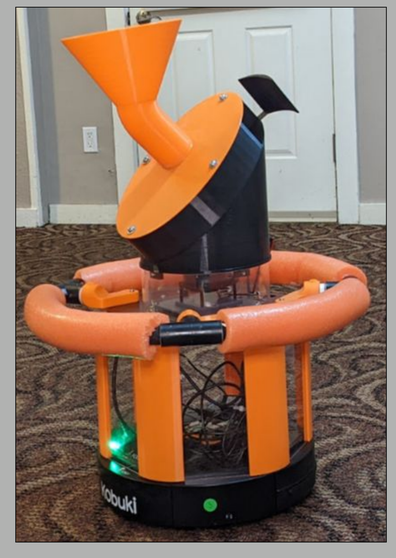

Figure 4: The final launcher

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