Prosthetic Hand: Phase II

Second Chance Engineers

Sponsored by: Jeff Wield

Project Overview

This project is aimed to help a person with transcarpal amputation and hand disarticulation perform daily tasks without the help of a third party.

The client needs a lightweight prosthetic hand that can be attached by the end-user without the help of a third party. This prosthetic will be designed to pick up basic household items such as a soda can, and outlast its predecessor. With aid from the Removal Aid and Glove Stand (R.A.G.S.) the user is able to attach and detach the prosthetic without the help of a third party.

Our sponsor is Jeff Wield, a SDSU professor and lecturer whose emphasis is in Product Design and Manufacturing.

Meet the Team

Team Members	Position
Jonathan Gaasch	*Procurement Lead*
Miguel Duarte	*Manufacturing Lead*
Bryan Maldonado	*Project Manager*
Brian Doyle	*Quality & Systems*
Jason Neumann	*Design Lead*

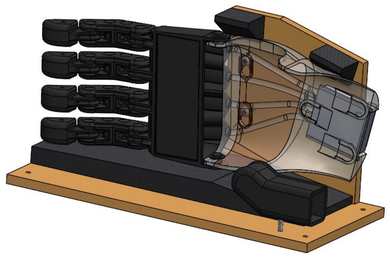
Members listed from left to right

Key Features

Glove Weight: 7 Oz.

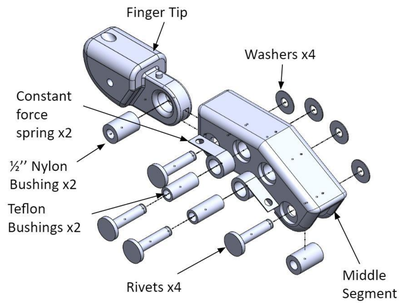
Material: MJF Nylon 12

Glove & R.A.G.S. (Removal Aid and Glove Stand)



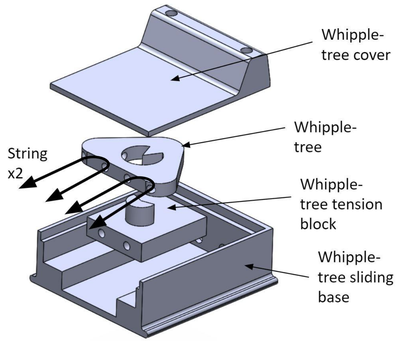
- Guiding foam to help end user safely secure the glove and thumb for attachment and detachment
- Easily able to mount and dismount the glove quickly without help of third party

Finger Subassembly



- Low friction bushing & rivet joints.
- Constant-force springs for smooth actuation
- Extremely lightweight.
- Gecko material on the underside provides significantly improved gripability

Whippletree Subassembly



- Limits slack in strings to ensure maximum possible actuation is achievable.
- Controls tension by sliding along the rails in the hand shell. Whippletree pivots about the tension block so each finger can continue actuating even if one is unable to.

System Performance

Due to the COVID-19 induced campus shutdown, system testing and fabrication was pushed back by several weeks as the team adjusted. The team and end-user could only conduct testing through Zoom meetings featuring system prototypes, and we can confidently conclude the system will conform to the functional requirements based on the success of Prototypes 3 and 4. This is because the delivered product will be adjusted very slightly to meet desired performance parameters.

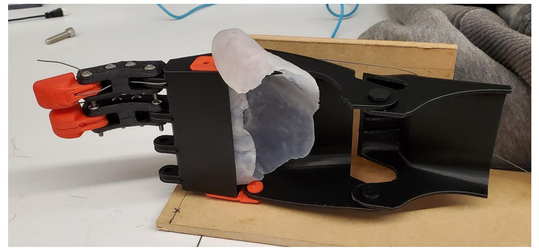
The end-user reported Prototype 3 to be comfortable, lightweight, and features a smooth actuation mechanism that allows fingers to bend in a swift motion. The R.A.G.S. mechanism is also extremely easy to use, especially with the implemented foam guides that aid with proper alignment of the catch points and notches.

Our end-user was able to bend the glove's fingers, allowing them to successfully hold common objects of various radii (See below).

Prototype Process

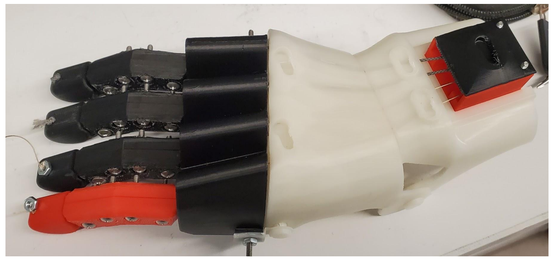
Key Changes

Prototype I



- Focused on comfort
- Fingers flexed completely

Prototype II



- Adjustments to fit contour of wrist
- New string path

Prototype III

- Leveled hand and wrist for less fray
- Hand and wrist portion combined to one part.

Prototype IV

- Integrated gecko material on finger socket and fingers
- Height of finger socket increased to improve travel of string and subsequent grip angles

San Diego State University

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