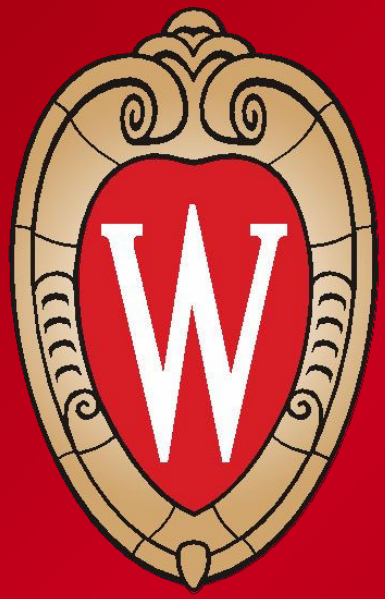


WISCONSIN

UNIVERSITY OF WISCONSIN–MADISON

UW BME Design

Individualized Finger Prosthesis

Hannah Mrazsko– *Team Leader*

Jason Dekarske – *Communicator*

Sahand Eftekari – *BSAC*

Stephan Blanz – *BWIG*

Kaela Ryan – *BPAG*

Bailey Ramesh – *BPAG*

Dr. Ed Bersu – *Advisor*

Gregory G. Gion – *Client*

Overview

- Problem Statement
- Background
- Design Specifications
- Preliminary Designs
- Design Matrix
- Future Work

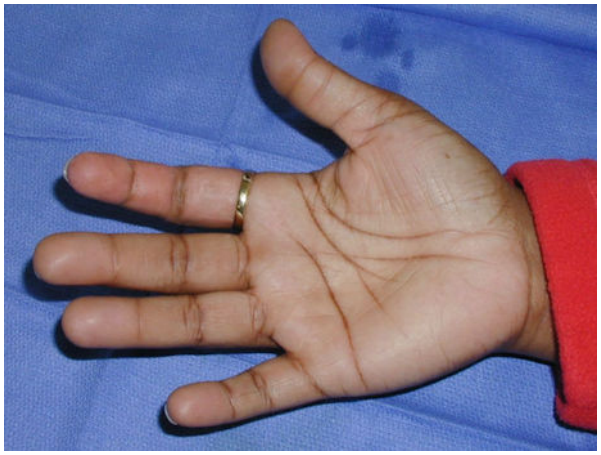
Problem Statement

The Challenge: Design a financially reasonable and mechanically functional finger prosthesis without sacrificing aesthetics.

Background

- Approximately 61,000 partial hand amputations a year in the U.S.
- Current options restore phalange include a cosmetic or functional prosthesis
- Costs roughly $4,000-$8,000 to acquire prosthesis

Cosmetic



http://www.medicalartresources.com/services-directory/finger-toe-2/

Functional

http://www.npdevices.com/patients/pipdriver

Product Design Specifications

- Client Requirements
  - Connect our mechanism to the residual finger
  - Easily reproduced within the client's laboratory
  - Max budget of $500

Product Design Specifications

- Design Requirements
  - Provide proper tension and flexion
  - Small enough to be concealed underneath a cosmetic coating provided by client
  - Durable for everyday tasks

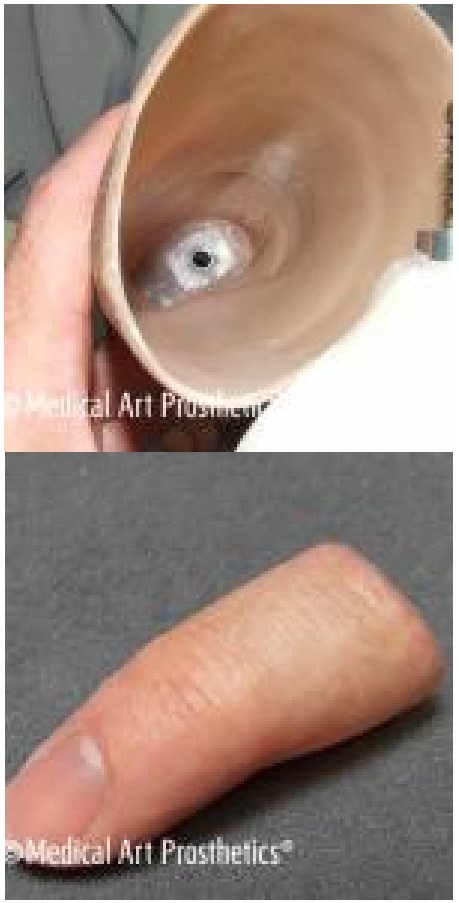
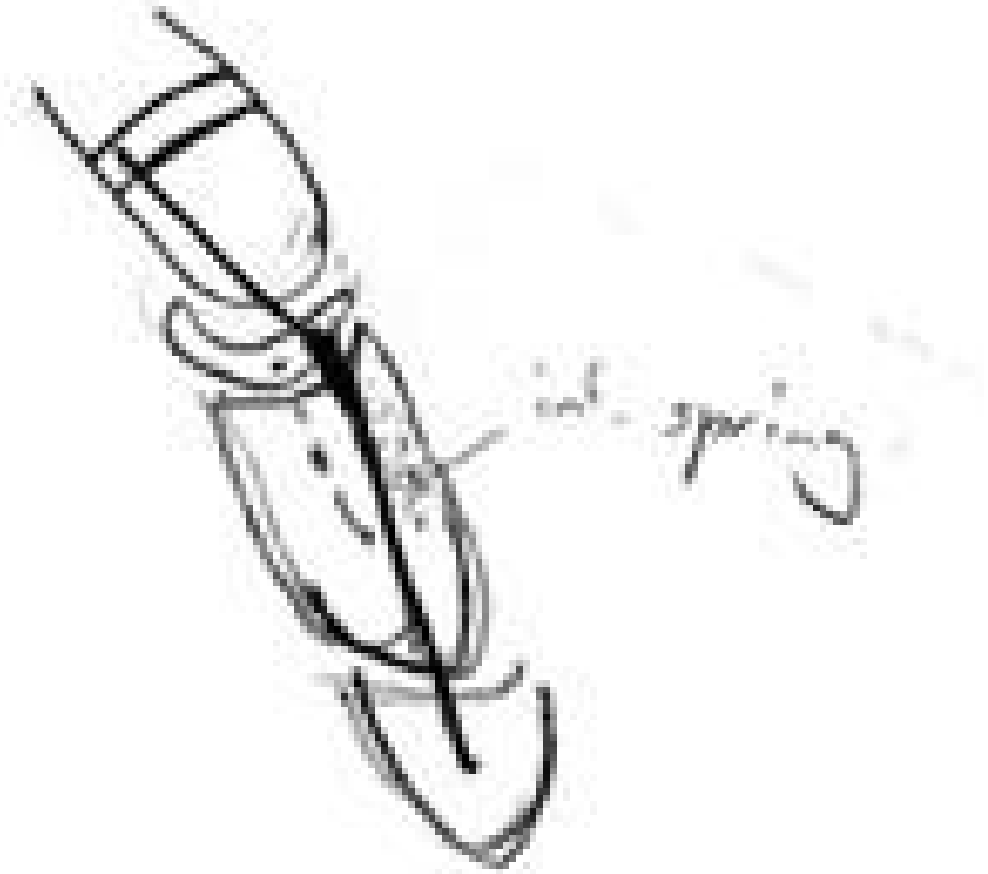
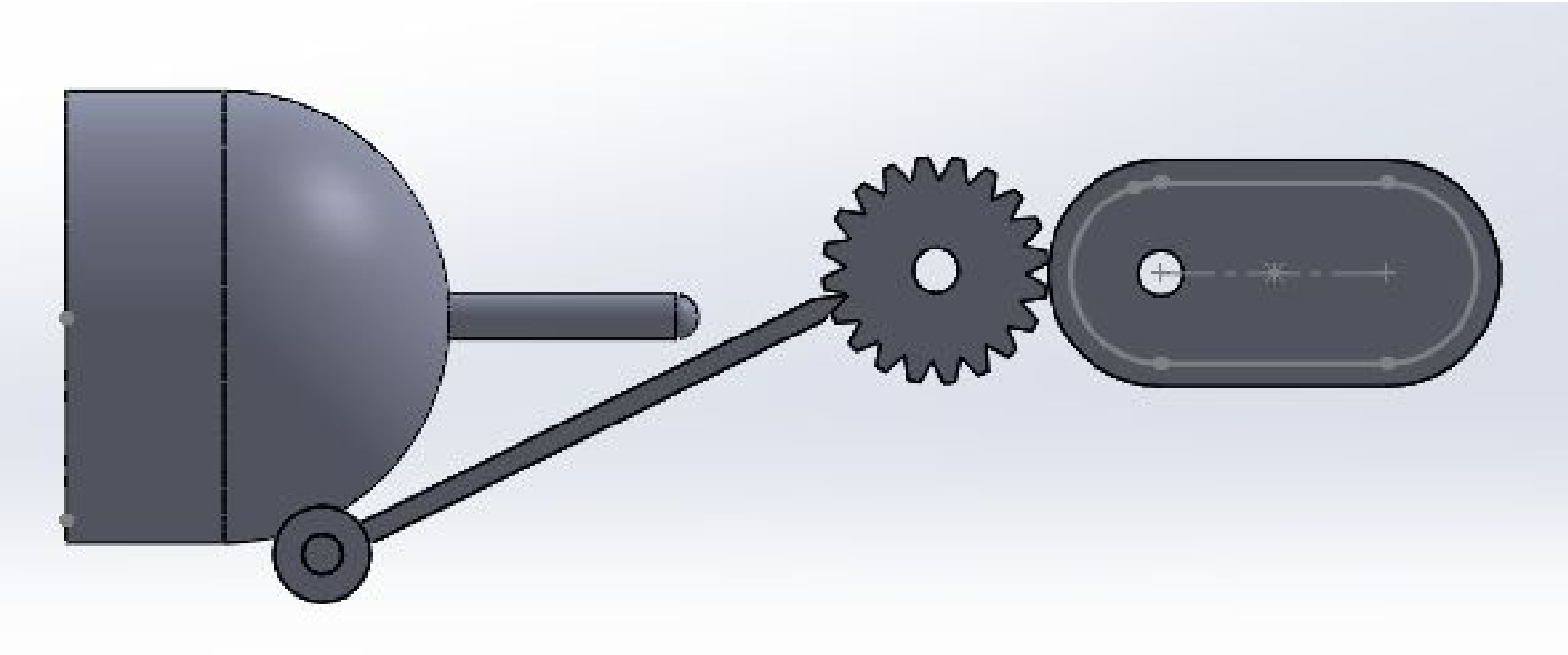


Image courtesy of medicalartprosthetics.com

Design Alternatives

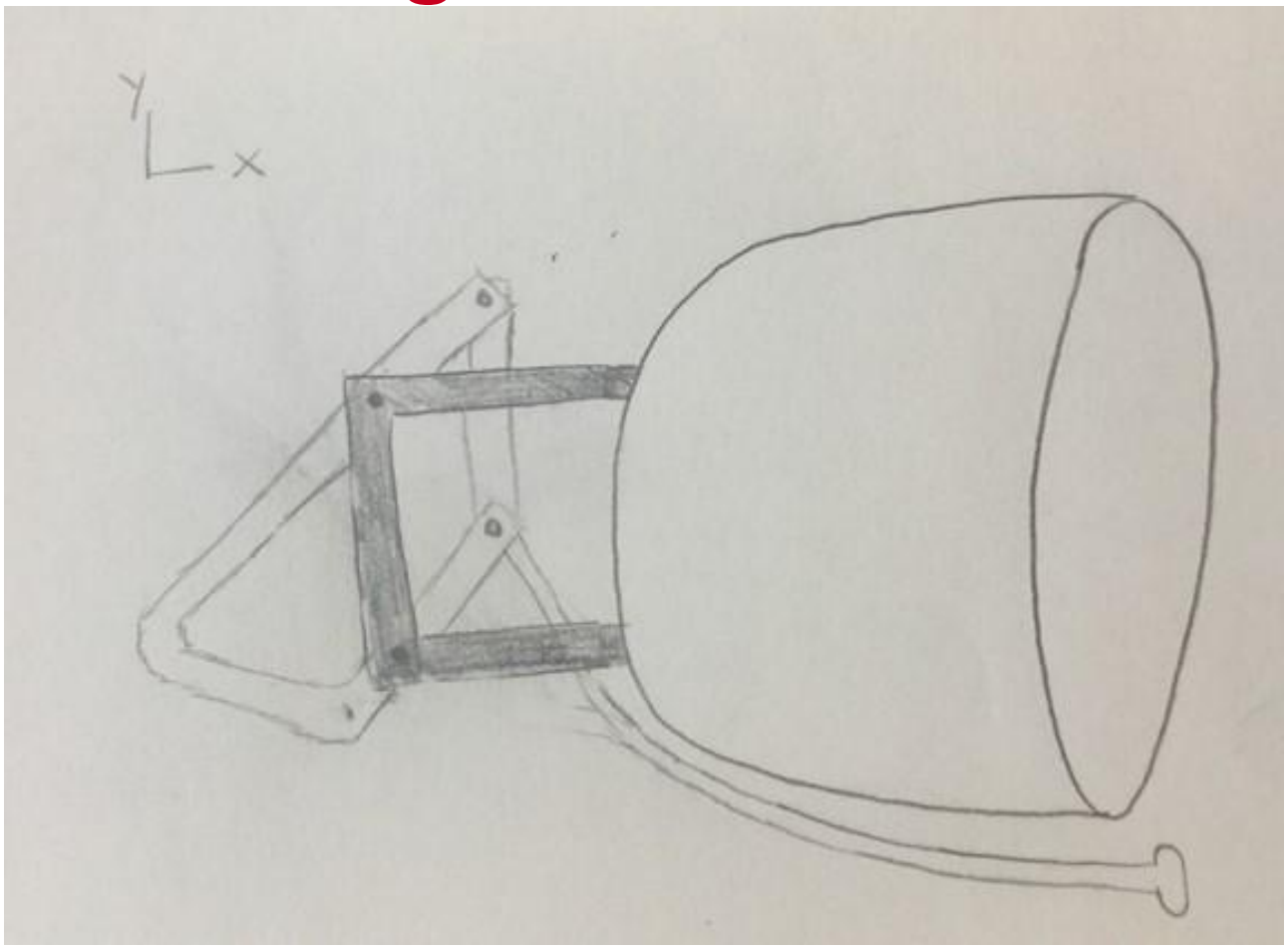


Design Alternatives

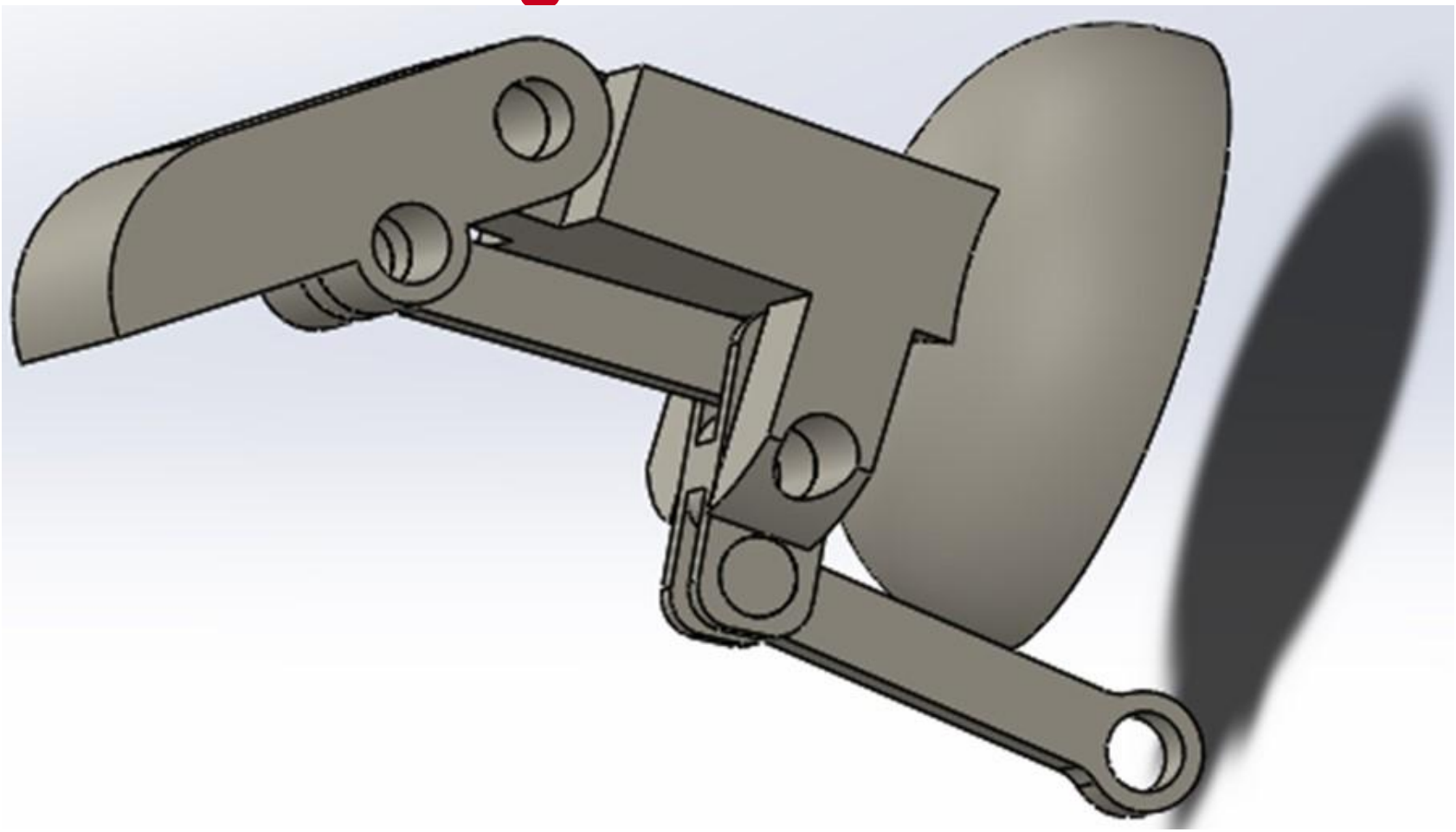


Design Alternatives

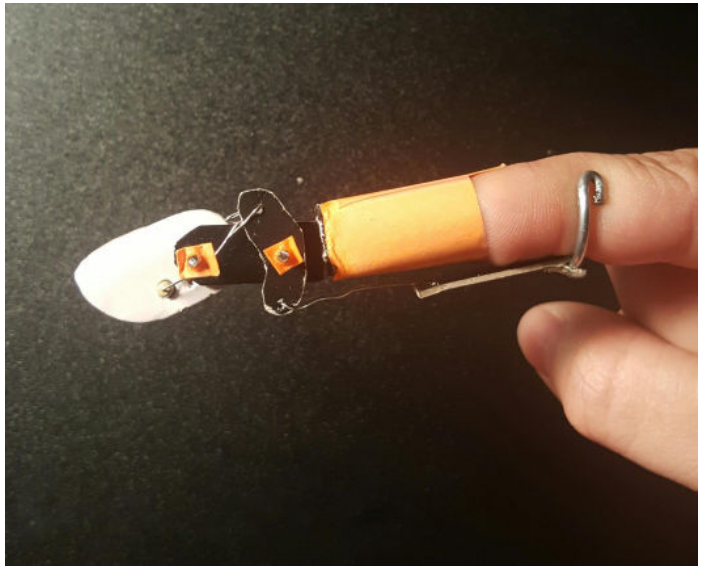
Design Alternatives

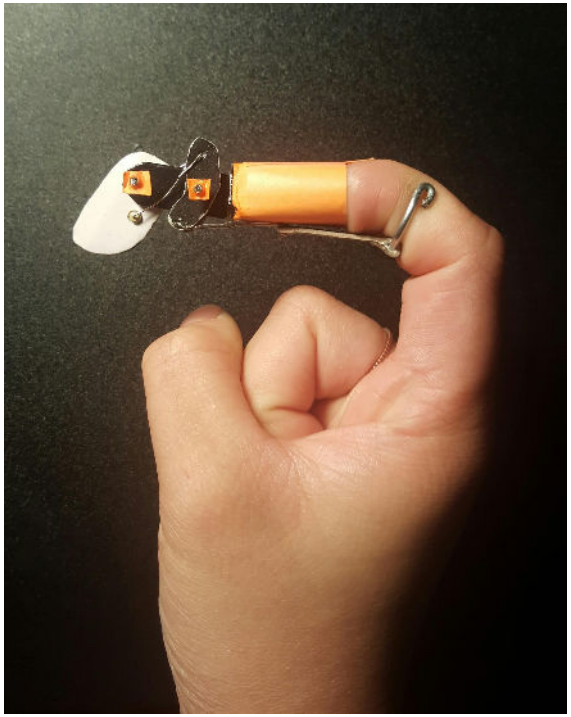


Design Alternatives

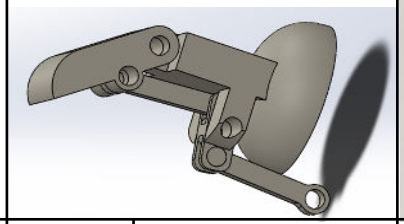
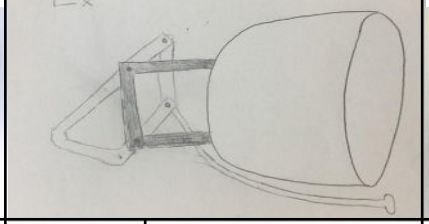
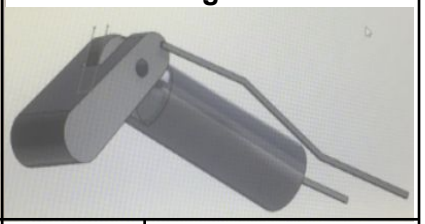


Design Alternatives





Design Matrix

	Weight	Links 		Two Bar Push / Pull 		Leverage Joint 	
Ease of fabrication	20	4/5	16	4/5	16	4/5	16
Functionality	20	4/5	16	4/5	16	3/5	12
Simplicity of design	15	4/5	12	3/5	9	4/5	12
Estimated lifespan	15	4/5	12	4/5	12	3/5	9
Weight	10	4/5	8	5/5	10	4/5	8
Safety	10	5/5	10	5/5	10	4/5	8
Cost	10	5/5	10	5/5	10	4/5	8
Total			84		83		73

Future Work

- Creating a natural look
  - Preventing abnormalities while bending
  - Bulkiness
- Moisture control - worn 16 hrs/day
- Device adjustment
- Resilience to various amounts of pressure
- Durability - device should last 3-5 years
- Safety concerns

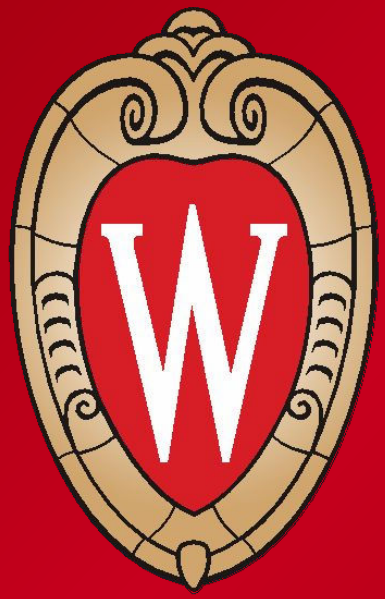
Future Work

- Final prototype

Image Source: http://cticit.services/home.html/single-page.html

References

- “Amputation Statistics in the United States” Davis Law Group http://www.injurytriallawyer.com/blog/amputation-statistics-in-the-united-states.cfm



WISCONSIN

UNIVERSITY OF WISCONSIN–MADISON