Muscle-Activated Prosthesis

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Project Origins

Born of Raptors
Raptor Hand

- Mechanically driven
- 3-D printed
  - Customizable
  - Cost effective
- Aimed for children

http://www.messiah.edu/homepage/2077/raptor_hand_project_helps_little_girl
Myoelectric Prosthesis

• Driven by muscle flexion

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Myoelectric Prosthesis

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- Electrical signal read on surface of skin
- Signal drives motors
- Provides increased functionality and grip strength

[Link](http://limbclinic.com/thought-controlled-prosthesis-is-changing-the-lives-of-amputees.php)
Warranted Need

• Cost >$50,000

https://www.cascade-usa.com/bebionic-myoelectric-hand.html
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- Eric Shoemaker
  - Local prosthethist partner
  - Has low-income clients

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MAP Goals

- Affordable at <$1,000
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- Hand weigh <500 grams
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http://www.rehab.research.va.gov/jour/2013/505/page599.html
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- Close/open hand in around 1.2 seconds

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• Achieve required grasps

• Close/open hand in around 1.2 seconds

• Completed device in 3 years

http://www.rehab.research.va.gov/jour/2013/505/page599.html
Mechanical Aspects
Motor Set-up

- 1 motor for each finger group
  - Allows multiple grips
  - Less expensive
Current Prototype Design
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Worm Gear

Spur Gear
Current Prototype Design
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Electronics and Software

It's all about the circuitry and code here.
Myoware Muscle Sensor
Arduino Uno
Prosthetic Hand
Integration

- Myoware Muscle Sensor
- Arduino Uno
- Prosthetic Arm's Motor
Forearm Muscles
Decisions
The Future
Future Goals

**Mechanical**
- Design opposable thumb
- Introduce compliance
- Replace Lego parts and implement more permanent components

**Electrical**
- Design a feedback system for the Arduino
- Control multiple motors in one signal
- Research and design a myoelectric sleeve
- Choose batteries based on electrical constraints
Acknowledgements

- Dr. Emily Farrar
- Paul Myers
- Dr. Don Pratt
- Dr. Mike Robinson
- Eric Shoemaker and Ability Prosthetics & Orthotics, Inc
- Dr. Brian Swartz
Questions?