Benefits of Additive Manufacturing

In R&D of Upper Limb Prosthetics

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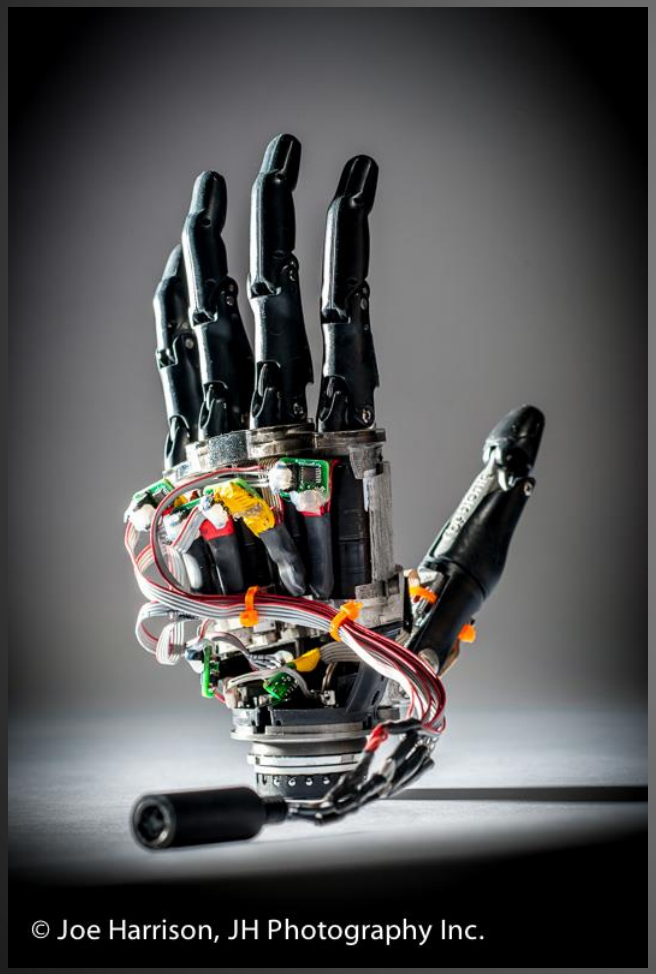

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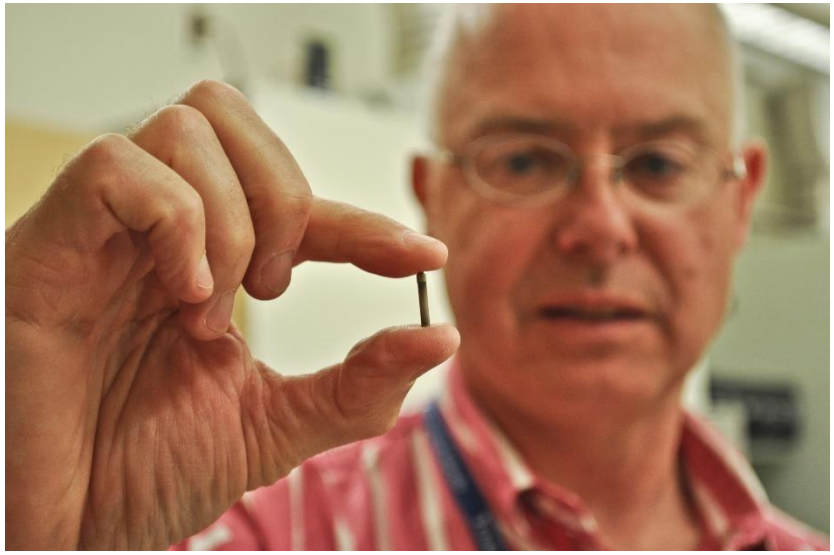
BIOMECHATRONICS LAB

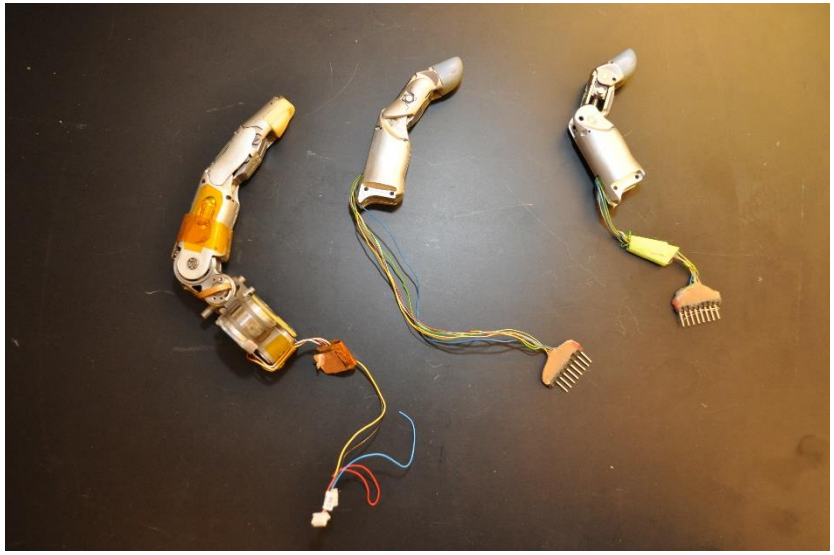
Dr. Richard Weir
Research Associate Professor
Department of Bioengineering
College of Engineering and Applied Science
University of Colorado, Denver

RICHARD WEIR PHD.

Dr. Weir came to the University of Colorado, Denver from Northwestern University in Illinois.

He works with the University as well as the Veterans Affairs to develop cutting edge upper limb prosthetics.





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STEPHEN HUDDLE MS

Professional Research Assistant

Taught in public schools for 10 years.

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JACOB SEGIL PH.D.

Instructor

General Engineering Plus program

Mechanical Engineering Department

CU Boulder

Postdoctoral Research Fellow

Biomechatronics Development Laboratory

University of Colorado
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ADDITIVE MANUFACTURING

A fancy way of saying 3-D printing

There are several technologies that are considered 3-D printing.

- Fusion Deposition Modelling (FDM)
- PolyJet 3D
- Direct Metal Laser Sintering (DMLS)
- Among others

PROCESS CONSIDERATIONS

Material Properties desired

Type of Material

Build size

Resolution

Finishing Processes

Build Time

STEREOLITHOGRAPHY

Using UV lasers and a photopolymer bath, 3D objects can be printed layer by layer.

Oldest Technology

High tolerance

Good surface finish.

Parts are strong enough to be machined.

Vertical resolution 0.05mm to 0.15mm

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FDM

- This technology offers strength and durability but comparatively low resolution
- Layer height ~0.1mm
- Many types of thermoplastic

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POLYJET 3D

This technology offers high precision and moderate strength as well as a variety of material properties and colors.

The photopolymer material can be combined for differing colors and material properties.

DIRECT METAL LASER SINTERING

This technology offers high precision and strength.

Time for production is much longer than plastic 3D printers.

SIMILAR PROCESSES TO DMLS

Selective Laser Melting

- Melts the metal into a solid homogeneous mass

Selective Laser Sintering

Electron Beam Melting

TESTING NEW DESIGNS

NASA recently tested a 3D-Printed Rocket Fuel Injector

- Traditionally it takes a year to produce
- The 3D printed device took 4 Months.
- The 3D printed injector only has 2 parts, a similar typical injector has 115 parts.

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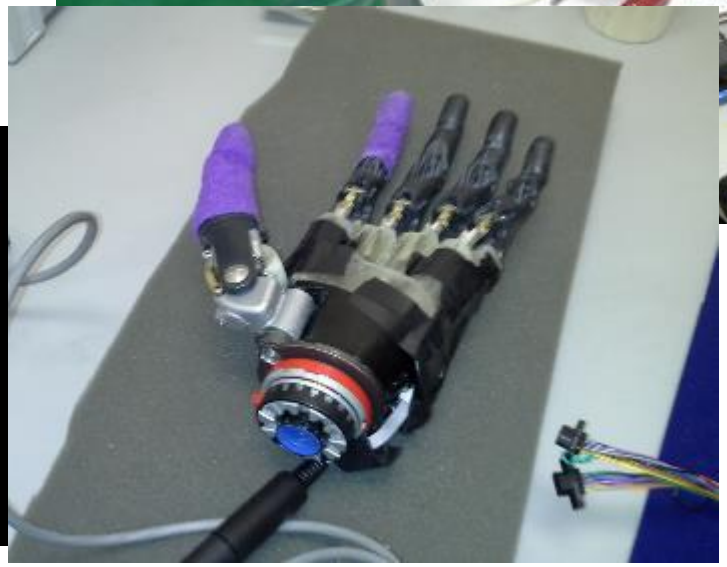
EXAMPLES



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RESEARCH AND DEVELOPMENT

3D printing has touched many fields

- Manufacturing
- Art
- Fashion
- Design
- Research and Development

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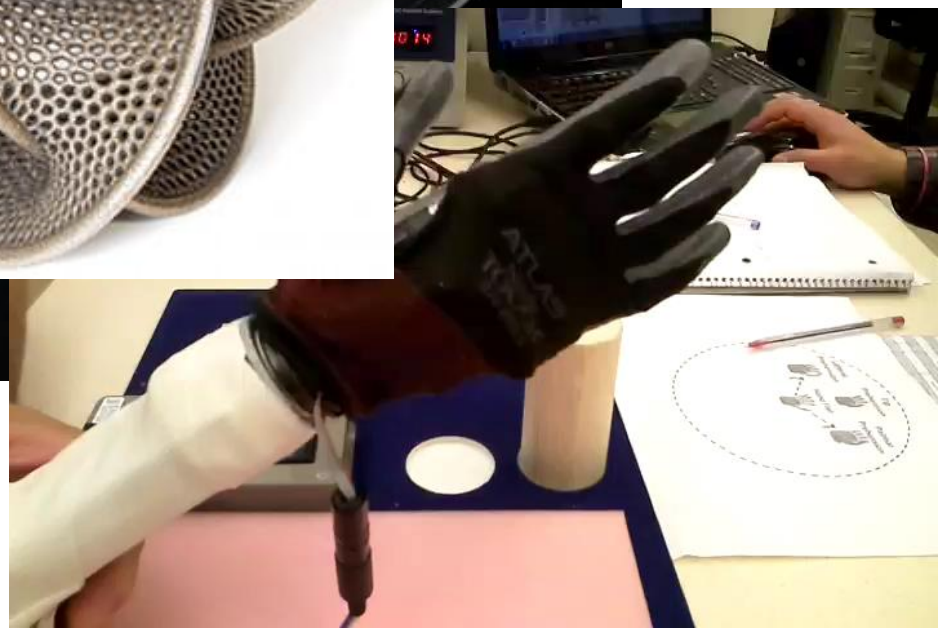
RESEARCH AND DEVELOPMENT

The possib to be realized.

- Faster proc
- Made to o
- Biological
- Finer or mo



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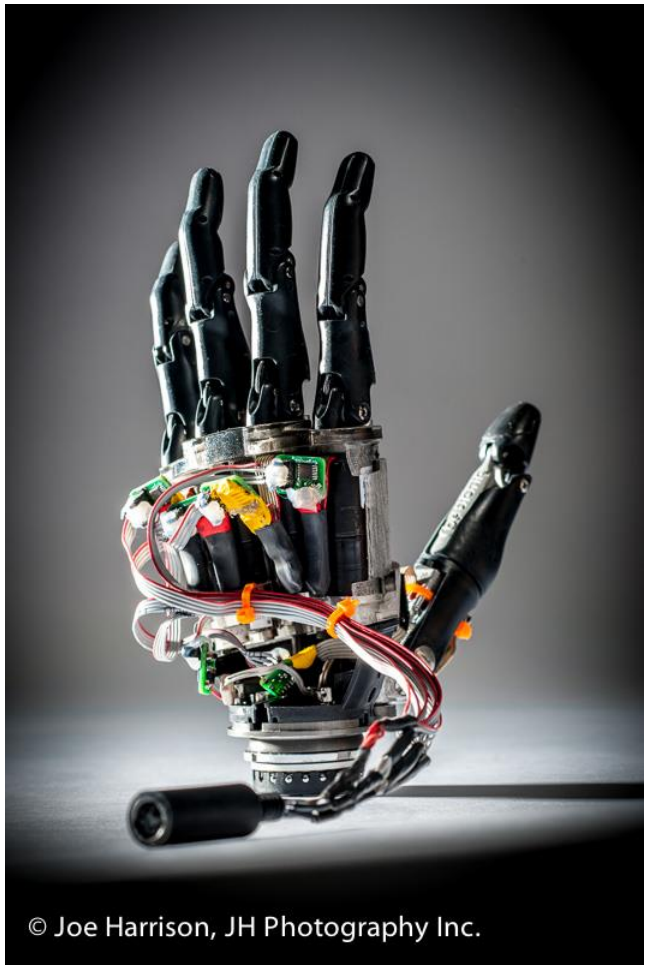
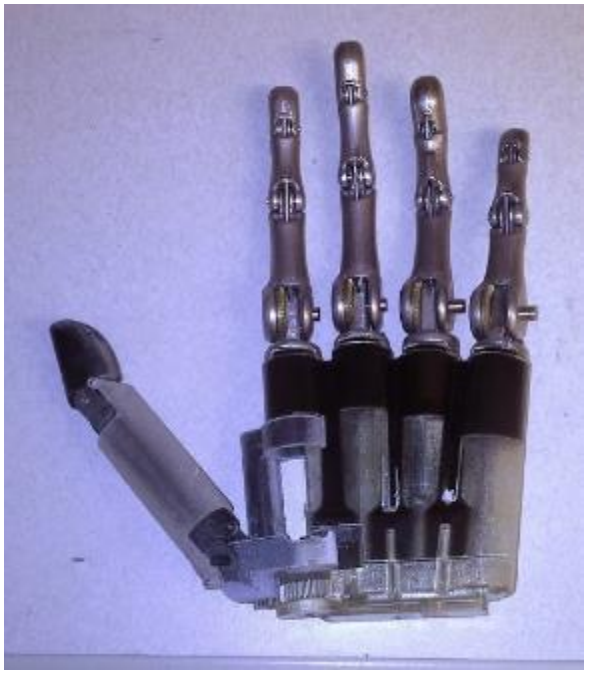
PROSTHETIC HAND DEVELOPMENT

Creating our own vision.





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PROSTHETIC HAND DEVELOPMENT
A CASE STUDY

Adding new capabilities to existing products

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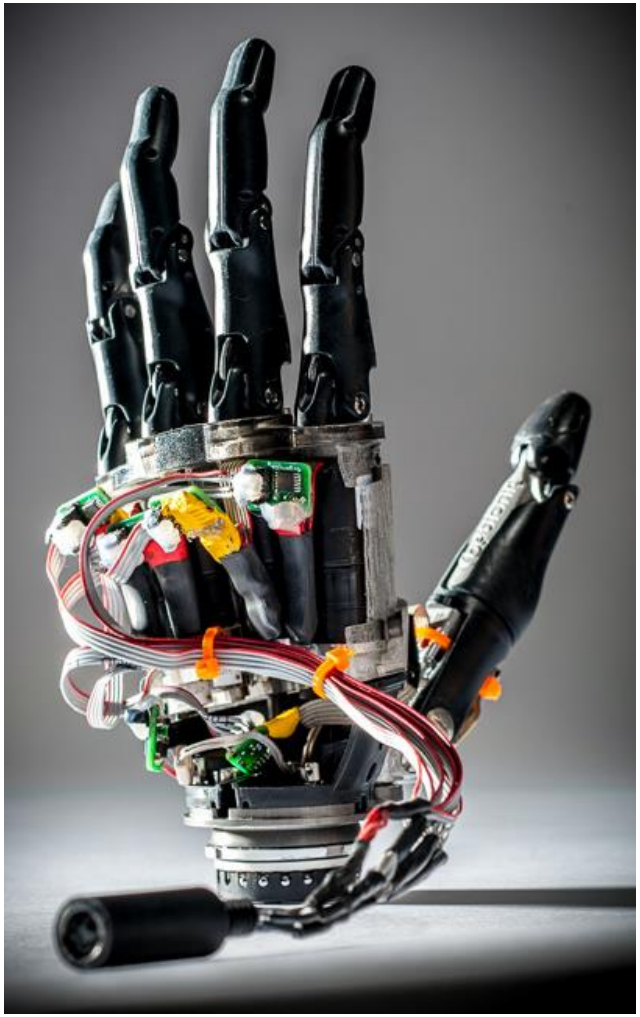
PROSTHETIC HAND DEVELOPMENT
A CASE STUDY

RSL Steeper – Bebionic hand v2



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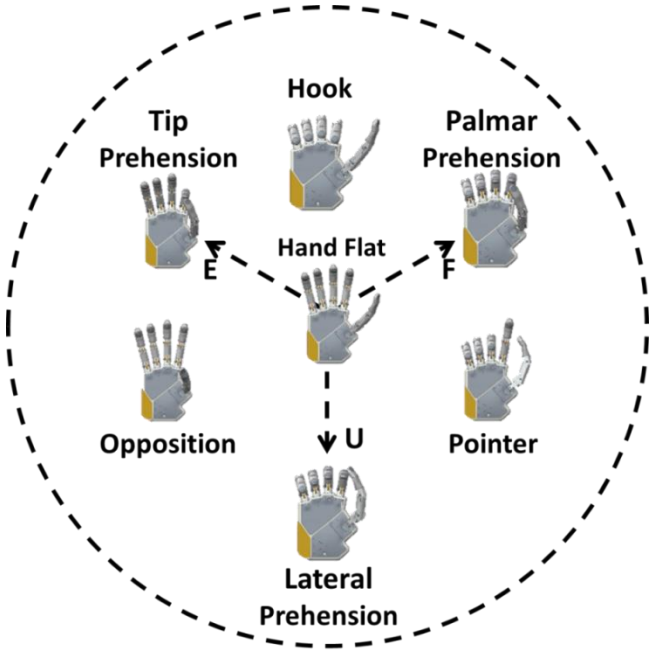
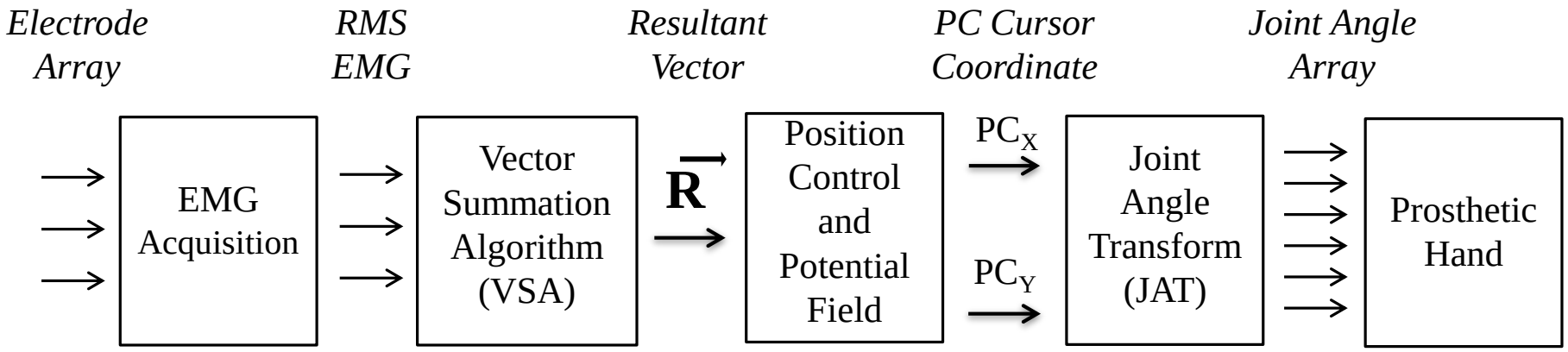
PROSTHETIC HAND DEVELOPMENT A CASE STUDY

Actuation of the thumb abduction

to allow for Postural Control algorithm





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PROSTHETIC HAND DEVELOPMENT A CASE STUDY

Bebionic hand redesign

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Application

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Material failures

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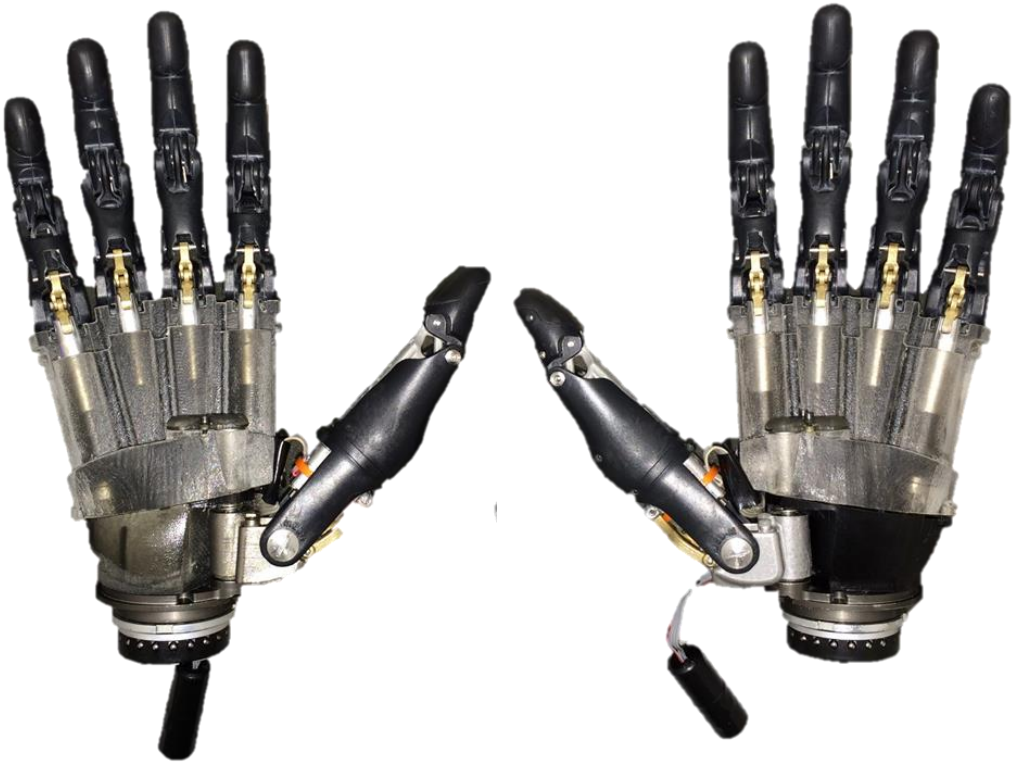
PROSTHETIC HAND DEVELOPMENT
A CASE STUDY

Wait, what about right handed amputees?



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PROSTHETIC HAND DEVELOPMENT
A CASE STUDY

3D printing helps, but we still have a long way to go.

OUR LAB

QUESTIONS

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