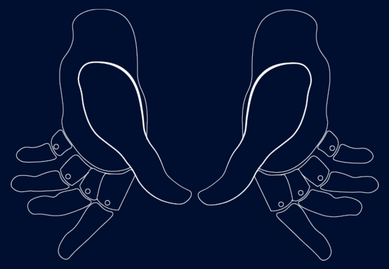


Hydra

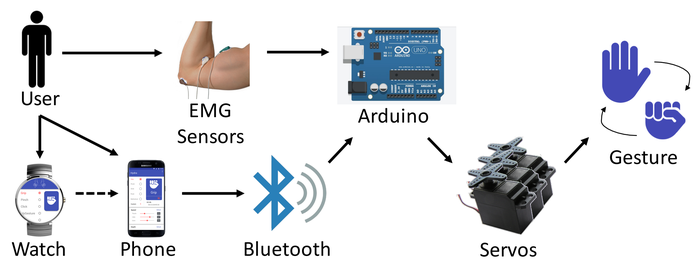
A low-cost elbow down prosthetic

UCONN
SCHOOL OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING

Objective

Design an elbow down prosthetic without sacrificing the features and functionality of high-end alternatives for less than $300. This is made possible by leveraging new and inexpensive technologies such as 3D-printing, smart phones, microcontrollers, and various open source software packages.

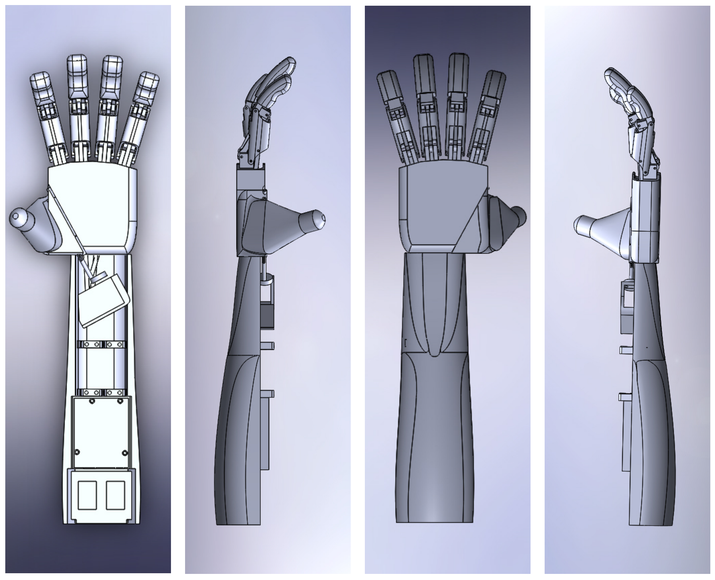
System Summary



Advisor	Yufeng Wu
Group	13
Members	Theodore Jensen Michael Neas Daniel Demarco Edward Hanlon

Mechanics

- All parts (excluding electronics) are 3D-printed in PLA plastic
- All 22 uniquely designed parts are scalable, allowing the prosthetic to be sized accordingly prior to printing
- Fully mechanical construction provides accurate motion and maintains rigidity throughout finger travel



3DSlicer

Arduino

Control: The microcontroller manages 5 control parameters:

Parameter 1 - Dynamic or Static
Static movements hold after a grip

Parameter 2 - Action Threshold
Percentage of full voltage range at which a flex is registered

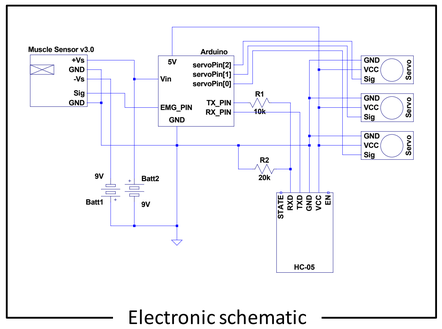
Parameter 3 - Write Delay
Delay between Arduino loops

Parameter 4 - Grip Depth *per-Servo* - how far each Servo extends
Percentage of full servo extension range (0 implies servo is inactive)

Parameter 5 - Responsivity *per-Servo*
Servo value increment (grip speed)

Communication: Bluetooth messages follow the format of "Parameter#=val;" or "Parameter#=val,val,val;" for per-servo settings

Multiple parameter strings can be sent in a single message
(i.e. "1=D;2=0.5;3=5.0;4=100,100,100;5=5.0,5.0,5.0;")



Electronic schematic

Software

Gestures: Select, customize, and save different modes for prosthetic to operate in

Live updating: Control parameters stored in the arduino update in live time; as they are modified on the phone, they are instantly updated in the prosthetic

Smart watch: Android wear companion app for quick gesture selection

Personalize: Users are able to make Hydra work the way they desire with flex threshold calibration and full parameter control