Prosthesis Control
via sEMG Signals

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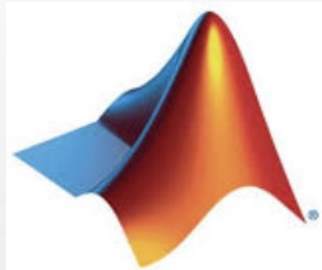
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Objectives

- Explore a cost alternative option for prosthetics.

- Control a robotic hand autonomously and have that autonomous control realistic.

Technologies Overview
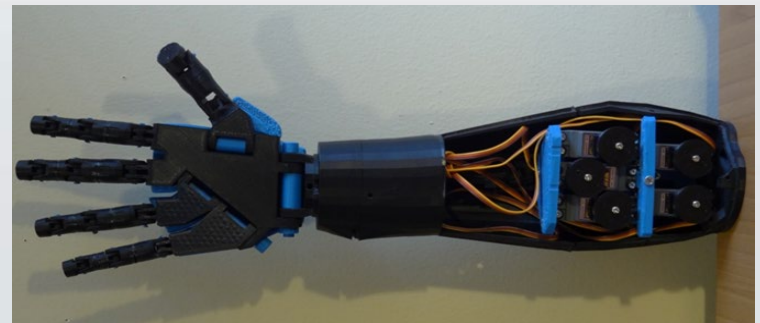
Software

MATLAB

Arduino

Hardware

Myo Armband

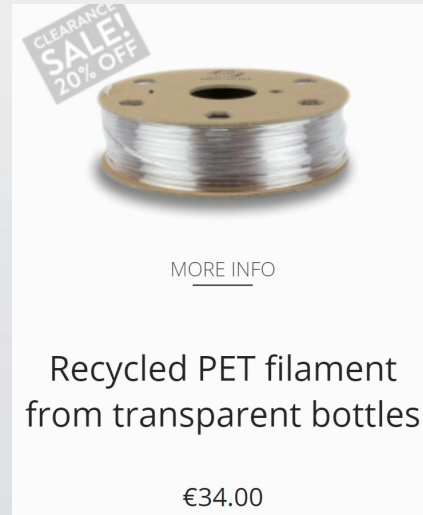LattePanda Delta

3D printed robotic hand

Software

- Arduino:
    a. Servo motor control that controls finger/hand movement

- MATLAB (custom application):
    a. Data collection process that collects data from the sensors of the armband.
    b. Artificial Neural Network training process to build and train an ANN.
    c. Live-Streaming / gesture classification process that determines the command for the servos.

Hardware

- ## MYO Armband:
  a. Sensors:
     i. Inertial Measurement Unit (IMU)
     ii. 8 surface EMG sensors
  b. Transfers data to computer via Bluetooth Low-Energy

- ## LattePanda Delta Board:
  a. Board that can run MATLAB on an Intel Celeron processor and Arduino control on an Arduino Leonardo processor

- ## 3D Printed Robotic Hand:
  a. Artificial hand to mimic a human hand
  b. Contains 6 servos (one for each finger and wrist)

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Sustainability

- Does design waste raw materials?

  a. Yes the 3D printed hand wastes plastic.

- Solution:

  a. A simple solution is to use recycled filament.

CLEARANCE SALE! 20% OFF

MORE INFO

Recycled PET filament
from transparent bottles

€34.00

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Sustainability

- Does project use renewable energy sources?

  a. No.

- Improvement/Solution:

  a. There could the option of having the LattePanda board battery powered/using a battery pack. Where the batteries would be rechargeable.

  b. The nominal load of the board is ~3 watts if the CPU usage is less than 5%.

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Sustainability

- Does your project use too much energy or process heat when operating?
  a. Not unless it is something requiring a lot of finger movement such as playing the guitar or piano.
  b. These continuous rapid movements would eventually cause the servos to heat up
  c. The nominal load of the board is ~3 watts if the CPU usage is less than 5%.

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Financial Sustainability

- The approximate cost of this material is $700
- Compared to the average medical prosthetic this is <u>at least</u> 10x cheaper

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Accomplishments

- Installed MATLAB and Myo software on the LattePanda board

- Verified custom application functionality on the board.

- Tested the wiring to the servo motors for the hand. Was able to produce power and create finger movement.

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Target Improvements

- Design servo commands to reflect human gestures as accurately as possible

- Reduce the latency of the hand's response via physical hand improvements

- Incorporate the servo for the wrist to improve the reality function of the prosthetic

- Create a portable power source for the board

Questions