

# DESIGN

# PORTFOLIO

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Biomedical Engineer at University of Waterloo



June-Aug 2022

## ATTITUDE DETERMINATION & CONTROL SYSTEMS PCB

### OBJECTIVE:

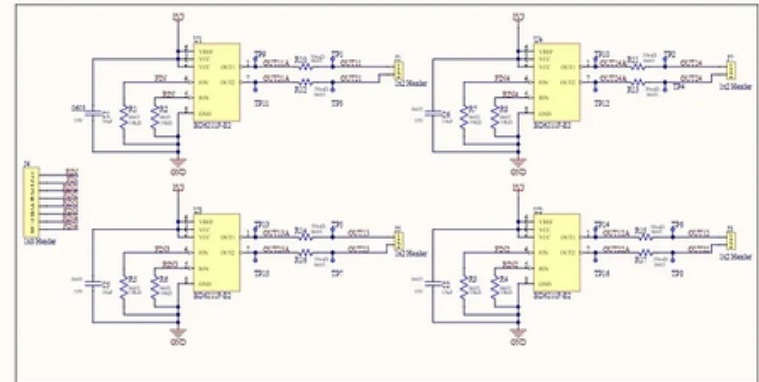
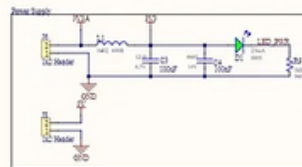
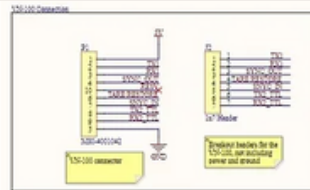
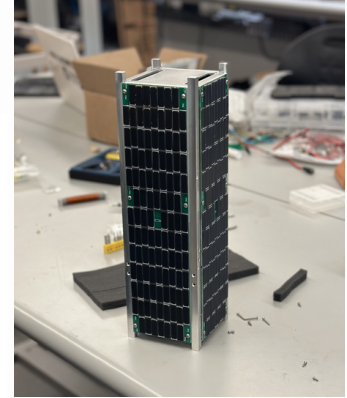
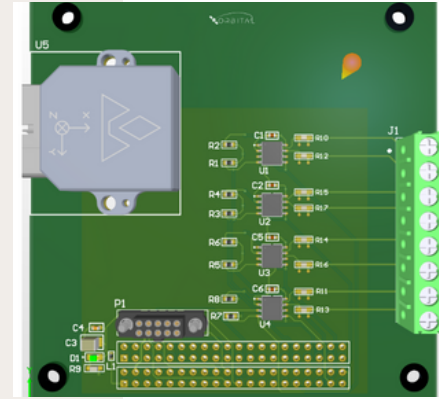
Research components and design a custom PCB for determining and controlling the attitude of a miniature satellite (CubeSat). Additionally write the firmware for necessary drivers that will control the sensors and actuators.

### WHAT I LEARNED:

- How to develop for a ARM-Cortex R4F microcontroller (TI Hercules RM46)
- Using lab equipment (oscilloscope, PSU, DMM) for hardware debugging and testing
- Flag triggers/polling for retrieving packet from on-board IMU
- PCB layout conventions and safety design

### RELEVANT SKILLS:

- Altium Designer (PCB Design)
- C/C++
- Git
- Soldering
- Texas instruments



May-June 2021

## GESTURED CONTROLLED VEHICLE

### OBJECTIVE:

Create a vehicle capable of being controlled by intuitive hand movements in 6DOF with wireless communication via WIFI and a live remote feed to a flask server.

### WHAT I LEARNED:

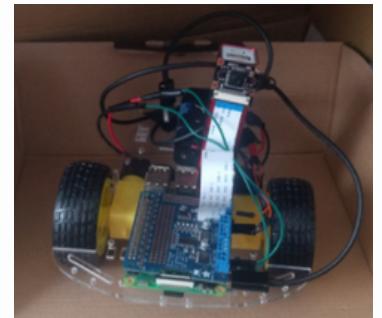
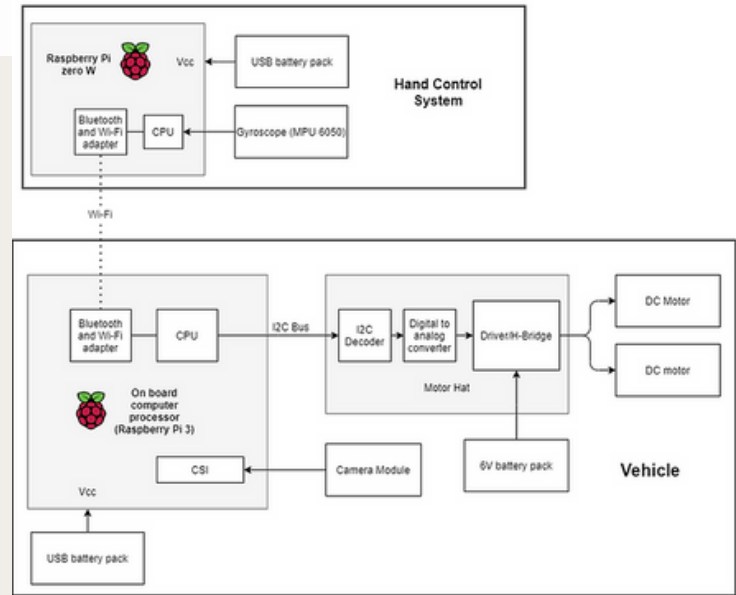
- An in depth understanding of developing for robotic applications with Unix based system.
- Gateway/introduction into OpenCV, flask and multithreading for embedded systems.
- Sensor filtering (complimentary filter & calibration) and actuator control.

### RELEVANT SKILLS:

- Python
- Raspberry Pi
- Linux
- Sensor & Actuator control
- Flask
- OpenCV



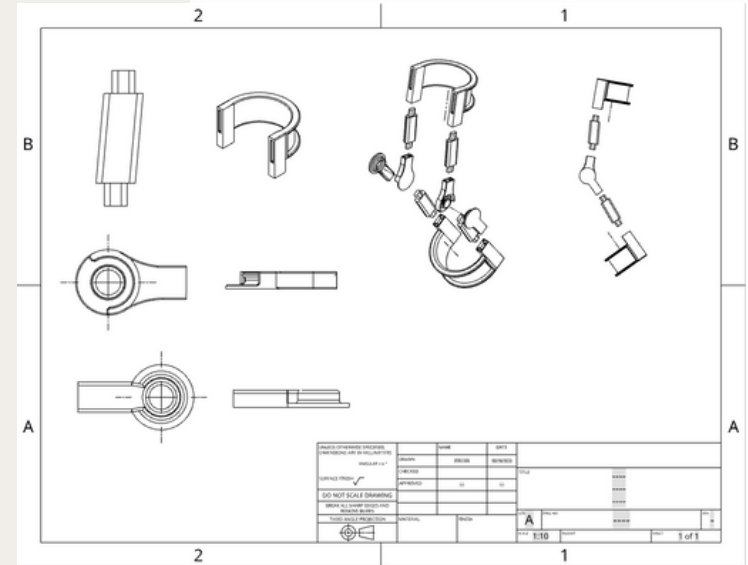
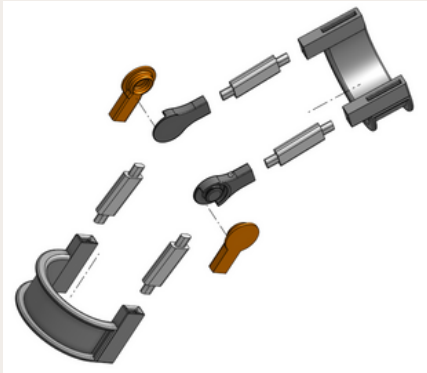
Complimentary Filtering



**OBJECTIVE:**

## RELEVANT SKILLS:

- CAD: Solidworks + Onshape



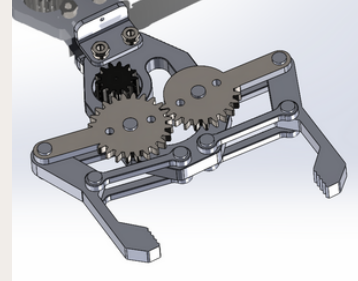
## EMG-HAND PROSTHETIC

### OBJECTIVE:

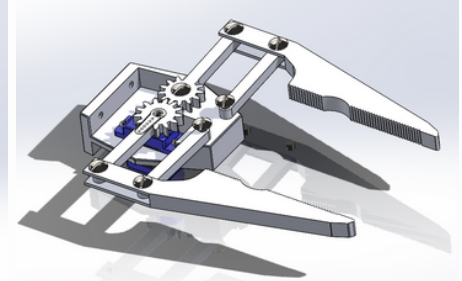
Design an EMG based prosthetic arm to be used by a hand amputee to perform two tasks. Firstly to utilize the arm to perform daily tasks like pulling up a zipper or holding a cup. This will demonstrate the precision and accuracy of the arm. Secondly to use the hand to grab a cup, demonstrating a balance of power and precision. Furthermore, implement a feature to customize the different "hands" that may be used with the prosthetic.

### RELEVANT SKILLS:

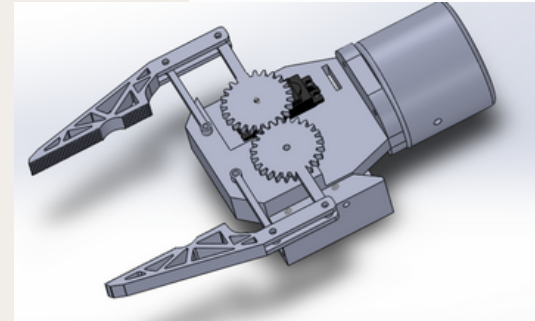
- Arduino
- C/C++
- Solidworks
  - Animation/motion study
  - FEA + Topology analysis
- Motor control
- EMG circuit design
  - Filtering & Amplification
- Circuit simulation
  - LTSpice + Falstad



Claw MK1



Claw MK2



ClawMK3

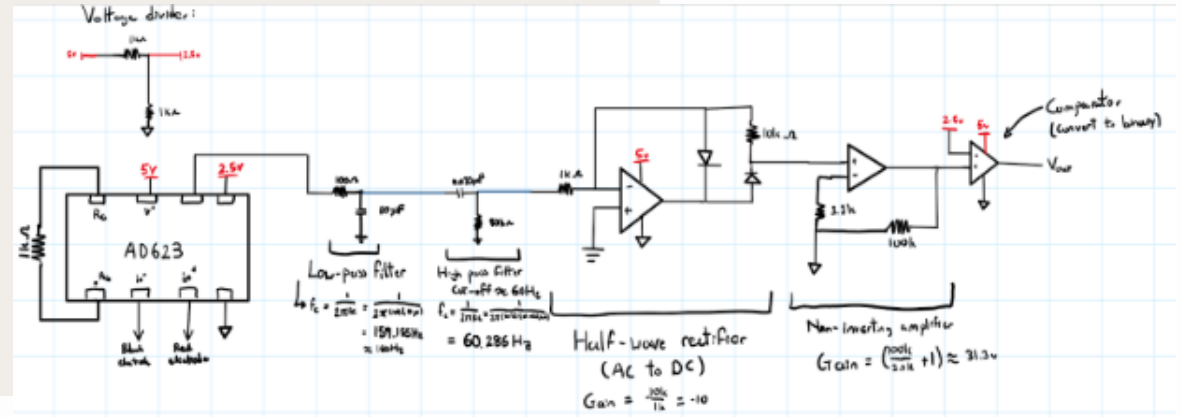
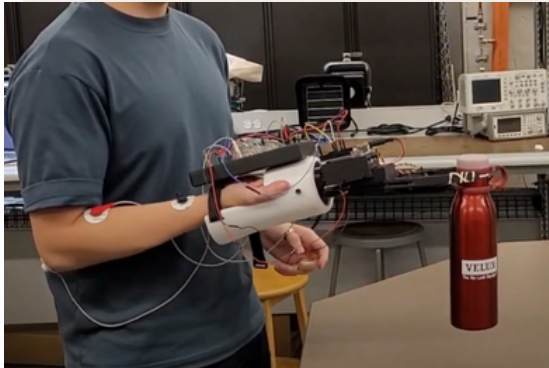
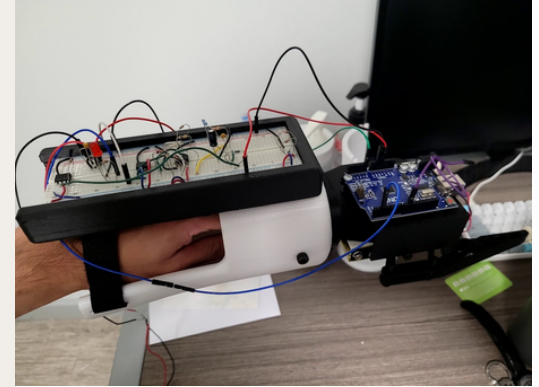
June-July 2023

## EMG-HAND PROSTHETIC

### WHAT I LEARNED:

During the process of designing this prosthetic arm, I was able to develop a vast array of skills and an in-depth understanding of system architecture and how various sub-systems (Microcontroller, electronics, servo motor, EMG sensor) interact. In the process of creating my own EMG sensor, I was able to gain an understanding of how to effectively filter and amplify signals using operational amplifiers, resistors and capacitors.

The project has also taught me valuable lessons concerning user design, which means not just making a cool project, but one that interfaces with the user effectively and leverages intuitive mechanisms to enhance the user experience.



### ***LANGCHAIN MEDICAL DATABASE BOT (IN PROGRESS)***

#### **OBJECTIVE:**

Using Langchain, create a bot with a user interface that will enable the user to search medical topics and receive information from reputable medical databases with PDF. Utilize agents, tools and chains to access relevant API's for databases from google search, Wikipedia, arxiv and PubMed.

Then allow the user to query the PDF as they so require. This project aims to simplify the intensive process of scouring medical academic resources for particular facts, quantitative measurements and related data.

#### **RELEVANT SKILLS:**

- Python
- Jupyter Notebook
- Git
- Langchain
- OpenAI
- Streamlit
- Unstructured (PDF reading)

**FOLLOW MY PROGRESS**





# COMMIT

YOUR WORK TO THE LORD,  
AND YOUR PLANS WILL BE  
ESTABLISHED.

PROVERBS 16:3

## CONTACT ME

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