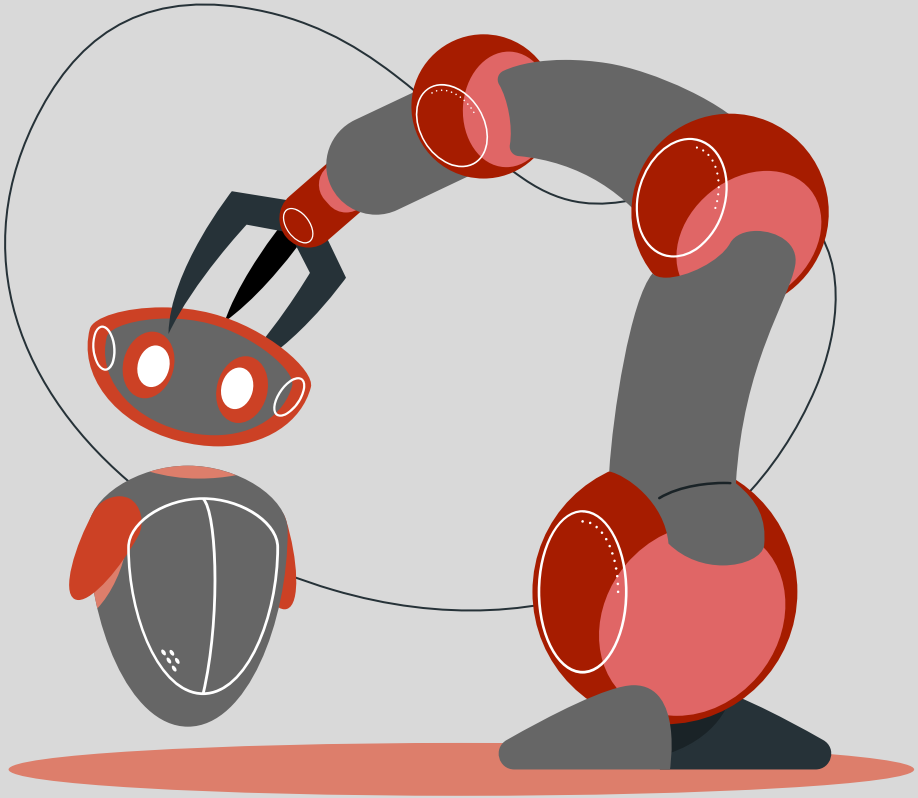
The Spring Soldier

- Brooklyn Bionics -

Head of Programming: Tanvi Rahman
Head of Production: Louie Rivera
Head of Design: George Zhang

EG 1003 Section C2
Final Presentation
April 27th, 2021



Agenda

- Company Profile
- Product Objective
- Solution Overview
- Product Animation
- Technical Design
- Cost Estimate
- Project Schedule
- Summary

Company Profile

Brooklyn Bionics

- Founded on February 25th, 2021
- Based at 6 MetroTech Center, Brooklyn NY
- Members:
  - Tanvi Rahman, Head of Programming
  - Louie Rivera, Head of Production
  - George Zhang, Head of Design

Mission Statement

Bridge the gap between human limitation and human potential

Company Profile

Tanvi Rahman
Head of Programming
NYU Tandon School of Engineering
Computer Science B.S.

Louie Rivera
Head of Production
NYU Tandon School of Engineering
Computer Science B.S.

George Zhang
Head of Design
NYU Tandon School of Engineering
Mechanical Engineering B.S.

Product Objective

- Prosthetic limb that replicates a functioning hand, elbow, and wrist
- Improves quality of life for amputees and the disabled
- Motorized robotic arm fully controlled by muscle movements
- Increasing opportunities in Biomedical Engineering & prosthetics

Figure 1: Amputee Using Prosthetic

Figure 2: Daniel Melville Using Hero Arm

Solution Overview

- Fusion 360 Model
  - Inspired by Metal Gear Solid Bionic Arm
- Completed circuit on Fritzing
  - TinkerCAD Simulation

Figure 3: Metal Gear Solid ‘Snake’ Arm

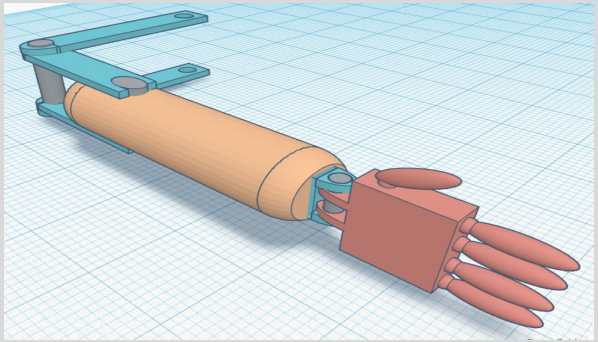


Figure 4: Preliminary Design

Solution Overview

- Functioning hand and joints
- Shortened upper arm connector
- Wire slots on finger joints
- Hollowed out upper and forearm

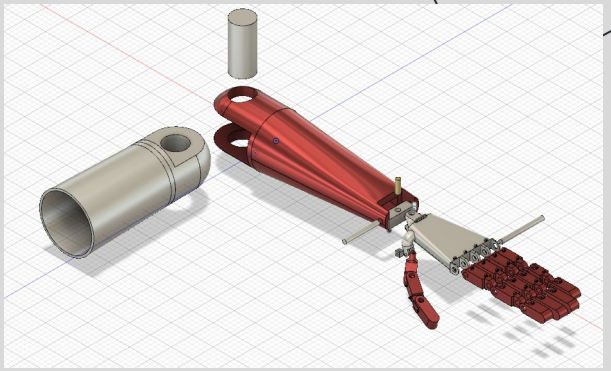


Figure 5: CAD Model (Isometric)

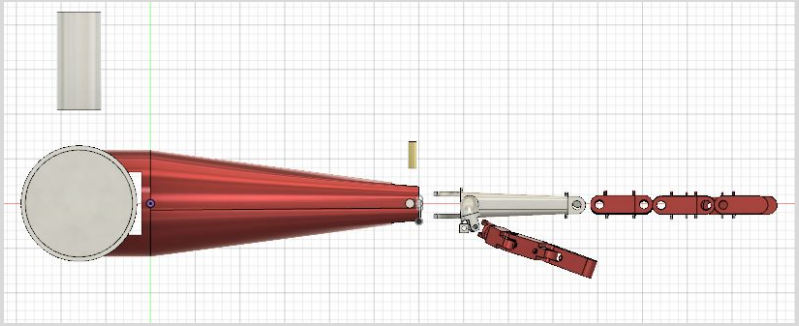


Figure 6: CAD Model (Front)

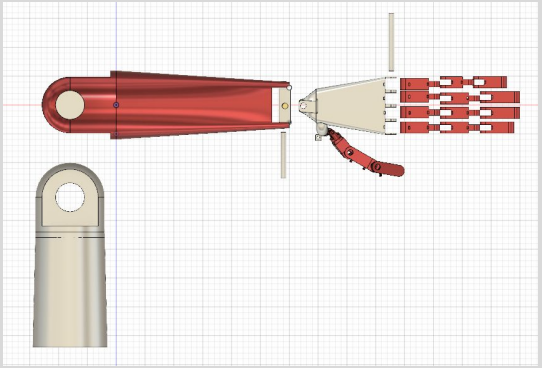


Figure 7: CAD Model (Top)

Product Animation

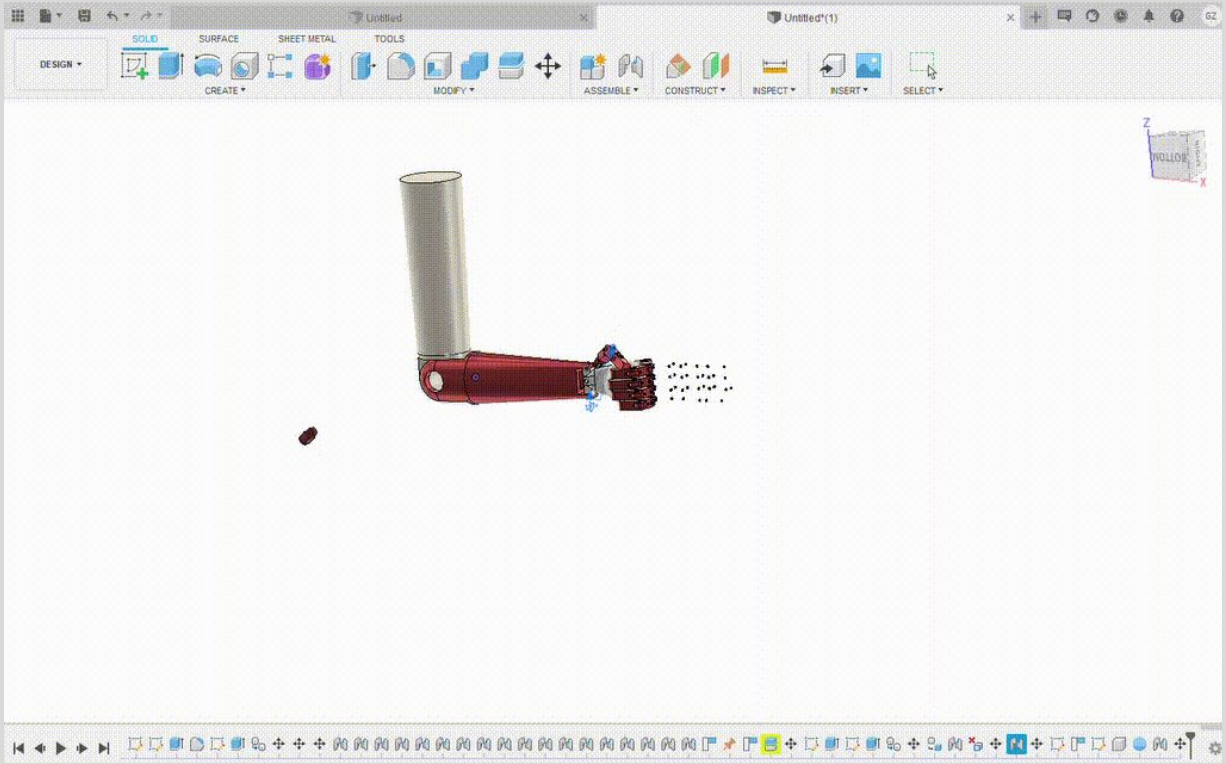


Figure 8: Elbow & Finger Demonstration

Product Animation

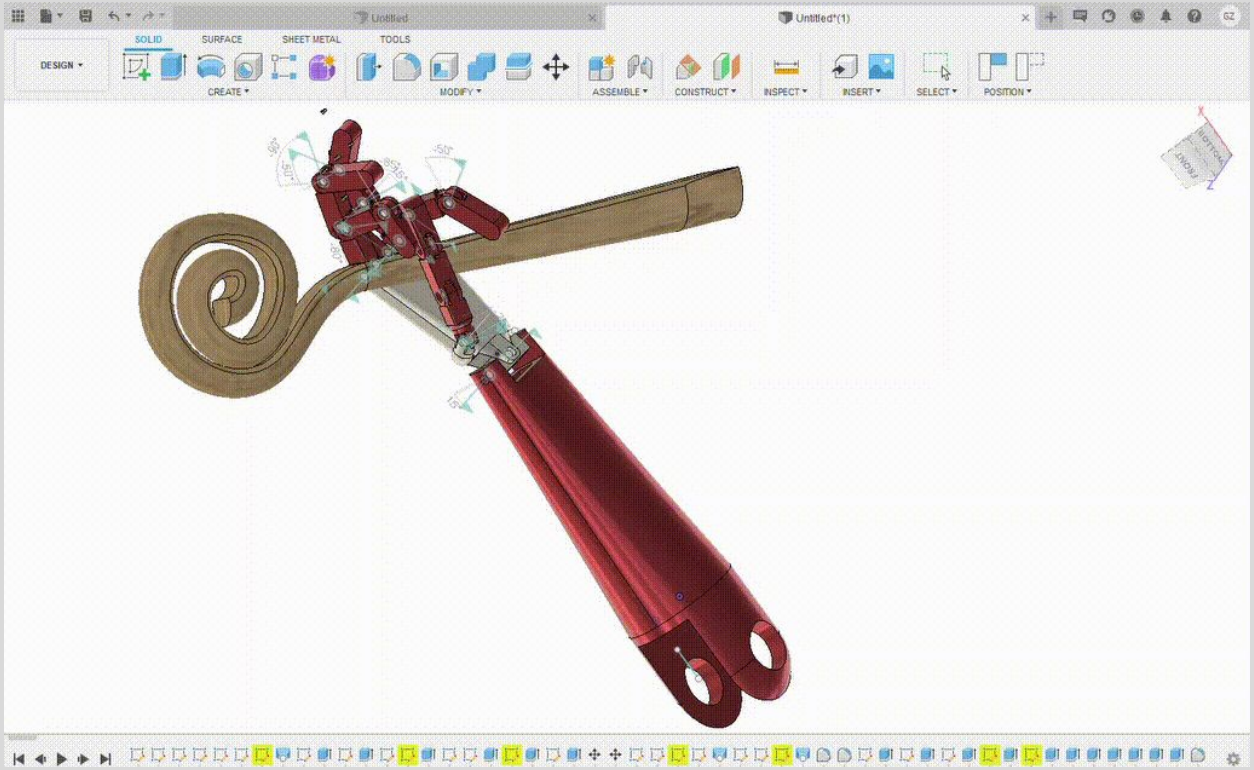


Figure 9: Wrist & Finger Demonstration

Technical Design

- Myoware Muscle Sensor
- Electromyography (EMG)
- Servo Motor

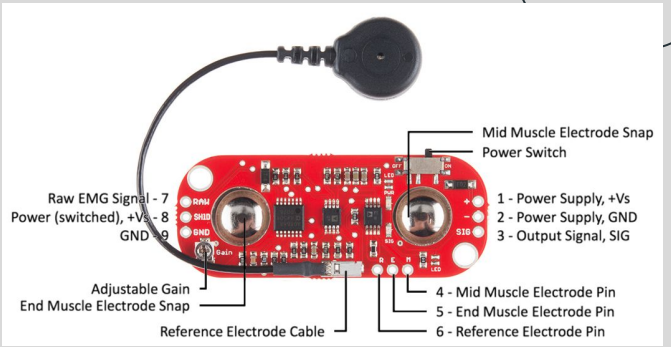


Figure 10: Muscle Sensor Layout

Figure 11: Servo Motor

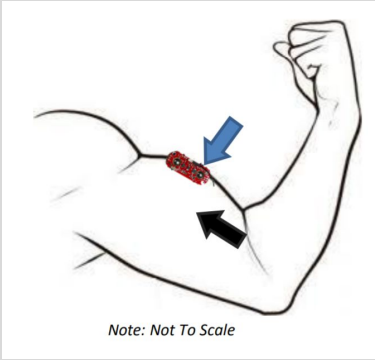


Figure 12: Ideal Sensor Bicep Orientation

Technical Design

- Arduino Microcontroller
- 9V Battery
- Muscle Sensor
- Servo Motor

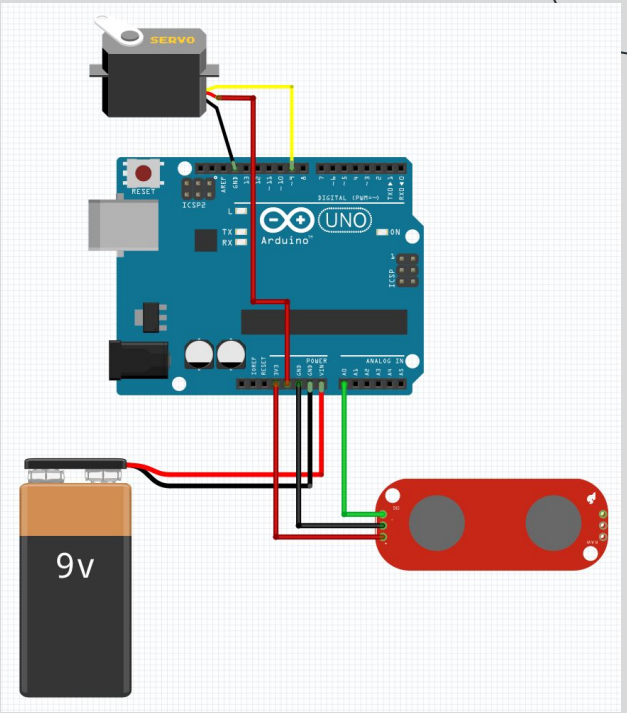


Figure 13: Circuit Diagram (Fritzing)

Technical Design

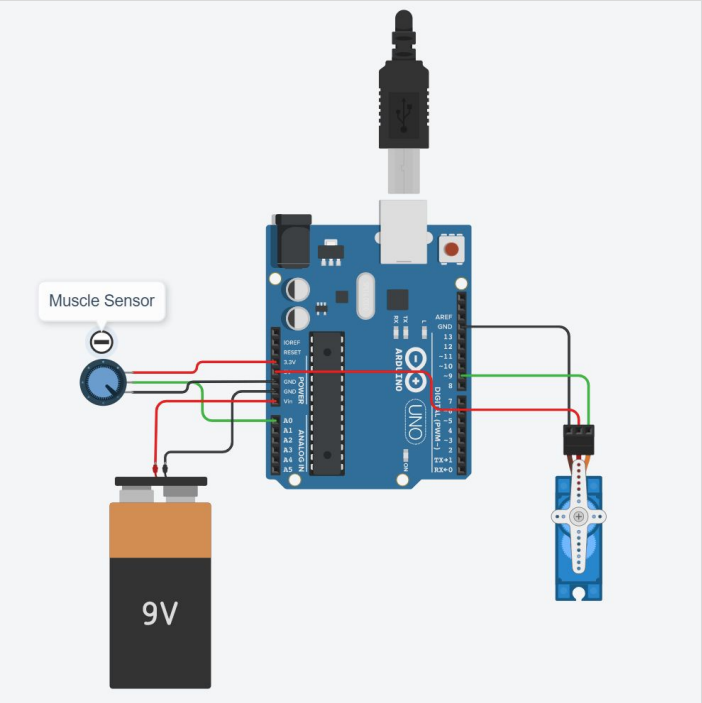


Figure 14: Circuit Diagram (TinkerCAD)

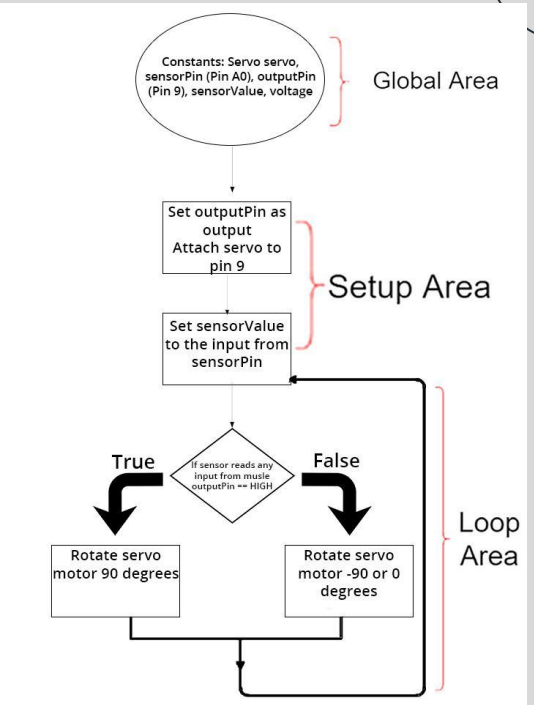


Figure 15: Arduino Code Flowchart

Cost Estimate

- Latest Myoelectric arm technology
  - Typically $20,000-$100,000+
- Affordable, reliable, highly functional
  - Working hand, rotating wrist, bending elbow, muscle-controlled
- Available to all amputees / disabled
  - Opening cost: $4,000

Table 1: Cost Estimate

Resource	Cost Per Unit	Quantity	Cost
Plastic Printing Material	$23.00	1	$23.00
Arduino Cable Pack (40 wires)	$6.00	1	$6.00
Arduino Uno Microcontroller (SparkFun Redboard)	$19.00	1	$19.00
Battery (9V)	$7.00	2	$14.00
Muscle Sensor	$38.00	2	$76.00
Servo Motor	$36.00	3	$108.00
String	$3.99	1	$4.00
Projected Labor	$50.00	75	$3,750
Total			$4,000.00

Project Schedule

ID	Task Mode	Task Name	Start
20		Benchmark B	Thu 4/1/21
21		MS3 Presentation	Thu 4/1/21
22		Design Changes	Thu 4/1/21
23		Mission Statement	Thu 4/1/21
24		CAD Drawings	Thu 4/1/21
25		Circuit and Schematic	Thu 4/1/21
26		Cost Estimate	Thu 4/1/21
27		Milestone 3	Tue 4/6/21
28		Fully working sensors	Thu 4/1/21
29		Completed team logo	Thu 4/1/21
30		Updated Engineering Notebook	Thu 4/1/21
31		Final Design Report	Thu 4/1/21
32		Early Final Submission	Thu 4/29/21
33		Final Presentation	Thu 4/1/21
34		Final Submission	Thu 5/6/21

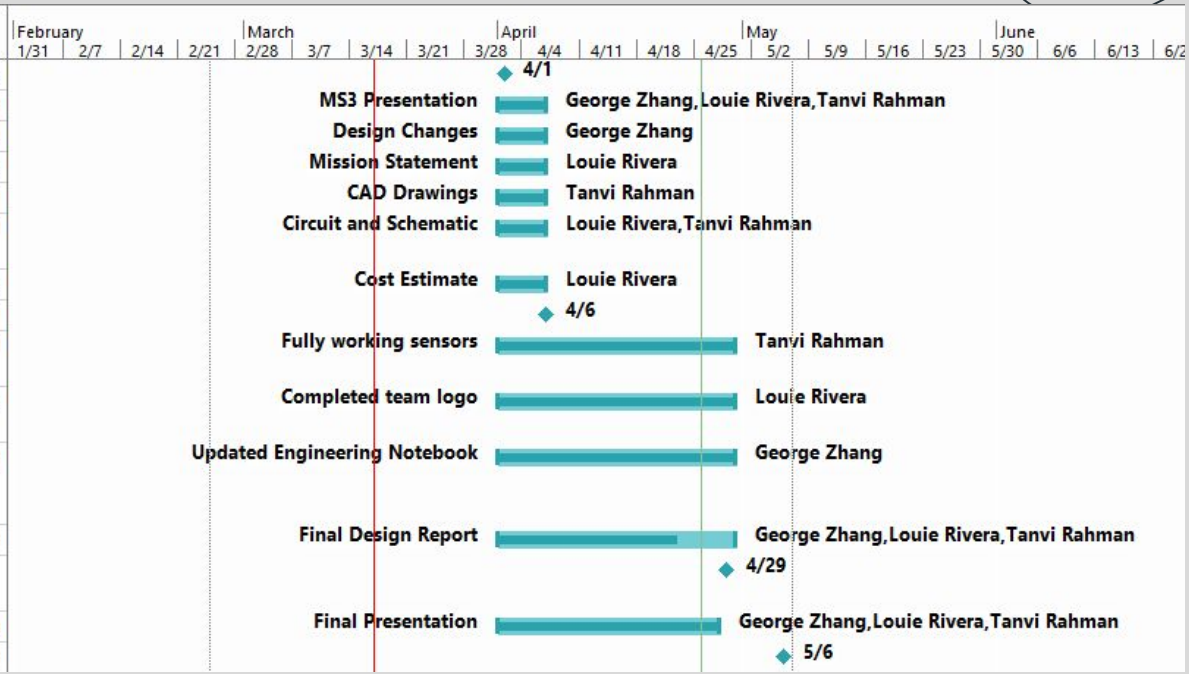


Figure 16: Project Schedule

Summary

- Fully functioning prosthetic limb
- Why Brooklyn Bionics?
  - Ahead of the competition
  - Affordable cost
  - Reliable functionality
  - Latest Myoelectric technology
- Reframing disabilities into opportunities

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