# Hand Grip

By: Nishchal, Doga, Liam and Hongjian

# Why a hand grip device?

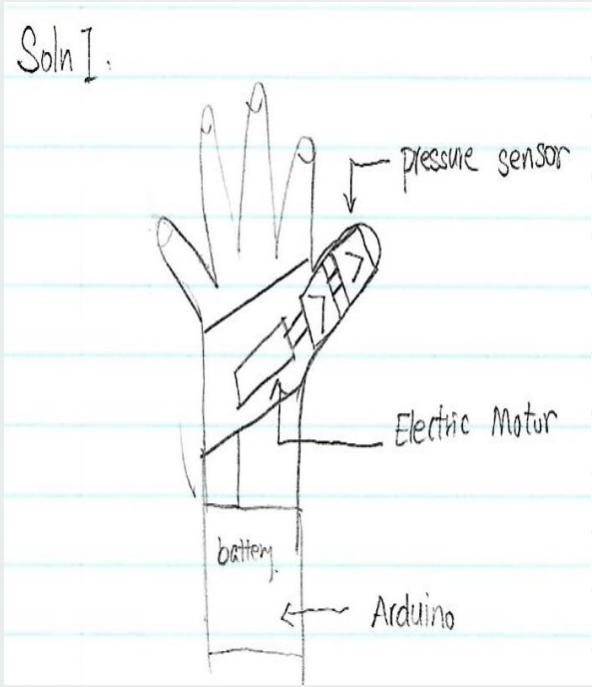
# Client needs:

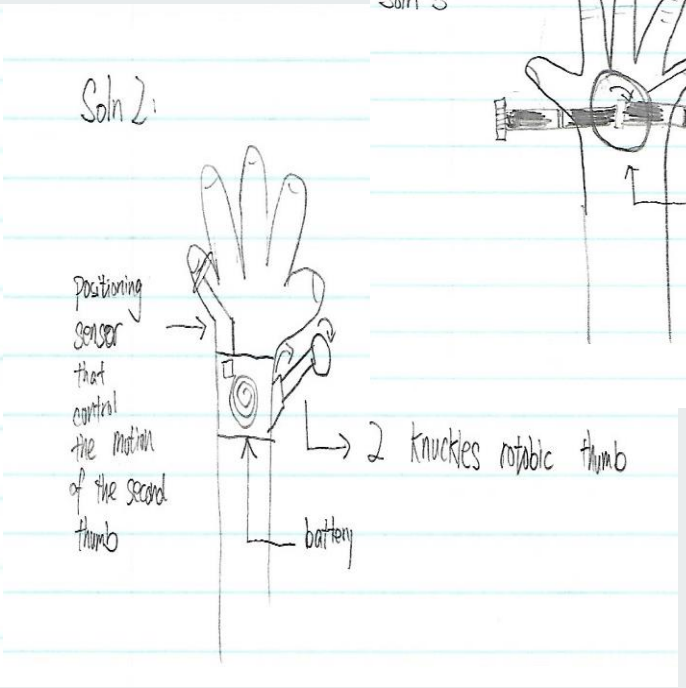
- The client wants to be able to hold small objects just as needle
- The client mentioned a project she was interested in with three-fingers and an arm support but did not hear back from them
- The client has not tried a hand grip glove before
- The client does not like compression glove, she prefers the glove to be of medium or large size

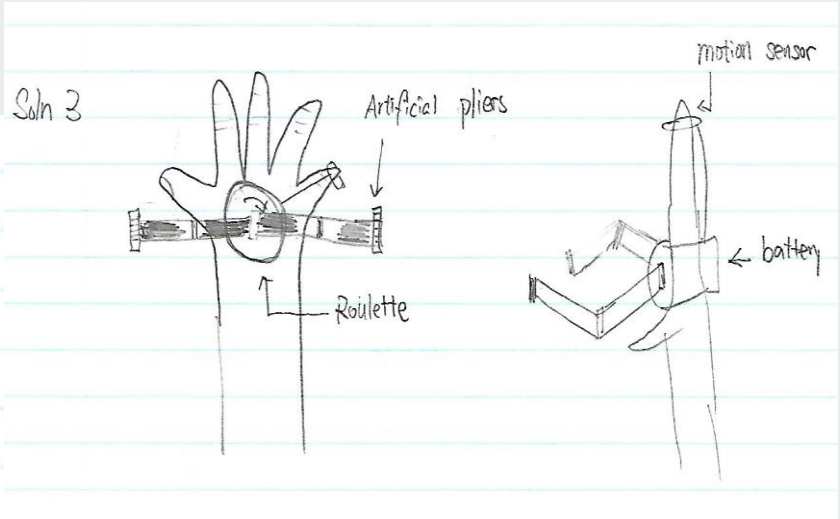
# Our Problem Statement:

“To design a comfortable, compact device that will help the client perform gripping and pinching motions.”

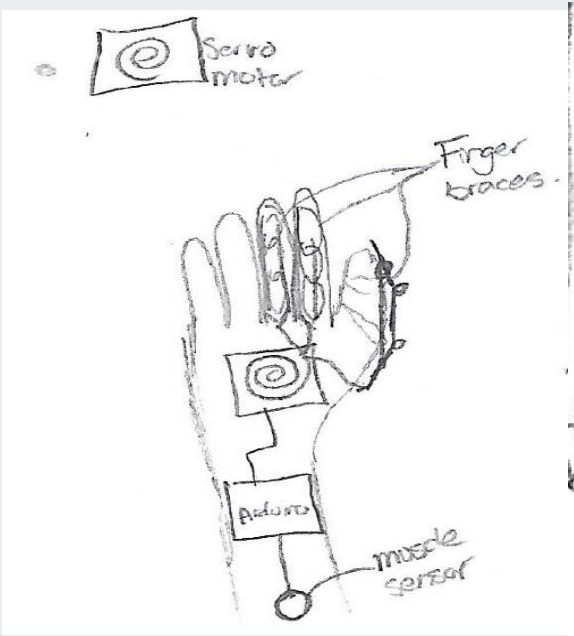
# Sketches (Hongjian)

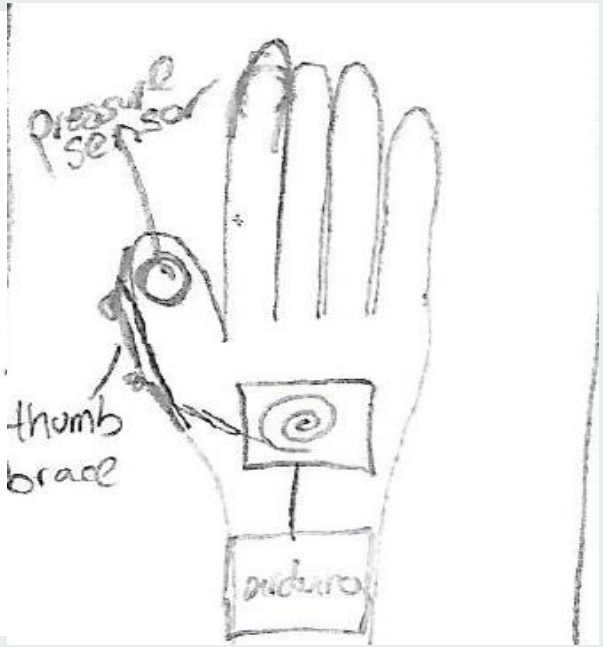


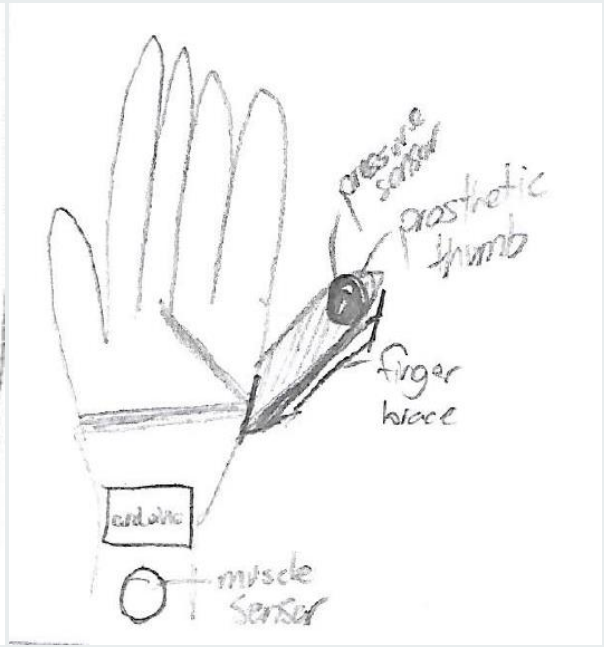



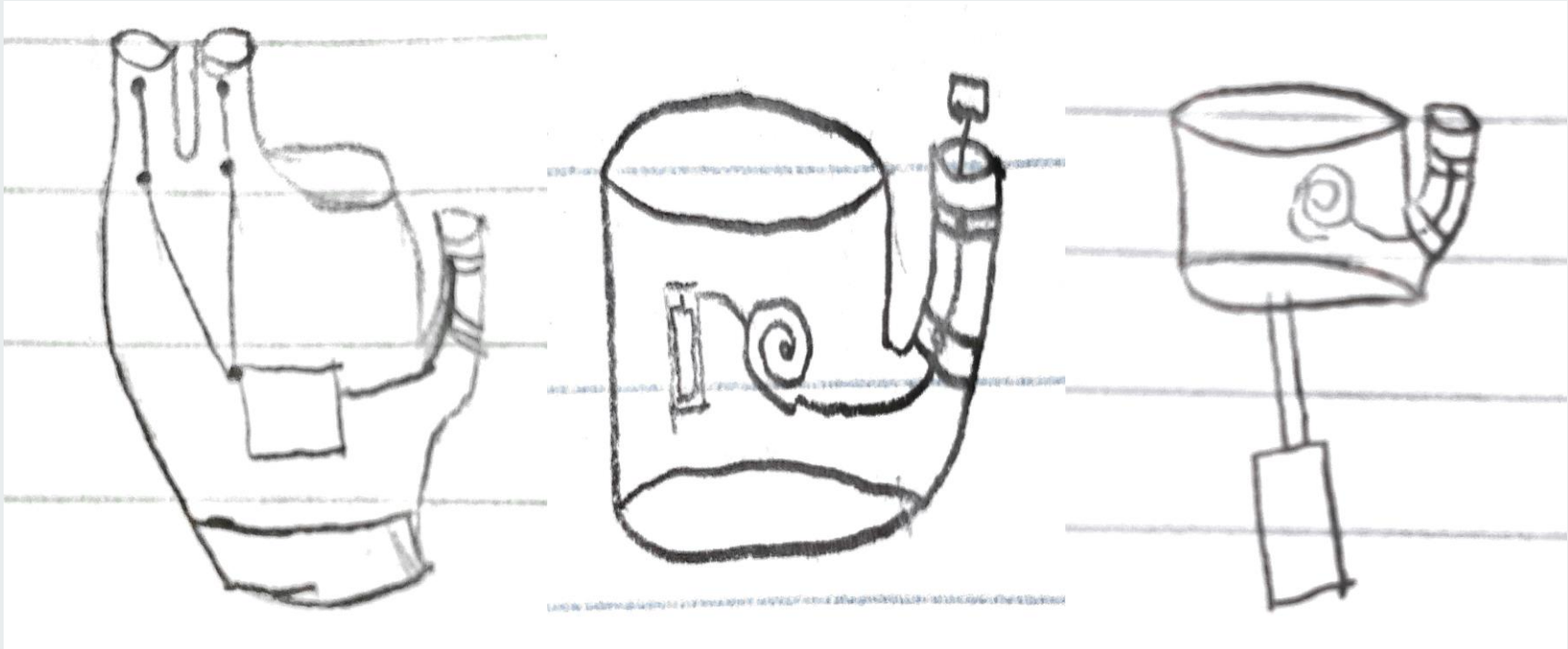
# Sketches (Liam)



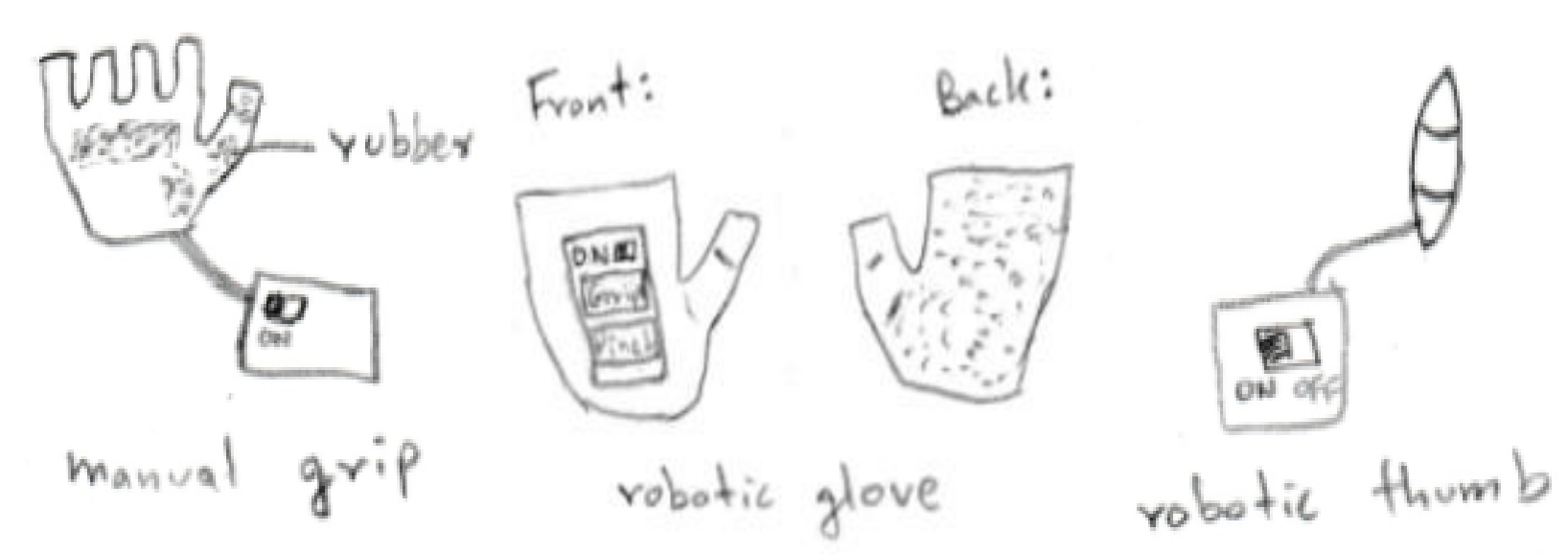



# Sketches (Doga)



# Sketches (Nishchal)



# Benchmarking

| Benchmarking projects | Technology | Price | Sizing | Target Client | Picture of the Product | Website |
|---|---|---|---|---|---|---|
| Saebo Glove | Manual | $559 CAD | Small, Medium, Large | Neurological and orthopedic injuries patients |  | https://www.saebo.com/saeboglove/ |
| The Third Thumb | Bluetooth-pressure sensors | N/A | One size | Everyone |  | https://www.daniclodedesign.com/thethirdthumb |
| Gripit | Manually | N/A | circular diameter: 30mm<br><br>Height: 20mm | Patients with spinal cord injuries. |  | https://www.wevolver.com/wevolver.staff/gripit./master/blob/Overview.md |

# Metrics

| Metrics Number | Importance | Metrics | Units |
|---|---|---|---|
| 1 | 2 | Mass | g |
| 2 | 5 | Minimum Gripping strength | kg |
| 3 | 4 | Device Size | size |
| 4 | 3 | Battery Life | hours |
| 5 | 1 | Water Resistance | bars |
| 6 | 1 | Wireless Charging | qi |
| 7 | 4 | Manufacturing Cost | $CAD |
| 8 | 4 | Time taken to assemble/ disassemble | minutes |
| 9 | 2 | Instills Pride | subjective |

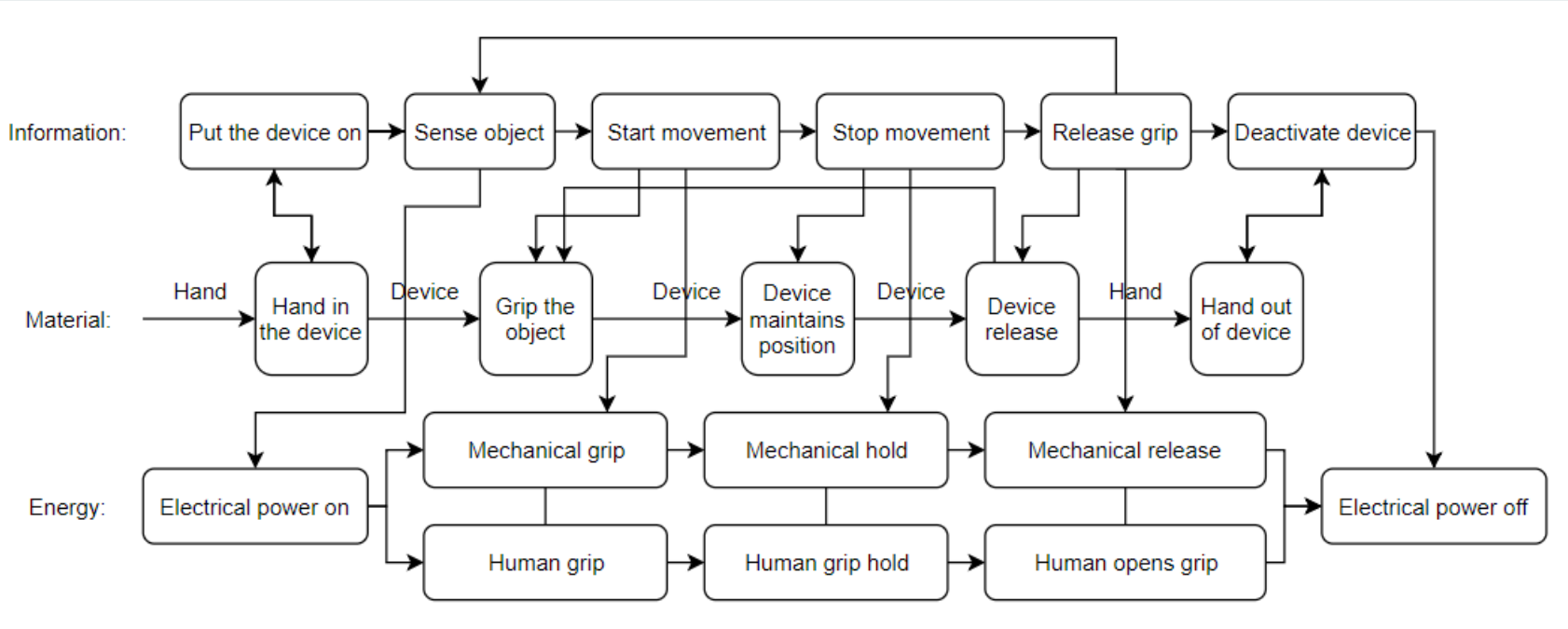
# Target Specifications (Part 1)

| Metrics Number | Metrics | Units | Acceptable Value | Ideal Value | Reason |
|---|---|---|---|---|---|
| 1 | Mass | g | <500 | <300 | The product needs to be as light as possible. Boxing gloves weigh 250g on average. |
| 2 | Minimum Gripping strength | kg | >15 | >20 | This is the average gripping strength. |
| 3 | Device Size | size | = large | = medium | The client prefers medium or large glove size. |
| 4 | Battery Life | hours | >3 | >6 | The client will use this product for a long duration. |
| 5 | Water Resistance | bars | no | yes | Product might come in contact with water. |

# Target Specifications (Part 2)

| Metrics Number | Metrics | Units | Acceptable Value | Ideal Value | Reason |
|---|---|---|---|---|---|
| 6 | Wireless Charging | qi | no | yes | Product will be able to recharge quickly without much effort. |
| 7 | Manufacturing Cost | $CAD | <100 | <90 | Competitive prices have to be lower than the competitions'. |
| 8 | Time taken to assemble/ disassemble | minutes | <2 | <1 | Product is easily removable and wearable. |
| 9 | Instills Pride | subjective | a bit | a lot | Meets requirements and satisfies customer needs. |

# Functional Decomposition



**Sketch:**

Front side:

Back side:

Thumb:

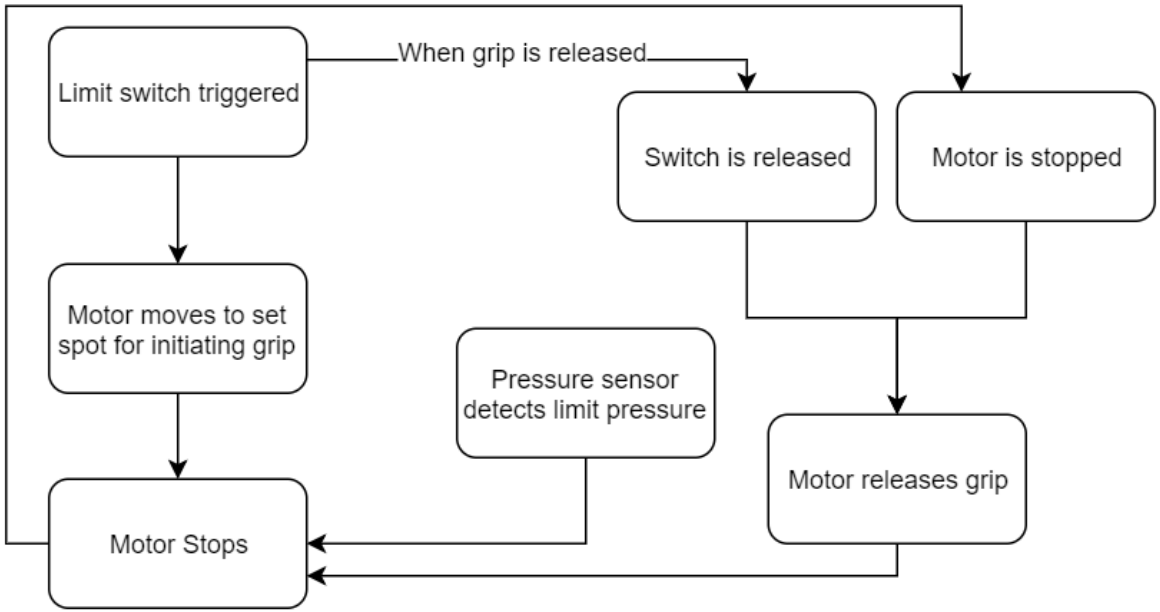
Side view:

index:

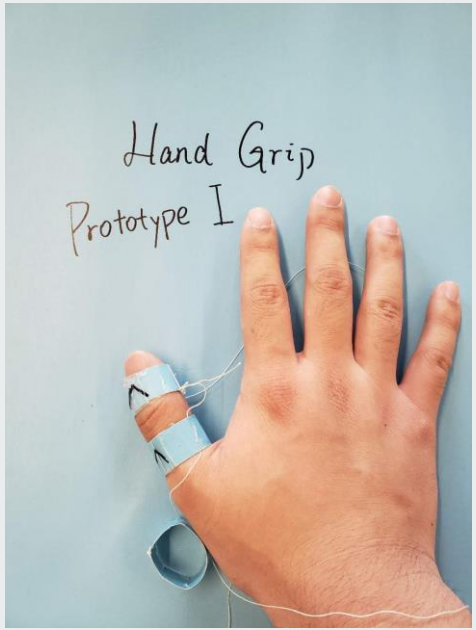
joint
rubber
motor
plate
string
arduino

battery slot
wire
spring

# Software Design



# Grip prototype I





# Bill of Materials

- On budget of $100 for the project
- Many parts can be found or made for free

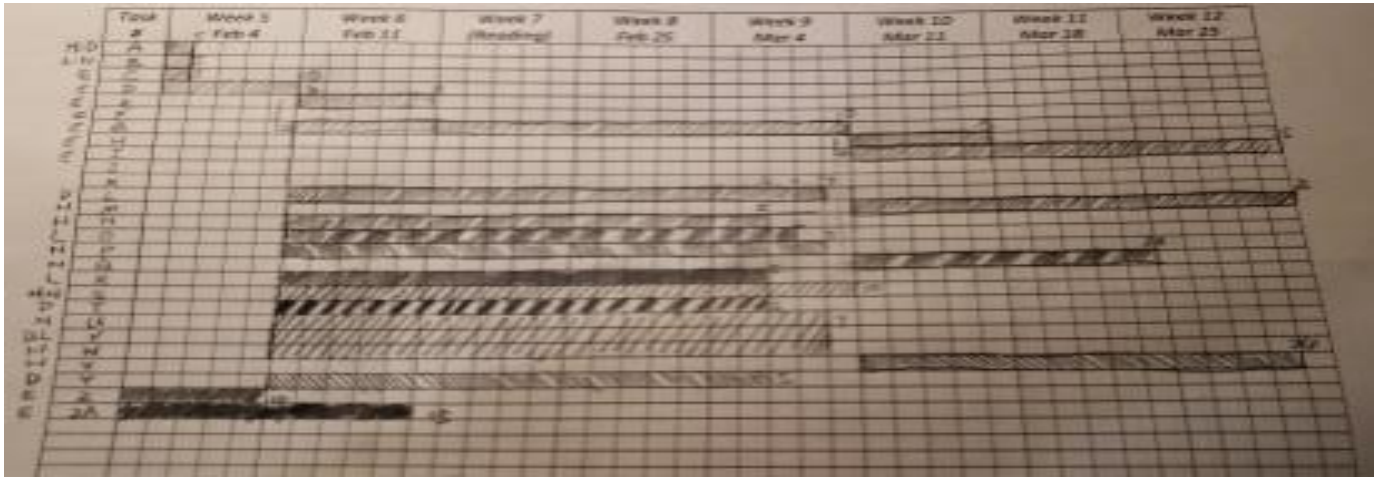
| Part Name | Description (Identify prototype #) | Quantity | Unit Costs ($CAD) | Extended Cost (Qty x $) | Actual Cost (Qty x $) |
|---|---|---|---|---|---|
| Push Button | A button to read a finger grip motion from the little finger and the right finger | 2 | 4.95 | 9.90 | 9.90 |
| Glove | To house the device and hold it onto hand of client | 1 | 15.00 | 15.00 | 15.00 |
| Servo motor | To spool strings used to activate fingers/thumb | 1 | 30.00 | 30.00 | 30.00 |
| Arduino Nano | Microcontroller to control the device | 1 | 22.00 | 22.00 | 22.00 |
| String | To help manipulate the plastic parts and cause gripping power | # | 5.00 | 5.00 | 5.00 |
| Wires | To wire the device to the arduino | # | 11.95 | 11.95 | 0.00 |
| PLA 3D printer filament | For various parts to manipulate the hand grip | # | Free | Free | 0.00 |
| Rubber pads | Provides extra grip in the palms | # | 3.45 | 3.45 | 3.45 |
| Battery pack | Holds batteries to power device | 1 | 5.00 | 5.00 | 5.00 |
| Battery | To power up the device | 1 | 5.00 | 5.00 | 5.00 |
| Spring | To execute on/off of the push button | 2 | 0.86 | 1.72 | Free |
| Elastic String | To execute on/off of the push button | 1 | 0.40 | 0.40 | Free |
| Needle | To weave parts on the glove | 1 | 0.26 | 0.26 | Free |
| Thread | To weave parts on the glove | 1 | 0.10 | 0.10 | Free |

# Prototype 1 Feedback

- Overall satisfied with the low level prototype
- Worried about the size of the device on her hand
- Ensured a breathable fabric would be used with the glove
- Ensured we knew her thumb didn’t necessarily move/work the same way ours do

# Plans for next Client Meet

- Functional prototypes for the different parts of the device
- Solidworks modelling of the device



# Plans moving forward

- Independent learning
- Organization
- Time management
- Never give up!

# References


https://www.saebo.com/saeboglove/
https://www.daniclodedesign.com/thethirdthumb
https://www.wevolver.com/wevolver.staff/gripit./master/blob/Overview.md
http://www.calleenwilder.com/spirituality/powerful-mudras/
https://www.theprboutique.com/think-outside-the-box/