Cyborg arm

Design Review 1

Force multiplier

Detects Muscle Activity

↓

Processes signal

↓

Sends signal to motor

↓

Motor moves the arm
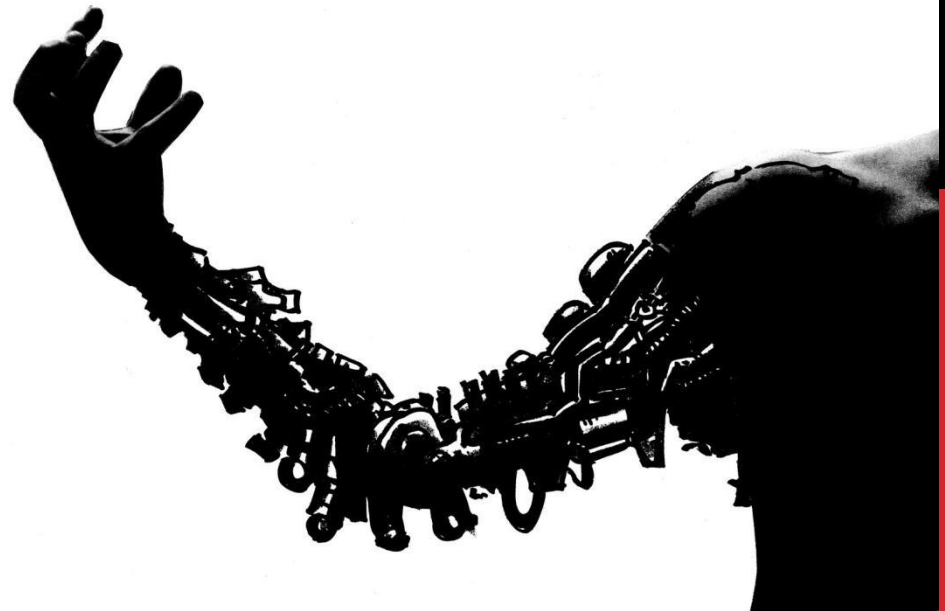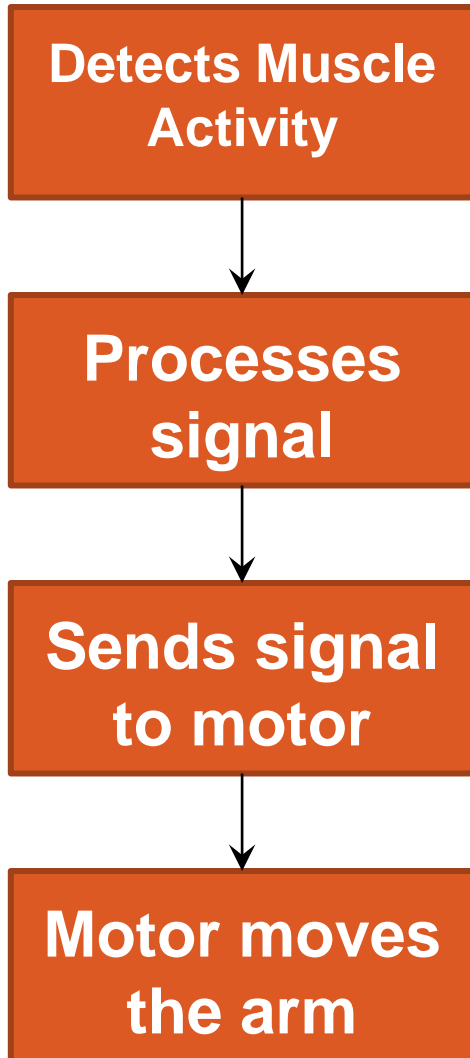
Example of assistive force multiplier
http://www.cornellcollege.edu/physics/files/mark-novak.pdf

GOALS

SENSITIVE

- **Accurately measures muscle activity**

- **Negligible delay between signal and output**
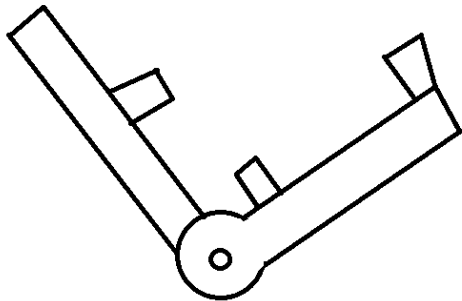

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COMFORTABLE/SAFE

- **Does not inhibit movement**

- **Minimal weight burden**

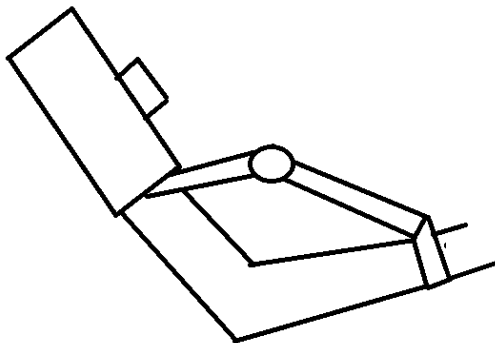- **Layer of protective/ comfortable material between user and arm.**

SYSTEM:

System Sketches

Rough Design Idea 1:

Rough Design Idea 2:

DESIGN DECISIONS:

Mechanical:
Gear vs. Series Elastic Actuator (SEA)

Sensors:
EMG vs. Pressure Plates

SENSOR: PRESSURE SENSOR

PROS:

- Easiest to program

- Simplicity

- More reliable as a sensor

CONS:

- Harder to incorporate all uses of arm
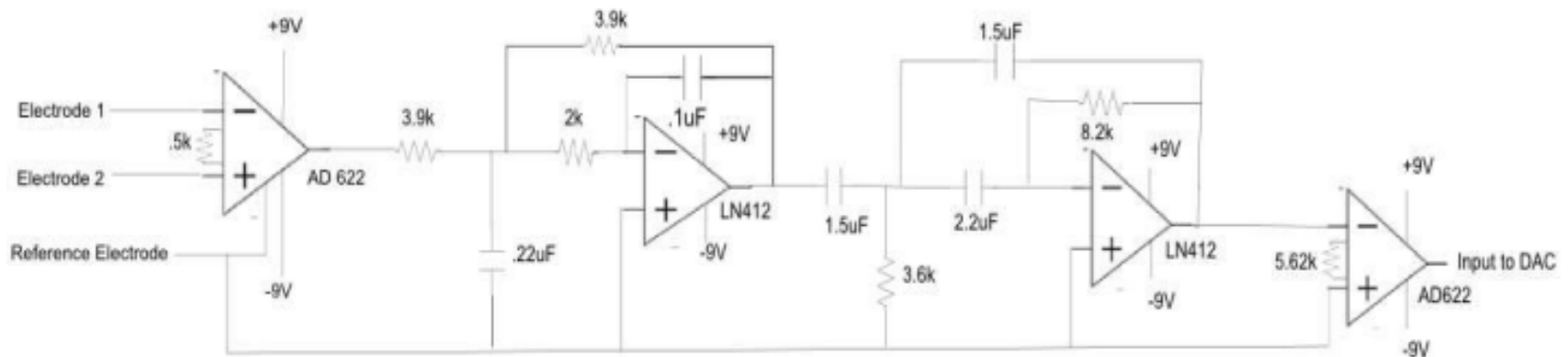
- More difficult for the user to control

Sensor: ElectroMyoGraphy

Pros:

-Natural. It should behave exactly how it should

-has proof of concept done before

Cons:

-Can be very finicky. May result in spending more time getting EMG to work than design

- Will require both bicep and triceps for accurate readings of movement

GEARS

PROS:

- Capable of greater force in a shorter amount of time

- Faster implementation

CONS:

- Feels like the cyborg arm is moving rather than user's own arm

- limited range of motion/ little lee-way for the user

SERIES ELASTIC ACTUATORS

PROS

- Allows user more leeway and freedom.

- More supportive and less forcing

- Assistive rather than controlling

CONS

- harder to calibrate

- more complicated

- may be more expensive

- involves a lot of research

- Not obvious instant response

SIGNAL PROCESSING

- **Low pass filter**

  - remove DC bias from the computer

- **Band-stop filter- 61-69 Hz**

  - to remove noise
  - Calibrated to lose minimal signal information

- **Convert AC signal to DC via Root mean square**

  - DC Motor requires DC signal