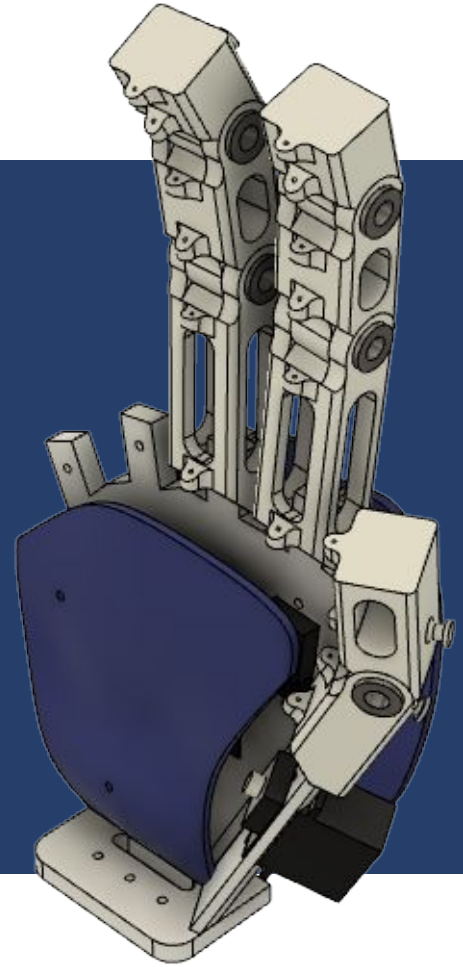
COLORADOSCHOOLOFMINES
engineering the way

Shadow Hand
A 3 DoF animatronic hand



MEGN 540 - Team 2
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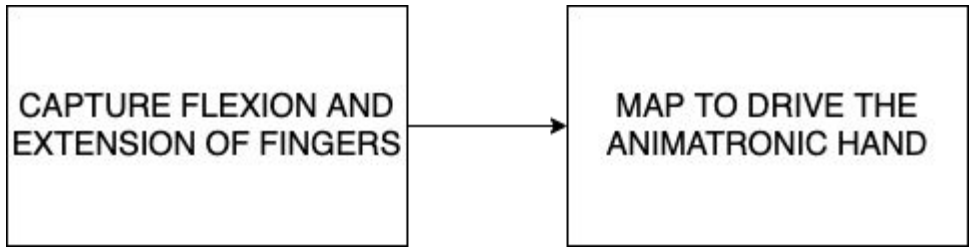
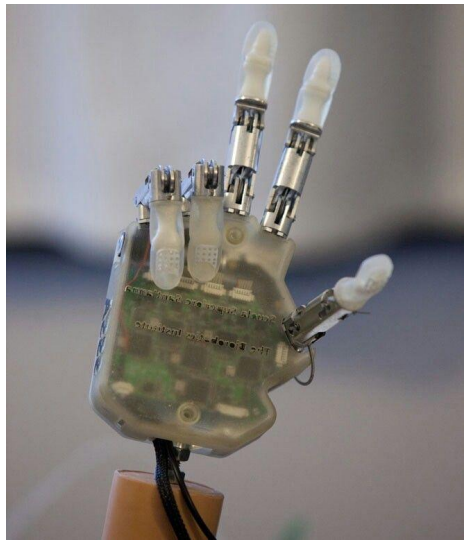
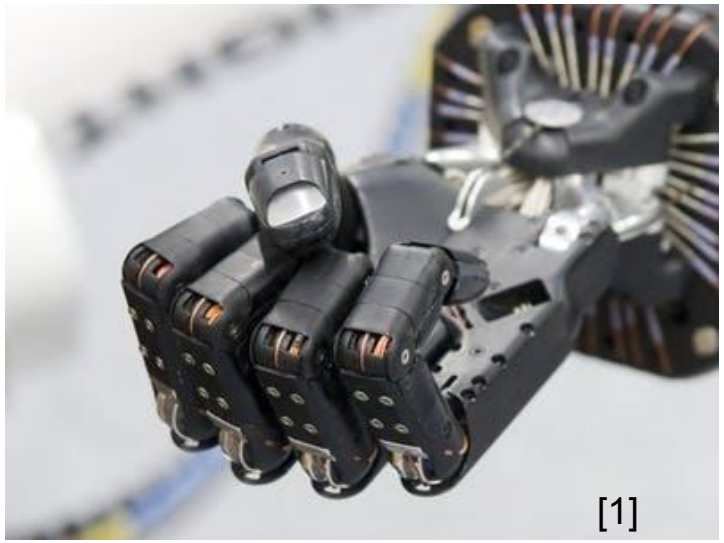
Bhuvan Tej Kanigiri

Design Problem

OBJECTIVE: DESIGN, FABRICATE AND CONTROL A 3 DoF ANIMATRONIC HAND USING FLEX SENSOR GLOVE

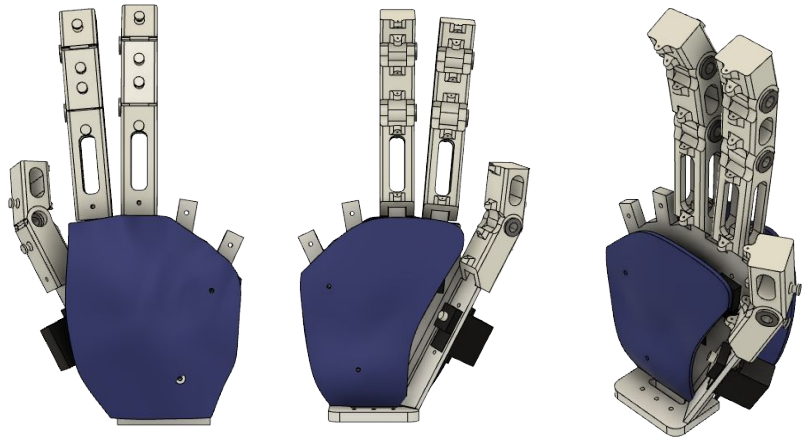






APPLICATION:

- Teleoperation
- Prosthetics



[1] Google stock images

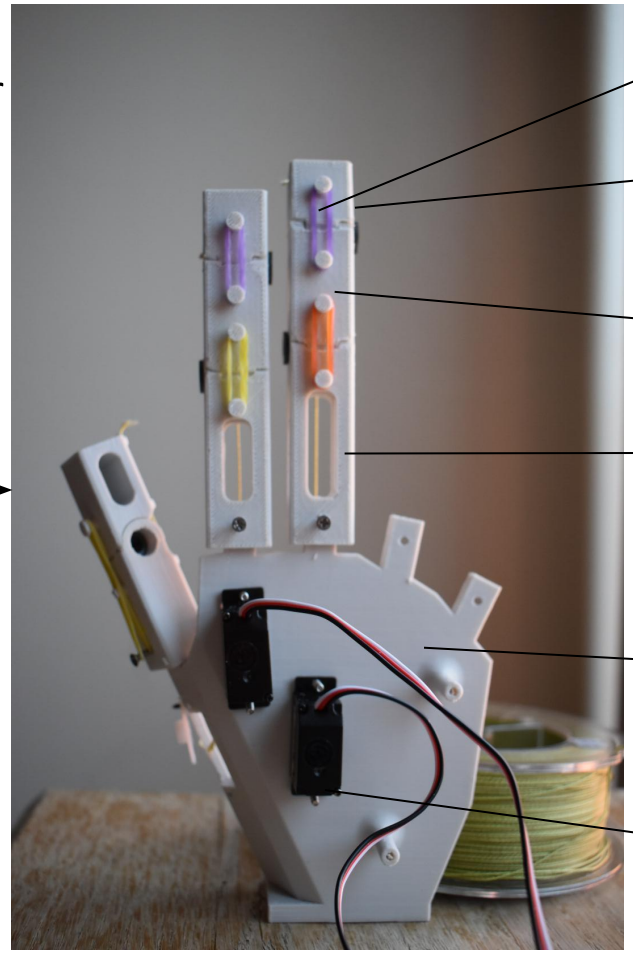
Overview of the solution

Right hand glove worn by human operator

Flex Sensor data at 100 Hz

Arduino microcontroller

Glove



3 DoF animatronic hand - dorsal side

Rubber bands - antagonist

Distal phalange

Intermediate phalange

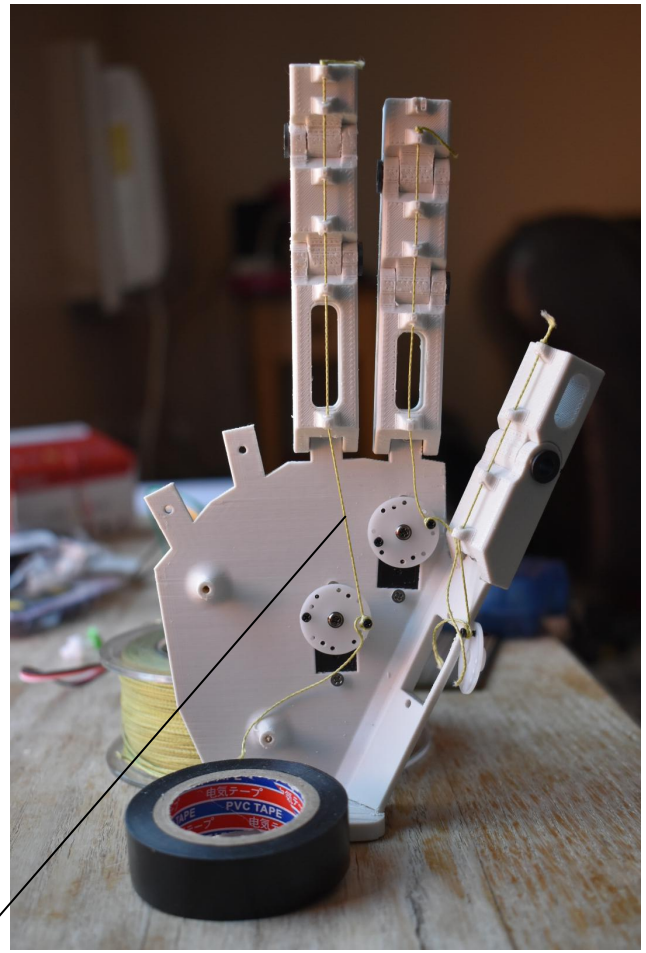
Proximal phalange

Middle finger

Palm/Finger mount

Micro servo motors with 20ms input PWM

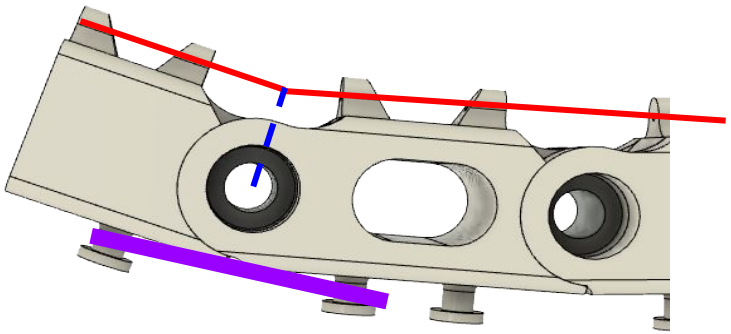
Fishing wire

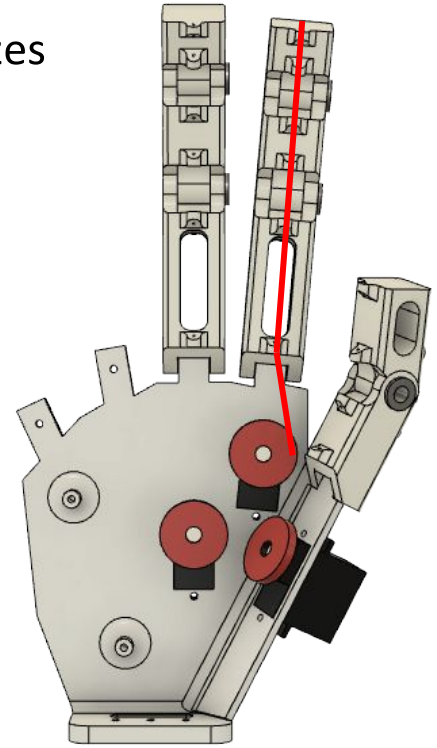


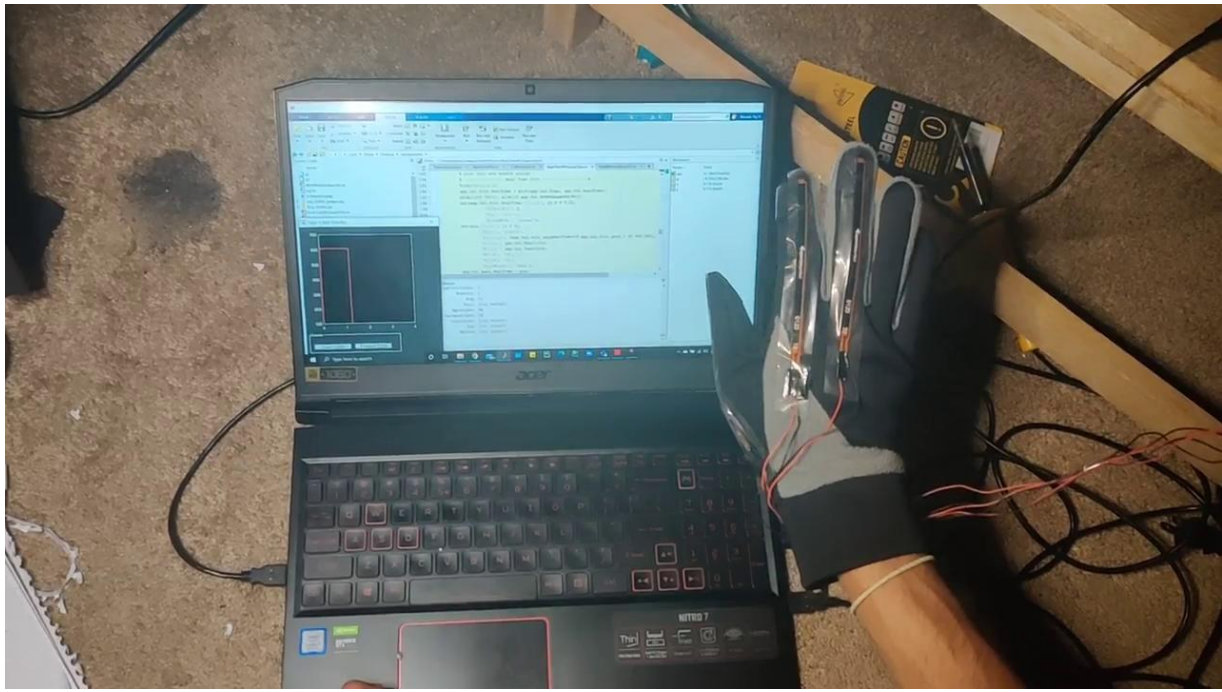
3 DoF animatronic hand - palmer side

Design Challenges

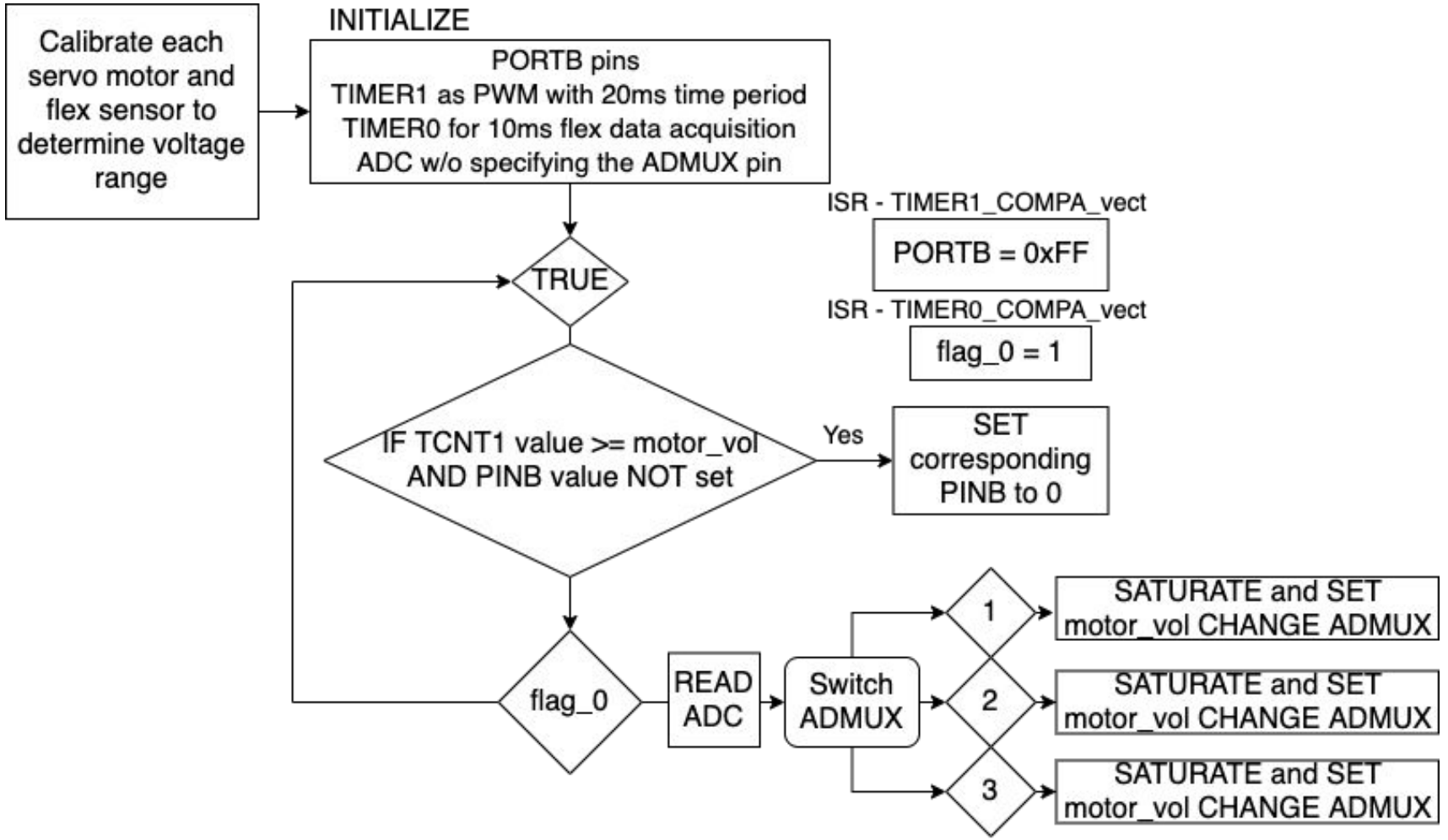
- Human hand proportion
- Placement of servo
- Limited servo motion - 0 ~ 165 deg - effective pull length ~ 28mm
- Sensitivity of servo motors
- Fixing flex sensor to gloves
- Thresholding for different hand sizes
- Friction in 3D printed parts



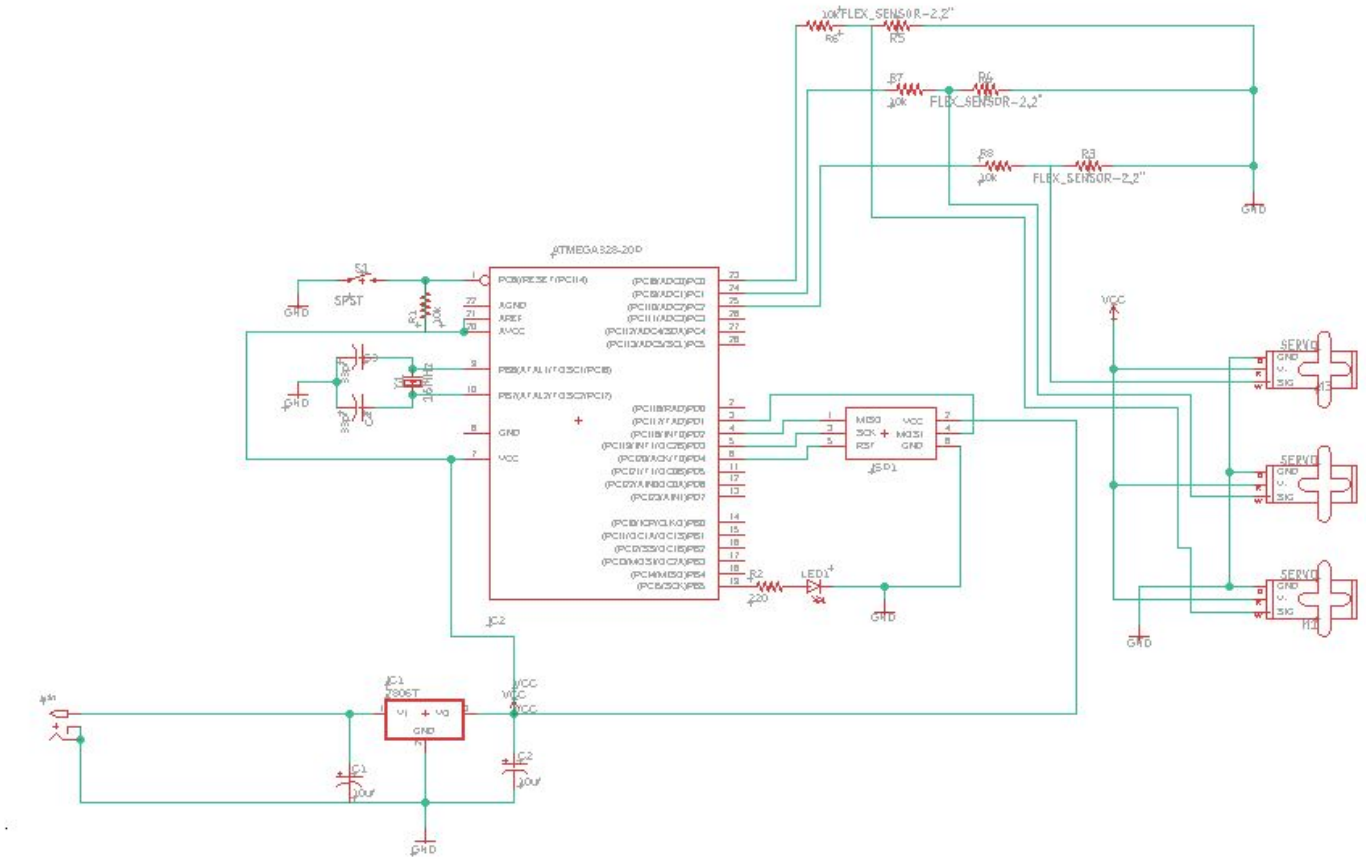


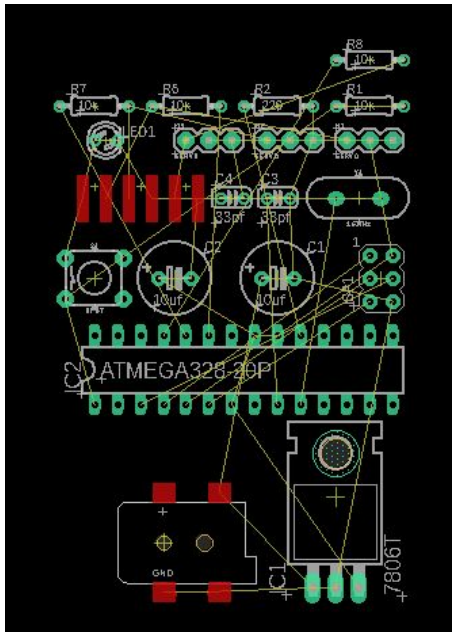


Pseudo chart



Schematic diagram





Next steps and Lesson learned

Next work? Why ?

- Wireless data transfer.
- Increasing the gain by using better torque motor.
- Custom PCB and power distribution.
- Building the platform.

Lessons learned and What to change?

- Programming with Embedded C and ring-buffers in real-time applications.
- Design challenges
  - Kinematic study
  - Interface for different user

Questions?

Thank you!

Demo-ish