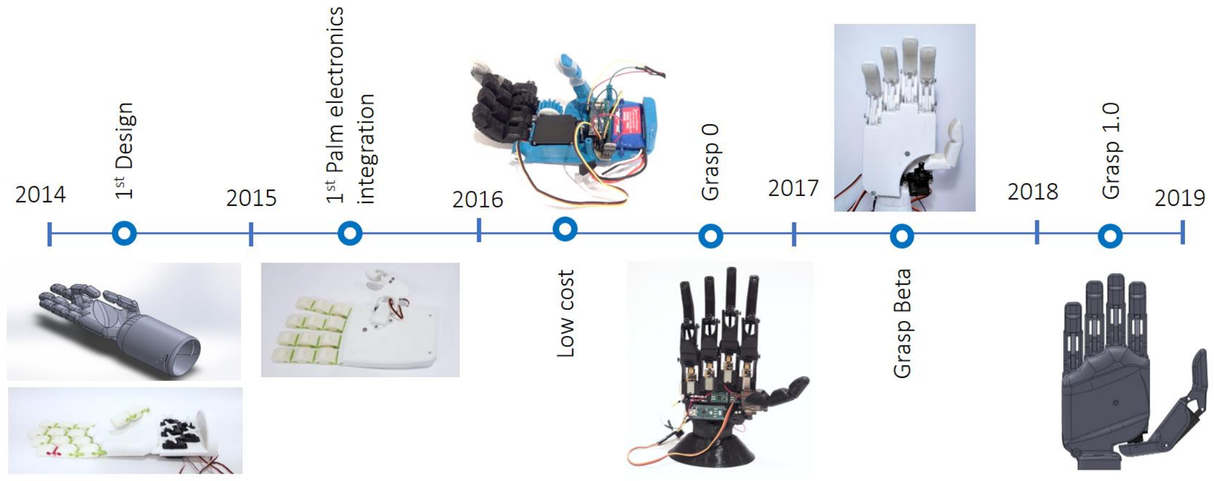
Design and development of an open source, 3D printable, bionic hand.

Xavier Cano Ferrer

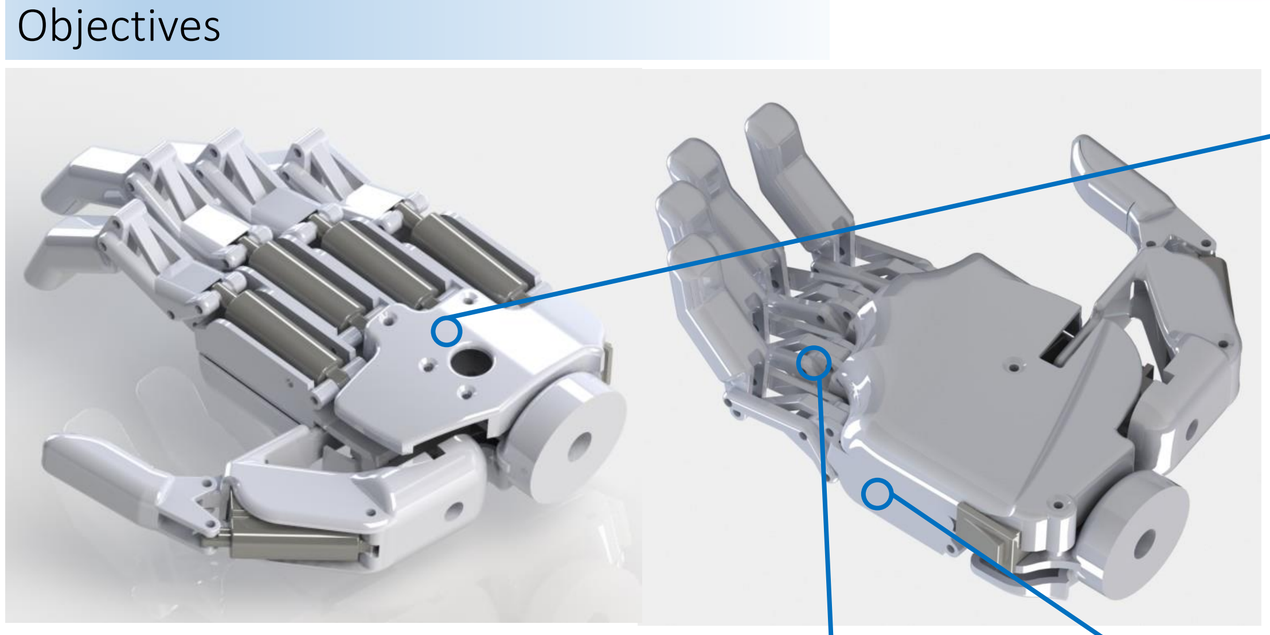
Introduction

Grasp is a 6 degrees of freedom bionic hand based on the Arduino Nano micro-controller. The main design motivation behind this project is to achieve an affordable prosthetic hand able to do the most important types of grasps for the activities of daily living with competitive fingertip forces and flexion-extension speed values Also, it can be used for different purposes: robotics, research, education, hobby. The present work contains the explanation of the theoretical design process and also the evaluation of a fully working prototype.

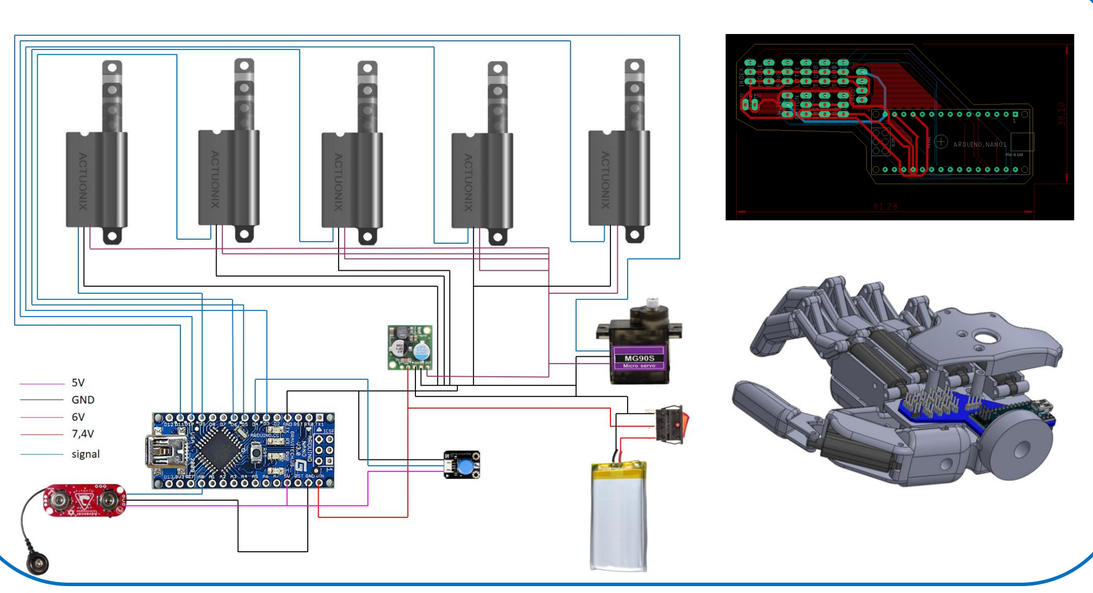
Project evolution



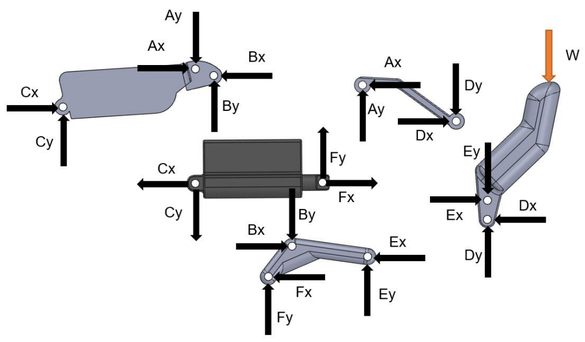
Objectives

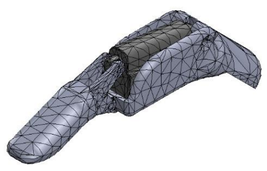


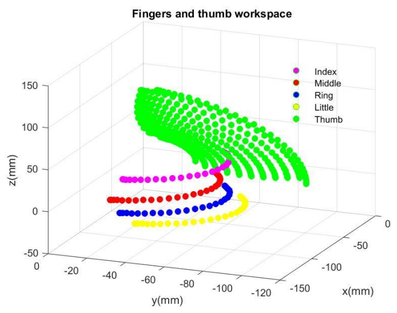
Electronics included on the palm

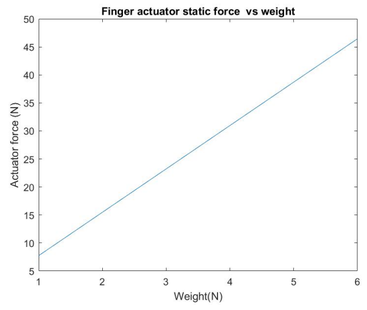


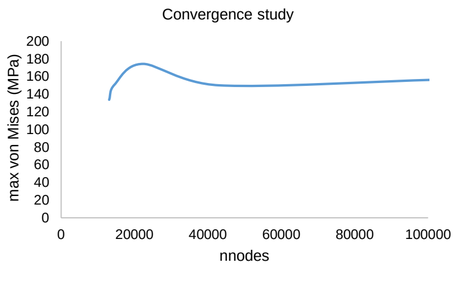
Effective mechanical design

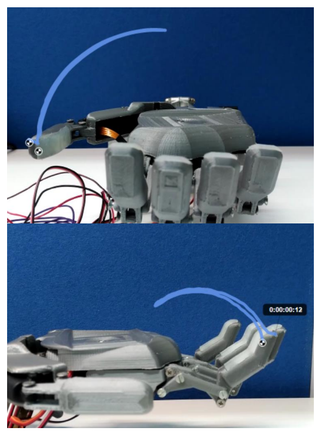


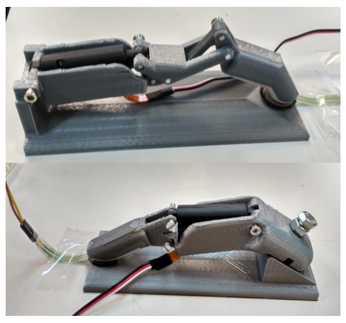


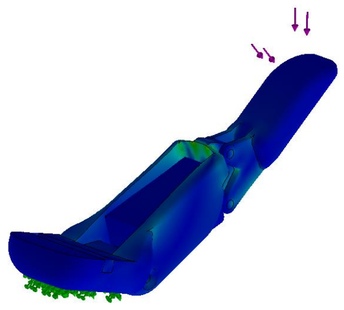




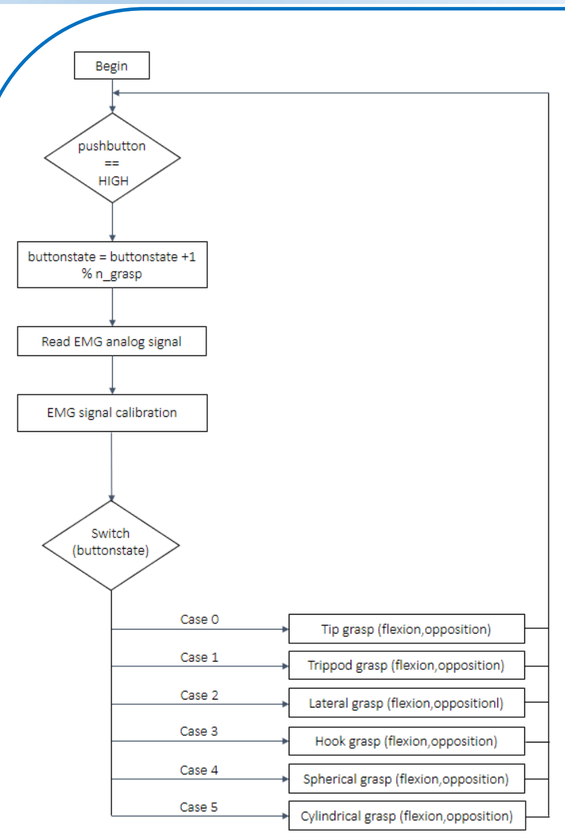


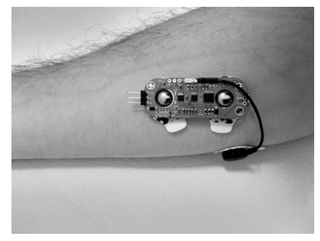


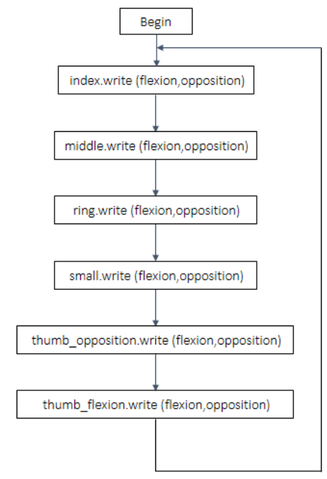




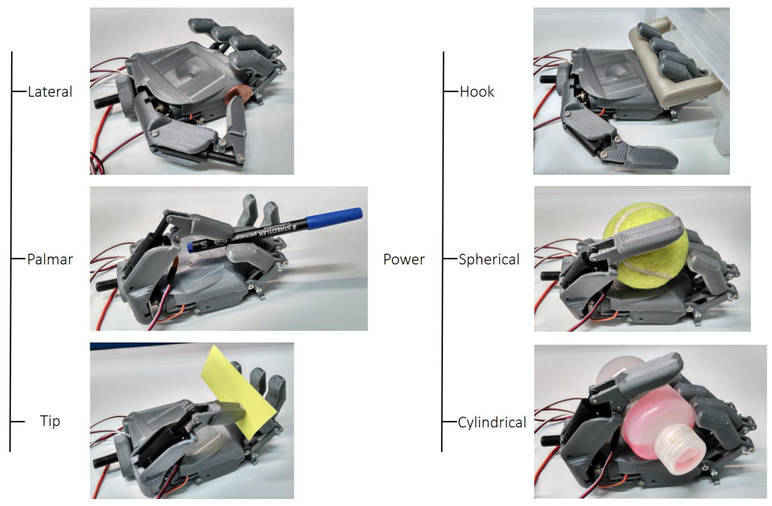
Human interface and control algorithm





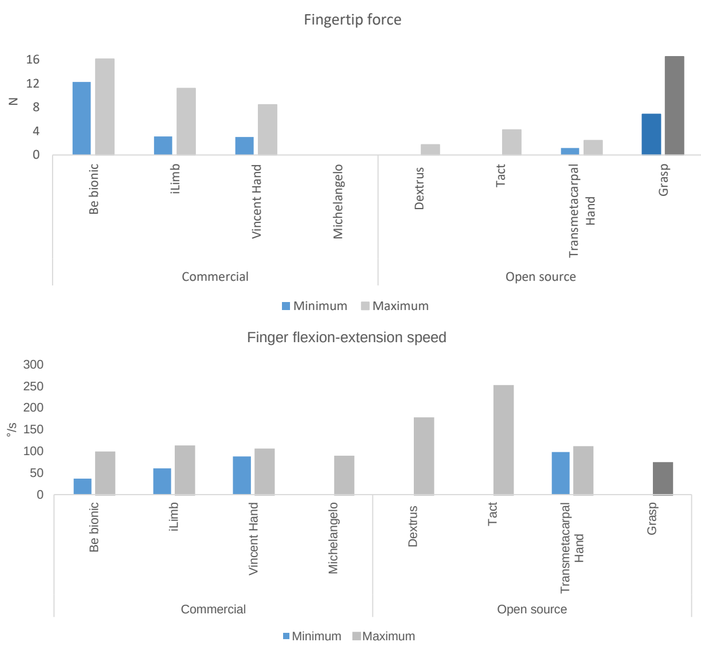


$$EMG\_Flexion = \frac{-107}{\max\_subject} \cdot EMG2 + 145$$



Grasp features

Summary of Grasp 1.0 features	
Flexion-extension speed (°/s)	71.96
Opposition speed (°/s)	196.10
Finger fingertip force (N)	6.82
Thumb fingertip force (N)	16.50
Mass (g)	335
DOF	6
Size (mm)	190 x 141 x 53
Cost (€)	477.35



Open source project

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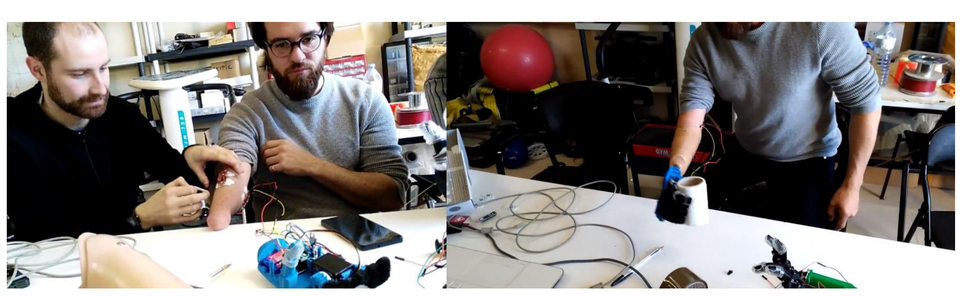

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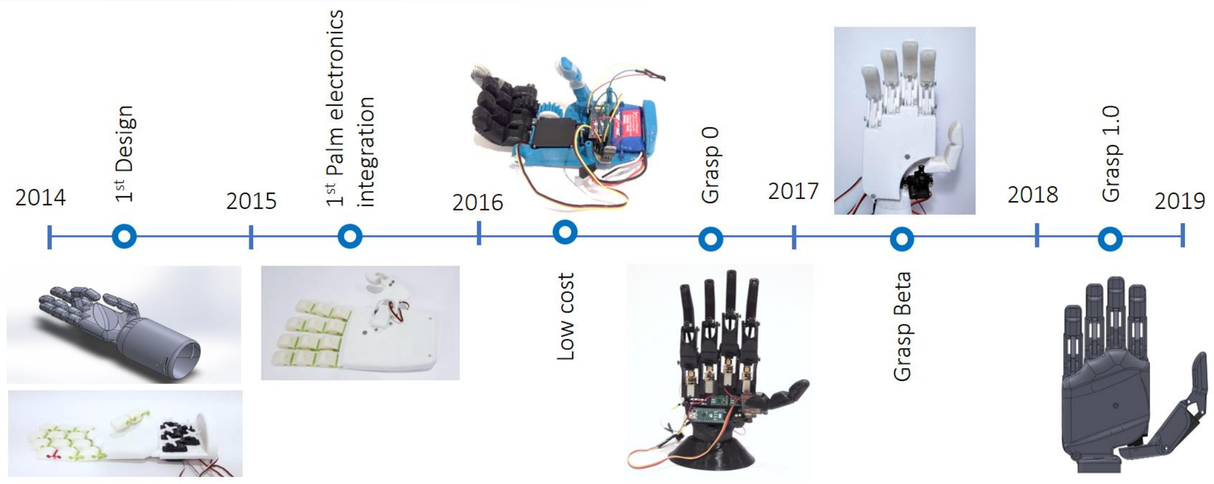

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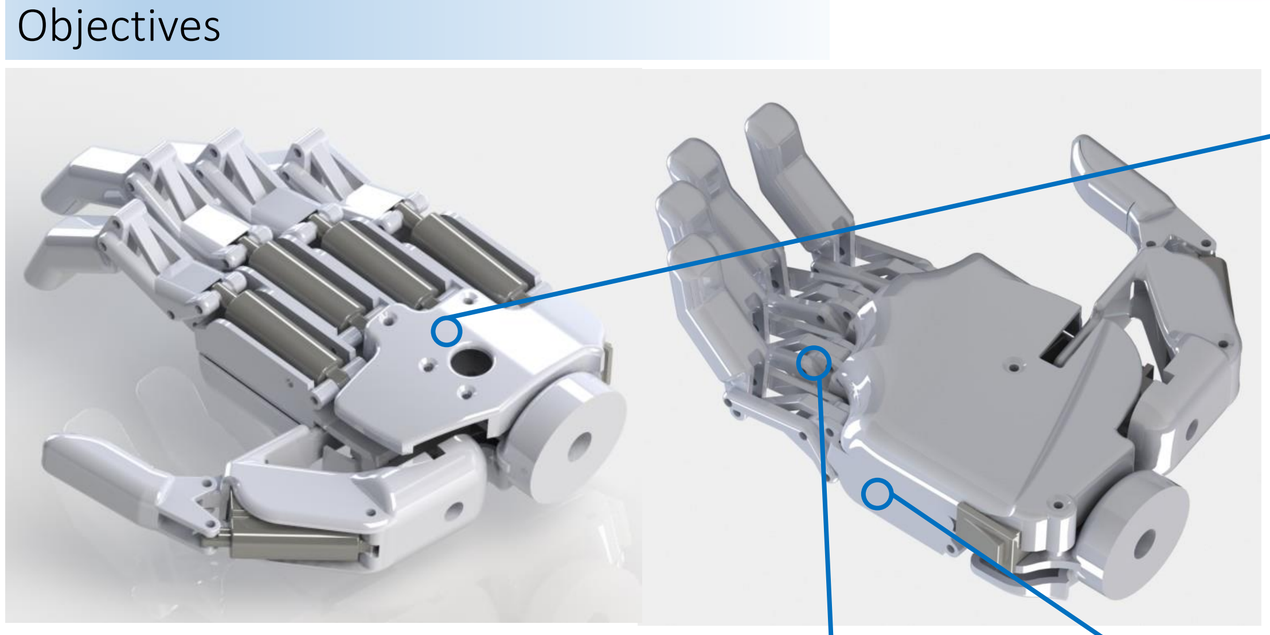

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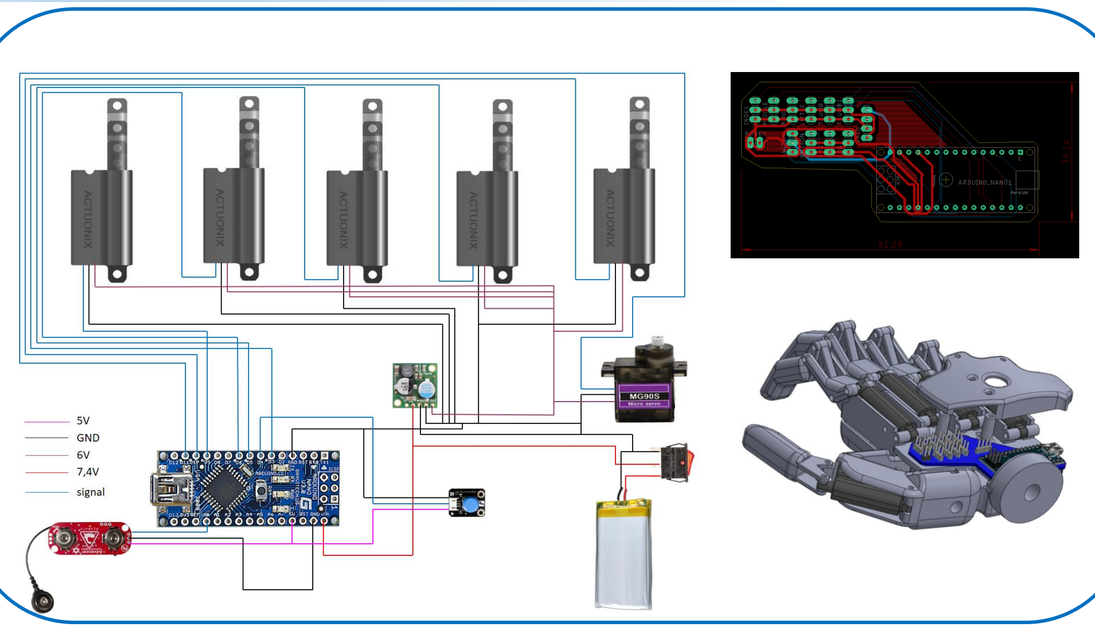

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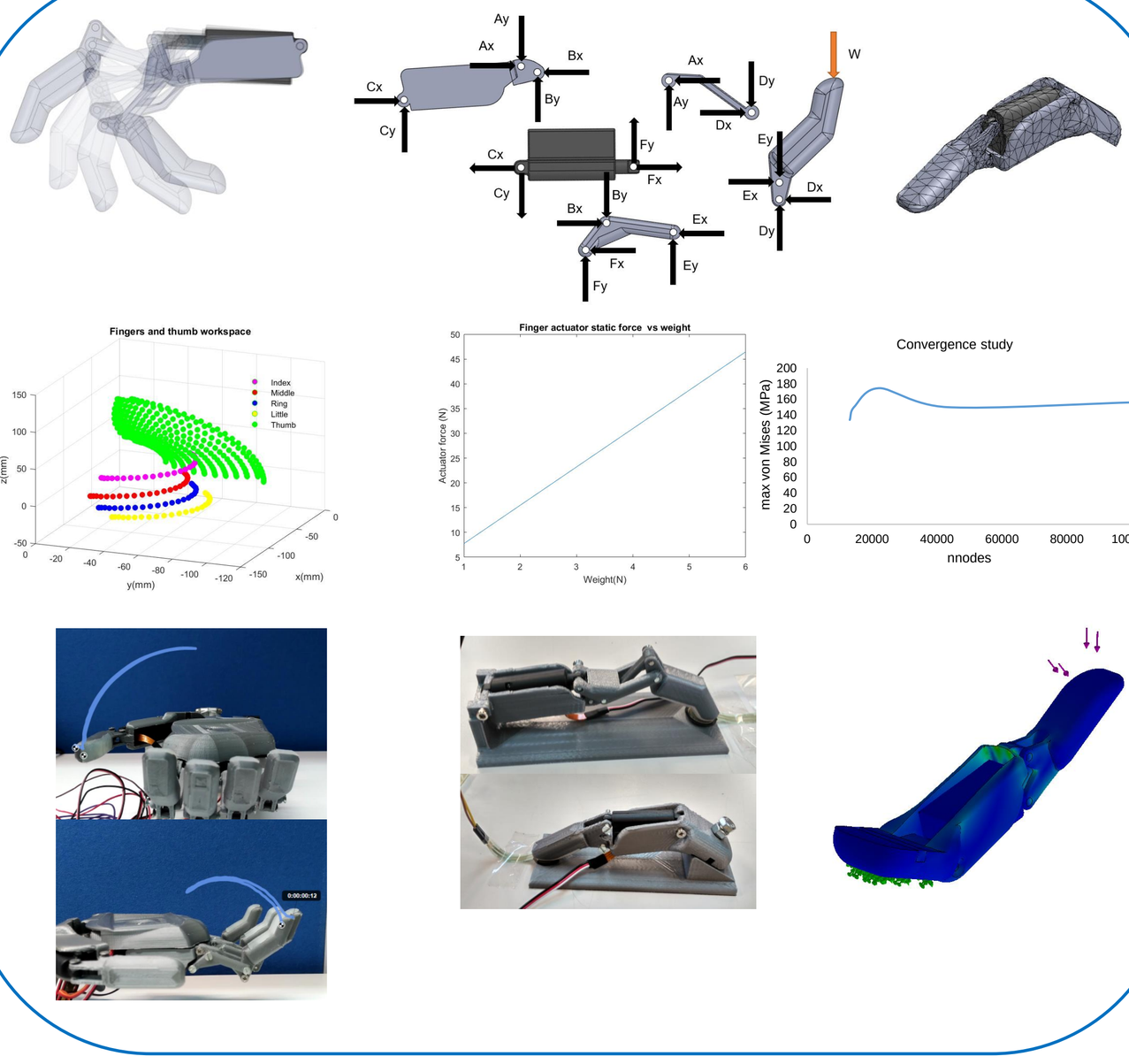

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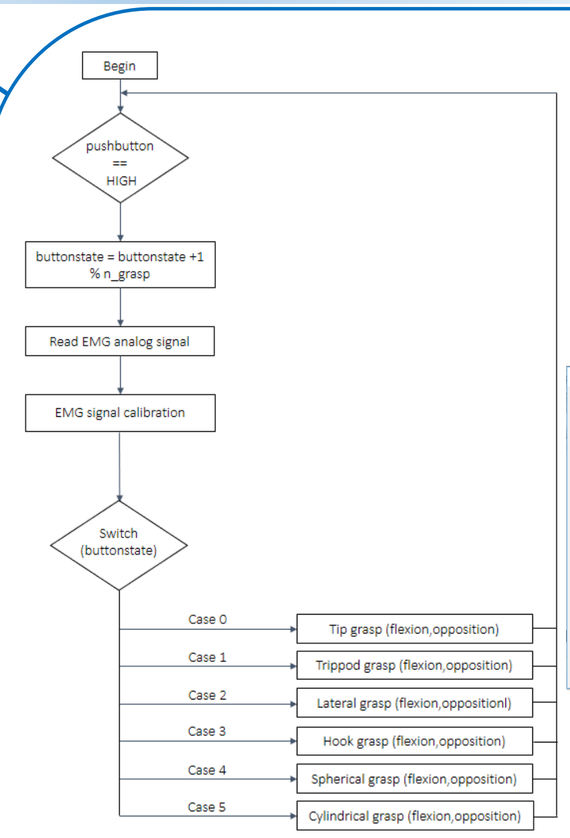

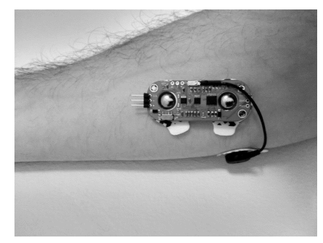

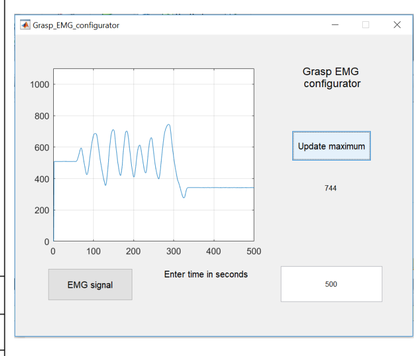

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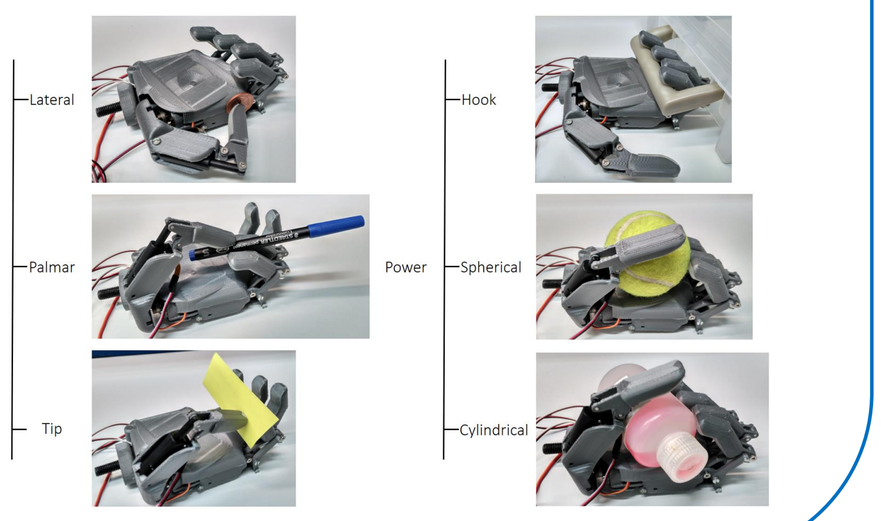

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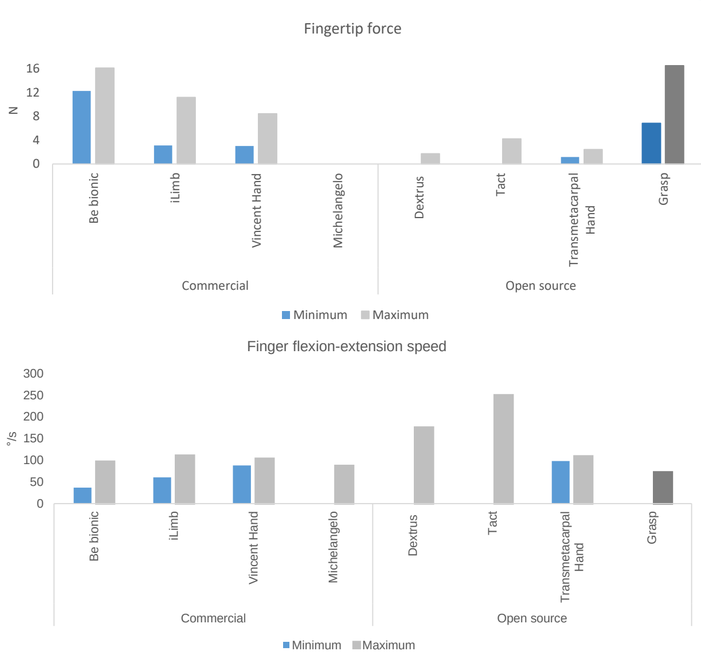

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