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Optimizing actuator design for prosthetic hands

Project type: BSc/MSc Thesis, Collaboration, Semester project

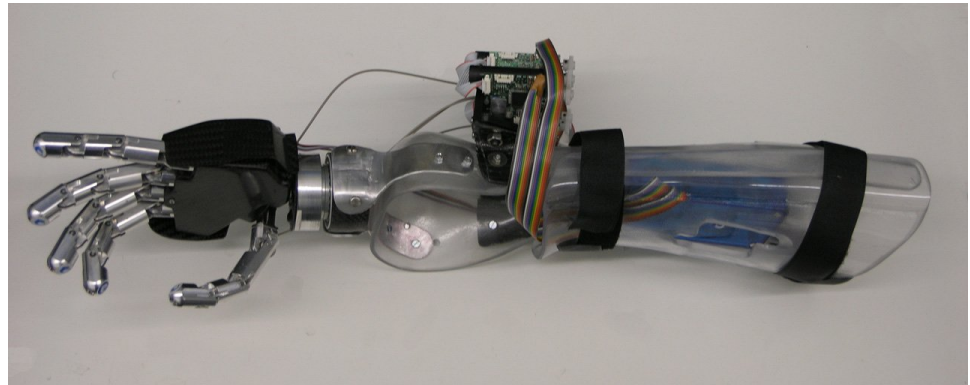


Figure 1 - The SmartHand prosthetic

Description

An upper limb myoelectric prosthetic device (e.g. Figure 1) needs to weigh as little as possible in order for the user to be comfortable while wearing it. Such a weight restriction significantly constrains the size of the motors to be used and as a result the force output of the device itself. The common methods of circumventing this restriction are either a reduced number of heavier motors, or large and/or non back-drivable gear ratios on lighter motors. In the first case, the number of active degrees of freedom (DOF) is reduced, in turn reducing the versatility of the device. In the second case, the lack of backdrivability suggests a prosthesis that is rigid, unnatural and which in turn can be dangerous in certain circumstances.

Tasks

The goal of this project is to optimize the design of an actuator system by (1) minimizing the weight and volume of the system while (2) maintaining an actuation force sufficient for a number of tasks. Once an appropriate mechanism has been developed, you will need to integrate it into an existing design of a cable-driven robotic finger and test it. The major requirements of this project are:

- The mechanism should be able to withstand forces found in every day object manipulation (100-300N).
- The miniaturization of the device is important both for space and weight considerations.

Applicant

The applicant should be a mechanical engineering student/graduate, with a good background in CAD/CAM software (Solidworks preferred) and an interest in robotic/prosthetic applications. The thesis is to be written in English.



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Supervisor

Your contact for this project is Konstantinos Dermitzakis from the AI Lab Zurich (<http://ailab.ch/dermitza>). You can best reach him by email (dermitza@ifi.uzh.ch).