‘Instrumented Prosthesis Pyramid’

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Context

The control of active prostheses can benefit from direct measurement of the contact of the prosthesis with the surrounding world. One way to measure the force and torque of the device is through the use of a force/torque measurement device.

Commercially there are a few options that exist for the specific use with prosthetic devices: the iPECS Lab (https://www.rtcelectronicsinc.com/) and the Europa+ (https://orthocareinnovations.com/europa/). These devices are prohibitively expensive (~16900 dollars for the iPECS Lab, for example). We wish to have similar capability in our prosthesis system called the CYBERLEGs X-Leg. The device should be able to be connected to the standard OttoBock pyramid system. There have been other designs that have been published in the literature [1-3] which may provide more insight about what is necessary in a device, as well as methods of producing devices.

CYBERLEGs X-Leg, knee and ankle modules. This study focuses on the ankle aspects of slippery controller design.

Objective

Design an instrumented pyramid adapter that is suitable for measuring forces and moments intended for control signals for an active prosthesis.

Description of Work

Project will consist of:

- Literature study.
- Design of an instrumented pyramid

- Testing of pyramid to characterize the signals

Experience and Equipment

CAD – A CAD software system for performing design and initial simulation of the transducer design.

Labview – The X-Leg ankle is programmed in Labview and will be required to learn for the project.

Matlab – For data analysis and controller development

Location

VUB-MECH/Brubotics (Pleinlaan 9, Floor -1, 1050 Brussels.)

Contact

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Citations

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2. Sup F, Varol HA, Mitchell J, Withrow TJ, Goldfarb M. Preliminary Evaluations of a Self-Contained Anthropomorphic Transfemoral Prosthesis. IEEE ASME Trans Mechatron. 2009;14(6):667-676. doi: 10.1109/TMECH.2009.2032688. PMID: 20054424; PMCID: PMC2801882.
3. Haque, M.R.; Berkeley, G.; Shen, X. Force-Moment Sensor for Prosthesis Structural Load Measurement. *Sensors* **2023**, *23*, 938. https://doi.org/10.3390/s23020938