Title (tentative): High Degree of Freedom Sensory Augmentation for Improved Grasp Control

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Motivation and application domain

Sensory augmentation is a mitigation strategy that seeks to compensate for sensory deficits by applying synthesized feedback to a body part retaining sensibility. Successful efforts to date have focused primarily on perceptual tasks or on motor tasks requiring active control of just one or two degrees of freedom. Sensory augmentation has not yet been demonstrated for high degree-of-freedom control problems such as the coordination of movements and forces of all fingers.

General objectives and main activities

Aim1: Developing technology for a novel hand grasp manipulandum that allows measurement of fingertip positions and forces, as well as active individual control of fingertip positions during object manipulation tasks. We will quantify the extent to which healthy human subjects can use sensory augmentation to learn novel patterns of individuated finger control.

Aim 2: We will quantify the extent to which a small cohort of stroke survivors can use sensory augmentation to learn novel patterns of individuated finger control.

Training Objectives (technical/analytical tools, experimental methodologies)

The student will learn
- To analyze and correlate individual finger grasp forces and motions from different sources such as load cells and position sensors
- To develop the control of an external device based on grasp forces coming from multiple sensors
- To develop data analysis tools for behavioral data
- To improve the knowledge of Matlab/Simulink, C, and statistical analysis
- To work (in an international team) with people with different backgrounds and with people with disability

Place(s) where the thesis work will be carried out: Marquette University Neuromotor Control Lab, Milwaukee, Wisconsin, USA

Maximum number of students: 1