

University of Massachusetts Medical School

eScholarship@UMMS

UMass Center for Clinical and Translational
Science Research Retreat

2014 UMass Center for Clinical and
Translational Science Research Retreat

May 20th, 12:30 PM

A Soft Robotic Exomusculature Glove with Integrated sEMG sensing for Hand Rehabilitation

Michael Delph
Worcester Polytechnic Institute

Et al.

Let us know how access to this document benefits you.

Follow this and additional works at: https://escholarship.umassmed.edu/cts_retreat



Part of the [Biomedical Commons](#), [Biomedical Devices and Instrumentation Commons](#), [Physical Therapy Commons](#), [Robotics Commons](#), and the [Translational Medical Research Commons](#)

Delph M, Nycz C, Fischer G. (2014). A Soft Robotic Exomusculature Glove with Integrated sEMG sensing for Hand Rehabilitation. UMass Center for Clinical and Translational Science Research Retreat. Retrieved from https://escholarship.umassmed.edu/cts_retreat/2014/posters/34

Creative Commons License



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 3.0 License](#). This material is brought to you by eScholarship@UMMS. It has been accepted for inclusion in UMass Center for Clinical and Translational Science Research Retreat by an authorized administrator of eScholarship@UMMS. For more information, please contact Lisa.Palmer@umassmed.edu.

Title:

A Soft Robotic Exomusculature Glove with Integrated sEMG sensing for Hand Rehabilitation

Authors:

Michael A. Delph, Christopher J. Nycz, Gregory S. Fischer

Institutional Affiliation:

Healthcare Delivery Institute at WPI
Automation and Interventional Medicine (AIM) Laboratory

Contact Information:

Gregory Fischer, gfischer@wpi.edu, (508)831-5261

<http://aimlab.wpi.edu>

Abstract:

Stroke affects around 750,000 people annually with 80% of survivors left with unilateral weakness in their extremities. Repetitive hand movement therapy is often used as a rehabilitation technique to help patients regain dexterity and strength. In order to facilitate this rehabilitation process, a soft exo-muscular robotic upper limb device was designed to aid in the movement and coordination of upper limb exercises. The device utilizes a cable system to open and close a patient's hand and elbow. These cables run through a series of guides and pull on attachment points at the fingertips and forearms, emulating muscle tension and generating joint torque. For energy dense actuation, DC electric motors were used to drive pulleys for cable actuation. To increase user comfort and safety, mechanically compliant actuation was added by using clutches with continuously variable slip torque between motor and pulley which could act as a means of mechanical force control. For closed loop control and monitoring of patient progress, a number of sensors were added. Flex and pressure sensors in the fingers can detect patient movement as well as the force being applied to objects and force sensors in the biceps are used to measure the lift force of the users arm. The device also takes input from a custom made surface myoelectric electrode (sEMG) array that measures the myoelectric signal being produced by the user's muscles to help aid the user in their intended movement. In practice the device will be able to provide a customized rehabilitation experience for each user based on sensor data analyzed by doctors who can adjust the therapy regiment to focus on goals and needs of a specific patient.