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

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

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**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.