A Robotic Hand Orthosis and Novel Automatic Brunnstrom Evaluation for Stroke Patients

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Limited hand movement caused by paralysis can significantly decrease quality of life for stroke patients. Wearable robotic hand orthoses are able to provide everyday assistance and rehabilitation purposes while also offering flexibility and convenience. This project presents a robotic hand orthosis with multimodal sensing intended to help patients with partial hand paralysis. Compared to hard, mechanical hand exoskeletons, which are heavier and more difficult to individualize for unique hand shapes, the hand orthosis developed in this project uses artificial tendons with adjustable lengths to flex and extend the fingers. The orthosis also uses multimodal sensing to accurately detect user intention. Even after stroke, patients typically retain a limited degree of finger movement, which can be used to determine grasp or release intention through flex and pressure sensors. The sensors are also used in a novel evaluation mode for tracking motor function recovery, which is based off of the Brunnstrom Stages of Stroke Recovery. To assess the prototype, different objects were used for grip experimentation. Range of motion and other important specifications were measured as well. The robotic hand orthosis discussed in this paper offers a more flexible, effective, and comprehensive solution than many current rigid exoskeletons for stroke survivors.

Awards Won:
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