Soft Robotic Exoskeletal Glove with Single Motor-Driven Tendon-Based Differential Drive

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Abstract : To aid and rehabilitate increasing number of patients suffering from spinal cord injury (SCI) and stroke, a lightweight, wearable, and 3D printable exoskeletal glove has been developed. Unlike previously developed metal or fabric-based exoskeletons, this research presents the development of soft exoskeletal glove made of thermoplastic polyurethane (TPU). The drive mechanism consists of a single motor-driven antagonistic tendon to perform extension or flexion of middle and index finger. The tendon-based differential drive has been incorporated to allow for grasping of irregularly shaped objects. The design features easy 3D-printability with TPU without a need for supports. The overall weight of the glove and the actuation unit is approximately 500g. Performance of the glove was tested on a custom test-bench with integrated load cells, and the grip strength was tested to be around 30N per finger while grasping objects of irregular shape.

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Keywords : 3D printable, differential drive, exoskeletal glove, rehabilitation, single motor driven

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