University of Utah
UNDERGRADUATE RESEARCH JOURNAL

ASSISTIVE BIONIC ARM: A POWERED EXOSKELETON TO ASSIST DEXTEROUS HAND GRASPS AND WRIST MOVEMENT

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There are over 800,000 new stroke patients each year and eight out of ten of them suffer from muscle weakness on one side of their body that limits the functional range of motion of their joints. Powered exoskeletons can restore upper-limb motor function to these stroke patients using actuated joints that provide supplemental power to assist with joint movements. Clinically available powered exoskeletons, such as the MyoPro, are limited in that they are costly and only provide assistance with elbow movement and a three-finger pinch movement. Here we showcase two additional actuated joints for the MyoPro exoskeleton that enable two novel movements – power grasp and wrist flexion/extension – that are built from a small number of 3D-printed parts for under $130. To enable power-grasp, six 3D-printed parts attach digits four and five to a servo motor and the MyoPro exoskeleton. To enable wrist flexion/extension, a single 3D-printed part attaches a servo motor to the wrist flexion/extension joint on the MyoPro exoskeleton. This work demonstrates that low-cost 3D-printed components can readily provide additional actuated joints to preexisting clinical exoskeletons. These additional actuated joints can be used by engineers to explore novel control strategies of multiarticulate upper-limb exoskeletons. Ultimately, more dexterous powered exoskeletons may improve stroke rehabilitation and provide patients with improved functionality in activities of daily living.