

Robotics and Autonomous Systems Thesis Defense

EMG Analysis of an Octopus Arm

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Abstract

The octopus' arm is a muscular hydrostat that enables the octopus to explore its environment, capture prey, and achieve locomotion. The arm features transverse, longitudinal, and oblique muscles that allow the arm to shorten, elongate, bend, and twist. The previously reported orientation of these muscle fibers has been used to hypothesize which muscle groups activate to achieve specific movements. Through localized electromyography (EMG) recordings of the longitudinal and transverse muscles of *Octopus bimaculoides*, this research aims to quantitatively confirm the roles of these muscle layers. Six 50-micron diameter bipolar hook electrodes were inserted into a freshly amputated arm. This included four probes in the oral, aboral, and lateral longitudinal muscle regions and one in the transverse muscle for EMG recording using an electrophysiology data acquisition system. One probe was inserted into the axial nerve cord to electrically stimulate the arm through a signal generator. Experiments were conducted with the arm submerged and suspended in a water container with surrounding cameras for recording, all housed by a Faraday cage. The findings of this study can be used to inspire the soft robotics community to engineer solutions by designing robots primarily composed of soft materials, for applications such as minimally invasive surgery, wearable prosthetics, handling fragile objects, and search-and-rescue operations.



October 26, 2022; 12:30 PM;

Zoom Link: <https://asu.zoom.us/j/84780823732>