REAL-TIME ELECTROMYOGRAPHY FOR BIOMECHANIC ACTUATION: SIGNAL PROCESSING AND CONTROL IMPLEMENTATION

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Due to the difficulty in interpreting muscle activity, the majority of current myoelectric and hybrid prosthetic systems are not able to provide smooth and intuitive motion to their users at an accessible price point. Electromyography (EMG) is a method of measuring electrical potential differences during contraction of the muscle, providing information on muscle function and control. A potential solution which allows users to operate prosthetics with natural muscle movement could be found with the use of EMG in prosthetics. With the financial assistance from the Fund for Undergradute Scholarly Experience (FUSE) grant, we are developing an EMG based control system that processes neuromuscular signals to control the grip strength of a prosthetic hand. A Myoware Muscle Sensor 2.0 will be placed on the biceps brachii for the recording of EMG signals. Preprocessing of the neuromuscular signals includes a process of filtering, rectification, and enveloping which removes low frequency noise and ensures relevant information is received. The data will be mapped from an analog signal to pulse width modulation (PWM) using an ESP32 microcontroller, allowing direct communication with a linear actuator. This device will be tested on its grip strength and time of a maintainable grip. We hypothesize that an accurate interpretation of real-time neuromuscular data through an EMG controlled prosthetic system will provide a stable and responsive grip while maintaining affordability to users. The findings from this project could provide a foundation for future assistive technology advancements, leading to the further development of intuitive and reliable prosthetic devices.