Design and Construction of a Cost-Effective Full Arm Prosthetic with Computer Vision

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Currently with the average cost of a prosthetic continually rising, and the usability of cheaper prosthetics negatively affecting the user, a prosthetic with long-term functionality and complex mechanics, using cost-effective materials, would provide a feasible solution to a costly problem. This project involved the design and construction of an anthropomorphic cost-effective arm, that uses computer vision, and muscle impulses, to control the advanced mechanisms of the arm. The overall goal is to provide autonomy for both the user and the arm. The hand opens and closes based on the amount of electrical output the EMG sensor returns from the arm. The arm uses an electromyography sensor, or EMG sensor, to capture the energy released in the motor neurons when the user wants to move a muscle. The machine learning infrastructure relies on an advanced environment involving a camera, an Arduino microcontroller, and several tactile sensors. The OV7670 camera has a depth sensor that allows it to take high definition photos of the object the arm is aiming to grasp. The OV7670 takes the photo and applies an edge detection algorithm, which looks at the object and outlines the edges and determines the best way the arm can grasp the object. The arm grasps the object using one of 12 specific gripping mechanisms unique to different objects. The arm can function in an everyday setting, and provides an exciting future for the advancement of EMG prosthetics, as the use of machine learning in the field is unlimited.

Awards Won:

Fourth Award of $500

International Council on Systems Engineering - INCOSE: Second award of $500