3D Printed Myoelectric Prosthesis without TMR Surgery

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The purpose of this experiment was to develop a more accessible and less invasive solution to today's current prosthesis procedures. The cost of a prosthetic arm can range anywhere from $15,000 to $50,000. The prosthetic developed in this experiment costs an average of $300 to $500 with the help of additive manufacturing techniques otherwise known as 3D printing technology. This also removes the necessity for Targeted Muscle Reinnervation (TMR) invasive surgery with the use of Electromyography (EMG) signal processing through the circuit designed. The way this was made possible without requiring invasive surgery, was to develop a way to move the prosthetic arm using the already existing nerves of the amputee, with electrodes placed on specific nerves that remain. The brain sends a signal to the nerves to move the arm that is no longer in existence, by using electrodes to read the signal and amplifying the analog signal with the circuit. In my C++ program I set a specific threshold that moves the prosthetic so it can be adapted to any amputee's specific needs. In the research, it was analyzed the relative voltages that the circuit provided, using the relaxed state of the Flexor Carpi Ulnaris (FCU) and the Extensor Carpi Radialis Longus (ECRL) in their flexed and extended states respectively. By successfully adapting current prosthetic technology to design a new alternative that makes the rehabilitation process and the regaining of full mobility for the amputee became more cost effective by 98% and non-invasive.

Awards Won: