Using Electroencephalography to Control Transhumeral Prostheses

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As of 2017 it is estimated that nearly 57.7 million people have amputations, and this number is expected to double by 2050. Within the U.S. it is reported that 34% of amputations are upper extremities. To treat these cases many people seek to use prosthetic limbs. The main problem with protheses is functionality especially for amputations above the elbow (transhumeral). The goal of this project is to address many issues regarding prosthetics including, control of prostheses, the need for surgeries, price of prosthesis, materials, and prosthesis for growing children. To address these issues, a prosthetic arm was created that is controlled using electroencephalography. Electroencephalography (eeg) is a test done to see the electrical activity going on within the brain which is represented through brainwaves. For this project, alpha and beta waves were used. These two types are associated with cognitive function and movement. These brainwave values were then analyzed by a machine learning model and used to open and close the hand. Currently the machine learning model has an accuracy of 58% which will be improved in the future. The arm itself is completely 3D printed, and each finger has individual movement controlled with a servo motor. These fingers use a tendon system, one string/elastic band is used to retract the finger and the other contracts. Lastly there are buttons mapped to various gestures allowing the user to map different finger movements for various events.

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