ABSTRACT

The Machine Learning (ML) algorithm with the Extream Learning Machine (ELM) method is designed as a classification method for determining Electromyograph (EMG) signal patterns. This algorithm uses the signal of each finger as the main input to move the fingers independently so that prosthetic hand movements are obtained in accordance with the input movements.

The signal used is a 2-channel surface EMG (sEMG) acquired from the arm muscle in the extensor and flexor digitorum, 3 electrodes placed near the wrist (flexor digitorum) and 3 other electrodes (2nd channel) on the back of the arm (extensor digitorum). The signal results are processed with feature sets (feature extraction) such as Hjorth Time-Domain Parameters, Skewness, Slope Sign Change to determine the characteristics of each hand and finger motion. Servo motors are used on each finger, which amounts to five motors.

Implementation of this research resulted in a 3D printed prosthetic hand using the open source project design Inmoov. ELM inference is carried out on raspberry-pi using Python programming. The average accuracy of hand movement classes produced using Extreme Learning Machine is 86% for the classification of 6 classes.

Keywords: machine learning, prosthetic, raspberry-pi, sEMG, ELM