An amplitude independent muscle activity detection algorithm based on adaptive zero crossing technique and mean instantaneous frequency of the sEMG signal

ABSTRACT

In order to enhance the efficacy of the prosthetic and orthotic robotic devices controlled by surface electromyography (sEMG) signals, muscle activity detection algorithms need to be independent of the amplitude variation in the sEMG signal to make these devices more feasible and reliable for the disabled people. A new algorithm has been developed to detect the presence of muscle activities in weak and noisy sEMG signals. The algorithm does not employ any amplitude features in the detection process and employs only frequency features of the sEMG signal; therefore it is amplitude independent and can detect muscle activities in signals that have low signal to noise ratio. A new zero crossing technique has been developed as a new frequency feature called the Adaptive Zero Crossing (AZC) which is used to minimize false alarms and enhances the detection process. This new feature in addition to the mean of the Mean Instantaneous Frequency (MMIF) of the signal is used to detect the presence of the muscle activities in the sEMG signals.

Keyword: Muscle activity detection; Electromygraphy; sEMG; Zero crossing