Generalization of ANN model in classifying stance and swing phases of gait using EMG signals

ABSTRACT

Exposure to physical therapy in rehabilitation shows a major interest in recent years. Even though the detection of gait events based on Electromyography (EMG) signals help the development of various assistive devices, the main issue arises on how to utilize EMG signals especially for two phases, stance and swing. Previous works had proposed various classification model of EMG signals for five and seven phases. However, the performance of the classification model for any individual has not been explored. Thus, this study investigate the generalization of classification model for two gait phases, stance and swing based on EMG signals. The model was developed by extracting five time domain (TD) features and fed into a classifier, artificial neural network (ANN). Eight participants were divided into two groups that is learned data and unlearned data. The ANN model was designed based on learned data with levenberg maquardt (LM) training algorithm. Then, the model will be further evaluated with EMG signals of both unlearned data and learned data to observe the generalization of ANN model. The ANN model gained 87.4% of classification accuracy in discriminatiing stance phase and swing phase. This study found the generalization of the ANN model were acceptable with 87.5% for learned data and 77% for unlearned data. Future works could enhance the classification accuracy with different TD features and number of hidden neurons for ANN.

Keyword: EMG signals; Time domain features; ANN; Gait phases