Classification of ankle joint movements based on surface electromyography signals for rehabilitation robot applications

ABSTRACT

Electromyography (EMG)-based control is the core of prostheses, orthoses, and other rehabilitation devices in recent research. Nonetheless, EMG is difficult to use as a control signal given the complex nature of the signal. To overcome this problem, the researchers employed a pattern recognition technique. EMG pattern recognition mainly involves four stages: signal detection, preprocessing feature extraction, dimensionality reduction, and classification. In particular, the success of any pattern recognition technique depends on the feature extraction stage. In this study, a modified time-domain features set and logarithmic transferred time-domain features (LTD) were evaluated and compared with other traditional time-domain features set (TTD). Three classifiers were employed to assess the two feature sets, namely linear discriminant analysis (LDA), k nearest neighborhood, and Naïve Bayes. Results indicated the superiority of the new time-domain feature set LTD, on conventional time-domain features TTD with the average classification accuracy of 97.23 %. In addition, the LDA classifier outperformed the other two classifiers considered in this study.

Keyword: EMG; Rehabilitation; Ankle joint movements; Signal processing; Pattern recognition