

Assessment on stationarity of EMG signals with different windows size during isotonic contractions

ABSTRACT

In order to analyse surface electromyography (EMG) signals, it is necessary to extract the features based on a time or frequency domain. These approaches are based on the mathematical assumption of signal stationarity. Stationarity of EMG signals is thoroughly examined, especially in isotonic contractions. According to research, conflicting results have been identified depending on varying window sizes. Therefore, in this study, the authors endeavoured to determine the suitable window size to analyse EMG signals during isotonic contractions utilising stationary tests, reverse arrangement (RA), and modified reverse arrangement (MRA). There were slight differences in the average percentages of signal stationarity for RA and MRA tests in 100 ms, 500 ms, and 1000 ms window sizes. However, there was none for the 200 ms window size. On average, a window size of 200 ms provided stationary information with 88.57% of EMG signals compared to other window sizes. This study also recommended the MRA test to determine EMG signals stationarity for future studies, as the performances were better in comparison to RA tests. However, the following recommendation is only valid for window sizes greater than 200 ms. For a real-time application, the size of the analysis window together with the processing time should be less than 300 ms and a window size of 200 ms is applicable for isotonic contractions.

Keyword: EMG signals; Isotonic contractions; Stationary; Windows size