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Assessing the SNR influence in the estimation of the mean frequency of lower limbs sEMG signals (Article)

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Abstract

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The mean frequency of the power spectrum (MNF) is commonly used to describe the frequency content of an electromyographic (EMG) signal. The objective of this study is to determine the minimum/desirable signal to noise ratio (SNR) value to achieve a reliable measurement of the MNF in superficial EMG (sEMG) signals of lower limbs during gait. To this end, measurements of MNF and SNR were taken in nine muscles of 21 subjects, and recorded signals were contaminated with different noise levels. The minimum threshold of a desirable SNR was determined using the K-means algorithm. A lower bound of 5.51 dB was determined as the SNR value for sEMG acquisition, while 12.28 dB is the desirable SNR value for recording sEMG signals. The methodology presented throughout this paper helps in the determination of the minimum SNR value necessary to validate the sEMG acquisition process that can be used, for example, as a control signal for identifying motion intention in the development of control systems devoted for a lower limb exoskeleton.

SciVal Topic Prominence

Topic: Muscle | Electromyography | Isometric contractions

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Author keywords

EMG | lower limbs | MNF | SNR

Indexed keywords

Engineering controlled terms: Biological organs | Biomedical signal processing | Exoskeleton (Robotics) | Frequency estimation

Engineering uncontrolled terms: Acquisition process | Electromyographic signal | Frequency contents | k-Means algorithm | Lower limb | Motion intention | Recorded signals | Reliable measurement

Engineering main heading: Signal to noise ratio

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