

Entropy-based analysis of the surface electromyography signals

Physiological systems are characterized by high dynamical complexity, which is conditioned by their ability to adapt in incessantly changing environment. Loss of such complexity can be related with occurring the pathological state, what has been gained widespread use in biomedical signal analysis.

Among the nonlinear methods that take into account an internal structure of the signal together with the insight into its complexity over a range of scales, the entropy of series has found wide application.

Based on sample entropy parameter (SampEn) which has been successfully investigated in the context of data characterized by the low signal to noise ratio, we present the application of Multiscale Entropy method (MSE) to the surface electromyography signals (sEMG).

The usefulness of that approach has been illustrated by examining the muscle activity of external anal sphincter during multimodal rectal cancer treatment which mainly involved surgery and radiotherapy. Both, the specific values of the entropy measure and the dependence on the time scale were analyzed due to the factors such as time period after surgery and the use of radiation therapy. Also the contraction and relaxation state in conjunction with the different levels of signal acquisition were considered separately.

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