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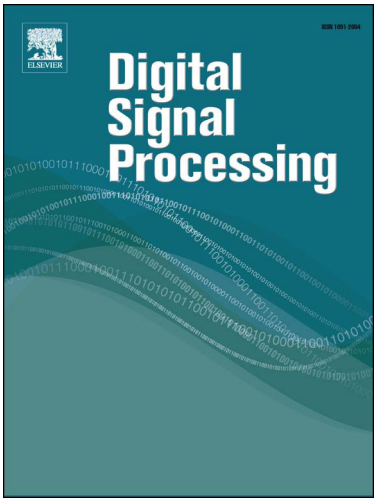

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A Local Entropy-Based Algorithm for Information Content Extraction from Time-frequency Distributions of Noisy Signals

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Abstract

In this paper, an automatic adaptive method for identification and separation of the useful information content, from the background noise of time-frequency distributions (TFD) of multicomponent nonstationary signals, is presented. The method is based on an initial segmentation of the TFD information content by the K-means clustering algorithm, that partitions the initial data set in order to obtain K classes containing elements with similar amplitudes. It is shown that the local Rényi entropy (LRE) can accurately distinguish classes containing noise from classes with the useful information content, as a consequence of their basic structural differences in the time-frequency plane. Simulations are run to compare the performance of the proposed adaptive algorithm for blind separation of useful information from background noise (i.e. blind amplitude threshold) and non-adaptive (hard) amplitude TFD threshold procedures. Simulation results indicate that the proposed method performs better or closely to the best of five blindly chosen hard thresholds. The limitation of efficient hard-thresholding is the need of previous knowledge of the signal's structure and SNR or visual evaluation.

Keywords:
Time-frequency distributions, segmentation, K-means, local Rényi entropy, threshold

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