

ANALYSIS OF HIGHER ORDER SPECTRA OF EPILEPTIC EEG SIGNALS

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Epilepsy is a pathological condition characterized by spontaneous and unforeseeable occurrence of seizures. The use of nonlinear features motivated by the HOS has been reported to be a promising approach to differentiate between normal, background (pre-ictal) and epileptic EEG signals [1]. Different ways to use nonlinear methods for processing of biosignals were proposed [2]-[3]

HOS are defined to be spectral representations of higher order cumulants of a random process. Cumulants can be calculated as certain nonlinear combinations of moments. HOS are often estimated directly in the spectral domain as expected values of higher order periodograms. The second-order cumulant spectrum is the power spectrum and the third-order cumulant spectra is known as the bispectrum.

For HOS analysis of EEG signals we calculated 4 cumulants, power spectra for 2nd and 4th order of cumulants, bispectrum and selected diagonal slice of the bispectrum for analysis of peaks. We analyzed forms of bispectra for all signals and grouped them by similar forms in 4 groups (fig.1).

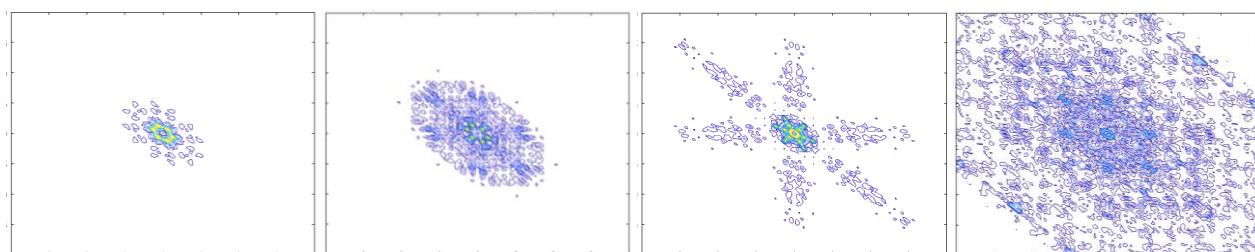


Fig.1 – Typical forms of bispectrum for epileptic EEG signals

Numerical values of the cumulants, amplitudes and frequencies of main peaks of bispectrum diagonal slice were grouped according to the bispectrum forms. In prospect, it is planned to carry out a statistical analysis of the numerical characteristics of the HOS analysis.

References:

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