Cristin Bigan, J Neurol Neurophysiol 2016, 7:2 (Suppl)
http://dx.doi.org/10.4172/2155-9562.C1.029

OMICS International
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5th World Congress on
Neurology and Therapeutics
March 14-16, 2016 London, UK

Higher Order Spectral Analysis of Alzheimer's Dementia Subjects P300 Responses

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The paper discusses the use of higher order spectral (HOS) analysis for the extraction of individual responses within each channel from P300 type responses from background EEG signals recordings. The focus is to separate the response to auditory stimuli (oddball paradigm) from the noise and background EEG by means of evoked potentials deterministic property used by higher order statistics for Gaussian distributed elimination. The main use of the method is of distinguishing between Alzheimer's disease and normal subjects based on an individual, non-averaged response, so using more information than the classical average response analysis.The use of higher-order statistics provides insight into signals which is not always available at lower orders. Gaussian-distributed signals have the characteristic of disappearing at higher orders. Because the noise and an important component of background EEG is Gaussian-distributed, higher-order statistics thus offer the promise of a method that individually recovers deterministic Evoked Potentials from recorded data. Computing of a signal's higher-order spectrum frequently allows insight into the nature of the signal that may not be possible in the time domain. After the Fourier transform is taken of a second-order cumulant (the covariance), the result is the power spectrum. One potential application of this is direct clinical assessment of the individual responses. Other application discusses in the paper is the use of statistical measure that can be derived from the successive individual trials responses to auditory target stimulus. P300 latency variance and amplitude variance between individual responses of each subject on each channel, are used for classification purposes.

Biography

Cristin Bigan received Ph.D.in Medical Electronics from Politehnica University of Bucharest, Romania. He is a Professor of IT, has published 90 papers on biomedical signal and 11 books. His research interests includes biosignals (EEG,ERP) intelligent processing.

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