

Multiresolution Analysis of Event Related Potentials for Early Diagnosis of Alzheimer Disease

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Early diagnosis of Alzheimer's disease is a major public health concern due to large portions of the elderly population it affects, and the lack of a standard and effective diagnosis procedure available to community healthcare providers. Several studies have been performed using wavelets or other signal processing methods to analyze EEG signals in an attempt to find a biomarker for Alzheimer's disease, which showed varying degrees of success. To date, in part due to lack of a large study cohort, the results of these studies remain largely inconclusive. Recognizing the non-stationary nature of event related potentials obtained from the oddball paradigm protocol, we describe a new effort using multiresolution wavelet analysis on event related potentials of the EEG to investigate whether such a diagnostic link can be established between Alzheimer's disease and the event related potentials. Several factors sets this study apart from similar prior efforts: We use a larger cohort, compare different frequency bands as feature vectors, use single as well as multi classifier systems, attempt to achieve data fusion by using different channels of EEG, and most importantly, we specifically target early diagnosis of the disease. Our multi-year effort will include a total of 80 patients, whose ERPs will be analyzed for automated classification. To date, 56 patients have been recruited, the recordings from 39 of whom have been analyzed. Preliminary results have been promising: the most informative frequency is 2-4 Hz, which includes the P300 component; Pz is the most informative electrode, though the Cz electrode also includes additional complimentary information; the generalization performance of the trained system on previously unseen patients is around 80%.

PI Website

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Publications

Jacques G., Frymiare J., Kounios J., Clark C., Polikar R., "Multiresolution analysis for early diagnosis of Alzheimer's disease," *Proc. of 26th Annual Int. Conf. of IEEE Engineering in Medicine and Biology Soc. (EMBS2004)*, pp. 251-254, San Francisco, CA, Sept 2004.

Jacques G., Frymiare J., Kounios J., Clark C., Polikar R., "Multiresolution wavelet analysis and ensemble of classifiers for early diagnosis of Alzheimer's disease," *Proc. of 30th IEEE Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP 2005)*, Philadelphia, PA, March 2005 (to appear).