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Artifact Removal from EEG using Kurtosis Based Blind Source Extraction and Spatially Constrained Independent Component Analysis followed by Wavelet Denoising

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Abstract— **this paper presents a novel technique for removing the artifacts from the Electro-Encephalo-Gram (EEG) signals. EEG signals are influenced by different characteristics, like line interference, EOG (Electro-Oculogram) and ECG (Electrocardiogram). The elimination of artifact from scalp EEGs is of substantial significance for both the automated and visual examination of underlying brainwave actions. These noise sources increase the difficulty in analyzing the EEG and obtaining clinical information related to pathology. Hence it is crucial to design a procedure to decrease such artifacts in EEG records. This paper uses an online blind extraction algorithm, suitable for the generality of complex-valued sources, both complex circular and noncircular, is introduced. This is achieved based on higher order statistics of latent sources, and using the deflation approach Spatially-Constrained Independent Component Analysis (SCICA) to separate the Independent Components (ICs) from the initial EEG signal. As the next step, Wavelet Denoising (WD) is applied to extract the brain activity from purged artifacts, and finally the artifacts are projected back and subtracted from EEG signals to get clean EEG data. Here, thresholding plays an important role in delineating the artifacts and hence a better thresholding technique called Otsu's, thresholding is applied. Experimental results show that the proposed technique results in better removal of artifacts.**

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Keywords— **Electro-Encephalo-Gram (EEG), EOG (Electro-Oculogram), ECG (Electrocardiogram), Spatially-Constrained Independent Component Analysis (SCICA) Wavelet Denoising (WD)**