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Automatic detection of epileptic discharges in long EEG recordings

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Electroencephalogram (EEG) is a representative signal containing information about the cerebral cortex activities, has been the most utilized tool to clinically assess brain functioning and the diagnosis of epilepsy. EEG morphology is characterized by short transients and sudden waveform changes. Investigation of these rapid events is still done manually through neurophysiologists by his/her naked eye to identify all occurrences of these electrographic abnormalities which is very hard and may be impossible, especially with the presence of a lot of many artifacts. Because of that, automatic EEG detection techniques have received intense attention since it aid for rapid identification of neurological abnormalities and opening a window to analyze the mechanisms of epilepsy. The nonlinearity nature and fast transitions between non-seizure, pre-seizure, and seizure states guide us to a promising solution in this work by combining several processing techniques to capture the EEG features in multiple domains. The method was tested on real epileptic EEG data, giving very promising results that allow it to offer better capabilities for assisting clinical neurophysiologists in routine EEG examinations for epilepsy diagnosis, nominating it to find its way into routine clinical use for other neurological disorders. For its fast computation, it provides a novel wide window for online processing of EEG data. Also, it can play a positive role for further research and applications in cerebral activity as deep brain and vagus nerve stimulation for seizure prevention on-line by closed feedback loop system.

Biography

Alaa Eldeen Mahmoud Helal Helal has completed his Master's degree from Cairo University and Doctoral studies from Helwan University. He has published many papers in reputed journals. In general, he is interested in Biomedical Engineering especially in biosignal processing (EEG, ECG, MEG). In his MSc study, he has designed and implemented a smart medical device based on electrical nerve stimulation to treat the drop foot disease using the functional electrical stimulation (FES). His Doctoral study is focused on automatic detection of epileptic waveforms in EEG signal and preventing the seizure evolution by vagus nerve stimulation using a smart closed feed back loop system.

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