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Analysis of absence epileptic seizures using spike sorting

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Recent studies have shown that somatosensory cortex (SoCx) is the main starting region of absence epileptic seizures. This theory has been confirmed in several well-known animal models such as genetic absence epileptic rat from Strasbourg (GAERS). In this research, we locally analyze seizures using the data recorded from different layers of SoCx of a GAERS. An electrode with 16 sensors (sensors inter-distance: 150 μm, sampling rate: 20 kHz) was vertically implanted in SoCx and the data were recorded. We localize the active layers of SoCx during seizures, and investigate the temporal changes of seizures. We achieve our goals by exploration of spikes which are the most important characteristics of seizures. The spikes appear synchronously in different layers of SoCx because the data were acquired locally. Hence, when one spike appears, we can consider a spike column including 16 spikes recorded from different layers of SoCx. We first detect the spike columns then, the spike columns are clustered, and a center is assigned to each cluster. Therefore, each spike column is corresponded to a cluster center, and each seizure is described by a sequence of clusters. Based on the topology of clusters centers and the sequence of clusters, we present the spatio-temporal analysis of seizures. The obtained results show that there are two kinds of spike columns which randomly appear during seizures. One of them is dominant and the other one is unstable. Moreover, it is shown that layers II/III and VI of SoCx are the origins of these spike columns.

Biography

Saeed Akhavan is a joint PhD student between University of Grenoble (France) and University of Tehran (Iran). His PhD thesis is in the field of Biomedical Engineering and Neuroscience.

Hamid Soltanian-Zadeh received PhD degree in electrical engineering: systems and bio-electrical sciences from the University of Michigan, Ann Arbor, Michigan, USA, in 1992. He is currently a full Professor and a founder of Control and Intelligent Processing Center of Excellence (CIPCE) in the Department of Electrical and Computer Engineering at the University of Tehran, Tehran, Iran. As a senior scientist and head of medical image analysis group, Prof. Soltanian-Zadeh directs research projects in the Department of Radiology, Henry Ford Health System, Detroit, Michigan, USA.

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