ABSTRACT

Epilepsy is a disorder in a brain, and it disturbs the brain function. This disturbance is caused by abnormal electrical activities in the brain. The recording of electrical signals in the brain can be collected from the scalp of the head by using electroencephalography (EEG). The depth analysis of the EEG can provide important information on diagnosing epileptic seizures. EEG signal in high dimension can be transformed into a low dimension by using flattening method, called flat EEG (*f*EEG). This research focus on the image transformation of the *f*EEG during an epileptic seizure via fuzzy digital topology, namely Khalimsky fuzzy topology. The topology is used to study the properties of fuzzy topology of the *f*EEG. Firstly, *f*EEG during an epileptic seizure is formed in digital space, and pixels of the digital space are given membership value based on the distance to a cluster centre and electrical potential at the cluster centre. Secondly, Khalimsky fuzzy topologies on integer number $\mathbf{Z}$ and its two-dimensional form $\mathbf{Z}^2$ are used to study the properties of digital topology of the *f*EEG during epileptic seizures. The Khalimsky fuzzy topology is constructed based on the fuzzy topology and Khalimsky topology. The images form of the *f*EEG during epileptic seizures are verified using domains spherical model of charges in the brain. These results show that, by using the Einstein field equation model, the images form of the *f*EEG that are transformed overlap with the spherical domains of charges in the brain.