Abstract

Epileptic seizures are generated by abnormal activity of neurons. EEG-based epileptic seizure prediction could be a key to improve life style of patients that suffer from drug-resistance epilepsy. In this study, we propose a fuzzy logic system to predict epileptic seizures by using statistical behavior of local extrema (SBLE) features and a rule-based fuzzy system. Two approaches are considered to evaluate the proposed method. First approach is patient-dependent, which requires EEG data in preictal and interictal state. Second approach is leave one out (LOO) technique to evaluate generalizability of the method. Applied to the Freiburg EEG dataset, it was found that the method has good performance for most of the patients of this database. In the patient-dependent approach, sensitivity of 84% with no false alarm and sensitivity of 94. 15% with a false alarm rate of 0. 1 were achieved. LOO evaluation approach obtained a sensitivity of 79. 38% with a false alarm rate of 0. 049. It is remarkable that for many of patients, the proposed method achieved sensitivity of 100% with no false alarm in both of evaluation approaches. This study showed that application of SBLE features as inputs of fuzzy logic system is a suitable way to track EEG changes leading to epileptic seizures.
Epileptic Seizure Prediction using Statistical Behavior of Local Extrema and Fuzzy Logic System

References

- D. Kugiumtzis and P. Larsson, &quot;Linear and nonlinear analysis of EEG for the prediction of epileptic seizures,&quot; in Proceeding of the 1999 Workshop &quot;Chaos in Brain?&quot;, Singapore, 2000.
- P. Ghaderyan, A. Abbasi and M. Sedaaghi, &quot;An efficient seizure prediction method using KNN-based undersampling and linear frequency measures,&quot; Journal of Neuroscience Methods, 2014.


L. Tsoukalas and R. Uhrig, Fuzzy and Neural Approaches in Engineering, 1996.

Index Terms

Computer Science
Fuzzy System

Keywords

Epilepsy  Fuzzy Logic  SBLE  Prediction  Genetic Algorithm