ABSTRACT

PhD. Thesis

NOVEL APPROACHES FOR DIAGNOSIS OF EPILEPSY DISEASE FROM EEG SIGNALS

Umut ORHAN

Zonguldak Karaelmas University
Graduate School of Natural and Applied Sciences
Department of Electrical and Electronics Engineering

Thesis Advisors:
Prof. Mahmut ÖZER
Asst. Prof. Mahmut HEKİM
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Epilepsy is a neurological disease which leads to uncontrollably unconsciously movements occurring as a result of electrical discharges in the brain and affects a considerable part of the world population. Epilepsy diagnosis is based on the monitoring of electroencephalogram (EEG) signals by physicians. Because of the difficulty of monitoring by physicians, there are many researches based on artificial intelligence on epilepsy diagnosis. The most of these researches based on the EEG signals includes two stages: the feature extraction and the classification. In general, statistical parameters and artificial neural networks are used for the feature extraction and the classification, respectively. Instead of using statistical parameters in the feature extraction stage, probability density approach based on discretization proposed first time in this study was used. EEG signals were discretized in both time and time-frequency domains by using three methods: equal width discretization, equal frequency and

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K-means. The density of each discrete interval was calculated and this density was applied to multilayer perceptron artificial neural network model as the inputs. In addition, the probability density functions of EEG segments were determined by applying the curve fitting to the obtained densities based on equal frequency discretization method, and the epileptic activities were classified by using the mean squared error criterion instead of neural network. Finally, the successes of proposed feature extraction approach and several the studies used the same EEG signals in the literature were shown by comparing all results.

Key Words: EEG, Epilepsy, Artificial neural network, Feature extraction, Probability density, Equal width discretization, Equal frequency discretization, K-means.

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