

Online Seizure Detection from EEG and ECG signals for Monitoring of Epileptic Patients

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Abstract. In this article, we investigate the performance of a seizure detection module for online monitoring of epileptic patients. The module is using as input data streams from electroencephalographic and electrocardiographic recordings. The architecture of the module consists of time and frequency domain feature extraction followed by classification. Four classification algorithms were evaluated on three epileptic subjects. The best performance was achieved by the support vector machine algorithm, with more than 90% for two of the subjects and slightly lower than 90% for the third subject.

Keywords. Seizure, electroencephalogram, electrocardiogram, classification.

1 Introduction

The 1% of the world population suffers from seizures [1, 2]. Epilepsy is manifested through recurrent seizures, resulting from an abnormal synchronous activity in the brain involving a large network of neurons [3]. The epileptic seizures are the product of highly non-linear dynamics in the brain circuits evolving over time [4]. The producing mechanism of seizure is not well known yet, thus making it's study a tedious task [4, 5].

Clues to the seizure producing process have began to emerge from the quantitative analysis of the electroencephalogram (EEG) [2, 4]. The epileptic seizures analysis is based on visual investigation of the EEG signal, which is performed manually by expert neurologists for the detection of patterns of interest, such as spikes or spike wave discharges [5]. Manual investigation is difficult, time-consuming and can be performed only by experts. Except this, the EEG signal analysis is highly subjective and thus frequently there is disagreement between expert neuroscientists.