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Evaluation of local Photoplethysmography signal in order to feasibility of detection and prediction of epileptic seizure

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Abstract

This research was conducted with the purpose of feasibility of using Photoplethysmography (PPG) signal to seizure detection. Participants in this study included eight focal epileptic patients. The frequency range of the signal was limited by using a 0.3 Hz high frequency filter. In the next step, using a dual optical receiver and adaptive filter, the signal from the scalp was removed from the main and the pure cortical signal remained. The segments were extracted for four Seconds at the moment of an epileptic attack and a four half Second and an hour before the onset in order to evaluate prediction and detection possibility. Morphological features including heart rate, Duration of systolic and diastolic phase, delta time, crest time, area time and amplitude of signal were evaluated using T-test. The results of the evaluation showed a significant difference between the normal and the attack. P-Value < 0.01 for heart rate, Duration of systolic and diastolic phase, crest time and area time as well as P-Value < 0.05 for delta time and amplitude of signal. Also, the P-value of feasibility predict epileptic seizure was less than 0.05 for some features.

Key words: Seizure, Photoplethysmography, Morphological features, Evaluation.

1. Introduction

Epilepsy is of the most common neurological disorders and 65 000 000 people in the world are affected by this disease. About 800 000 of the patients are in Iran.

Prescribing the type and dosage of the drug in the long-term process of drug therapy requires monitoring parameters such as occurrence time and the number of seizures, the duration of the ictal phase in each seizure, and the severity of the seizures, but doing it manually, due to the high amount of data and the need for a specialist doctor, is very time consuming and costly, which tell the importance of automatic epileptic seizures detection. Medical treatment is the most prevalent therapy method and in the cases that the patient is resistant to the drugs, surgery and removal of focal epileptic area are recommended [1].