Feature Extraction in P 100 Detection for Classification of Pattern Visual Evoked Potential (P-VEP) Signals Correlated with Occlusion Therapy for Squint eyes

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Abstract: In this work, we carried out a detailed study of various features of pattern visual evoked potential (P-VEP) signal. P-VEP tests are commonly used in ophthalmology to estimate bioelectrical function of the retina and optic nerve. P-VEP signal which consist of extracted information could assist ophthalmologist in making appropriate decisions during occlusion therapy. The extraction and detection of P100 from P-VEP signal with powerful and advance methodologies is becoming a very important requirement for monitoring the effectiveness of occlusion therapy in squint eye patient. By analyzing the features in different domains we conclude that amplitude and time domain features are more powerful in finding P100 signals from non-P100 signals. The method we proposed in this work is based on the extraction of five out of nine main features of P-VEP signal. Five features are: Latency, Amplitude, Peak-to-peak, Peak of N100 and Latency of N100. The performance of each feature assessed by Linear Discriminate Analysis (LD) classifier. The experiment was performed with different number of channels to analyze the effect of the number of channels.

Keywords: Occlusion Therapy, Squint eye, Latency, Amplitude, Peak-to-peak, Peak of N100, Latency of N100, P100 detection.

1. Introduction

Squint eye problem is one of the most common causes of Amblyopia in the world. Patients with squint eye frequently complain of vision disturbances that do not have evident changes in routine ophthalmological examination findings. The main causes if these disturbances are neuropath logical changes in visual cortex. Squint eye patients often want to know the potential for success before committing to treatment. Recent reports have indicated that pattern visual evoked potential (P-VEP) can be used as a predicator of the success of Occlusion therapy [1]. P-VEP tests are commonly used ophthalmology to estimate bioelectrical function of the retina and optic nerve.[2] Current non-invasive BCI systems based on electroencephalographic (EEG) data are divided in three main classes according to the type of neuromechanisms: 1) event related synchronization and desynchronization (ERD/ERS) of sensorimotor rhythms μ (8-12 Hz) and β (18-25 Hz). This rhythms typically decrease ERD during motor imagery and increase ERS during motor relaxation [3]; 2) P300 peak elicited by a visual oddball paradigm [4]; and 3) steady-state visual evoked potentials (SSVEP) elicited by a constant flicker at a given frequency [5].

Occlusion Therapy is of crucial importance in providing timely information regarding squint eye in child. However, to accurately monitor the effectiveness of occlusion therapy, the noise inherent in measuring devices,