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ScienceDirect

Procedia Computer Science 123 (2018) 92–97

Procedia Computer Science

www.elsevier.com/locate/procedia

8th Annual International Conference on Biologically Inspired Cognitive Architectures, BICA 2017

The Correlation between EEG Signals as Measured in Different Positions on Scalp Varying with Distance

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Abstract

Biomedical signals such as electroencephalogram (EEG) are the time varying signal, and different position of electrodes give different time varying signals. There might be a correlation between these signals. It is likely that the correlation is related to the actual position of electrodes. In this paper, we show that correlation is related to the physical distance between electrodes as measured. This finding is independent of participants and brain hemisphere. Our results indicate that the EEG signal is not transmitted via neurons but through white matter in a brain.

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Peer-review under responsibility of the scientific committee of the 8th Annual International Conference on BiologicallyInspired Cognitive Architectures

Keywords: EEG, Biomedical signal processing, Time Series Data Analysis, Cross-Correlation.

1 Introduction

Electroencephalogram (EEG) signals provide a measure of brain nerve cell electro-physiological activity that is accessible on the surface of the scalp (EEG indices of G-induced loss of consciousness (G-LOC), 1988), thus provide information about different types of brain activity. The electrical activity in the brain is recorded via measurement electrodes attached to the surface of the scalp. The EEG signals detected will vary, depending on the location of the electrodes on the scalp. Identifying changes in EEG signals has improved our understanding of the relationship of these signals to people's moods, and behavior (Han, 2012).

Research (Niedermeyer, 2005) suggests that various characteristics of EEG signals are representative of distinct states of brain activity. These distinct states can be quantified using linear or non-linear measures. Previous research has demonstrated a correlation between EEG signals (or brain activity) from different part of the brain (Na, 2002), (Bob, 2010), (Jeong, 2015). A high correlation between the signals from different electrodes indicates similar brain activity, and a low correlation indicates that the brain activity at the different measurement sites is relatively independent.

Researchers (Na, 2002), (Li, 2013) have demonstrated that brain activities within the same (local) region might be similar, but that they might be different among non-identical regions (globally). One question that we address here is whether the activities of the two brain hemispheres are similar.

White matter, which modulates the distribution of action potentials, is brain tissue that is composed of bundles of axons. It acts to coordinate communication between different brain regions (Fields, 2008). One issue we address here is how electrical activity can be communicated across the surface of the brain. We believe that white matter makes a significant contribution to this communication. Our research focuses on evaluating the correlation of EEG signals between different brain regions. The aim of this

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10.1016/j.procs.2018.01.015