HISTOGRAM OF ORIENTED GRADIENTS OF SIGNAL PLOTS FOR BRAIN COMPUTER INTERFACES

por

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EN CUMPLIMIENTO PARCIAL DE LOS
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Firma del Autor

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dedication page.
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like this.

Contents

Abstract

The brain is a wonderful controlling machine. At the same time

This work is part of worldwide effort to provide a neural interaface which would be able to transmit direct information from the brain and use that information to exert control.

The thesis should be written for

BCI newbie Very long and extended Wolpaw 30 pages Jury FOCALIZED

Abstract

Aquí la versión en inglés del abstract (la segunda).

Lists of Publications

Lo reportado en las siguientes publicaciones conforma la base de la presente tesis.

- publicación 1
- publicación 2
- publicación 3

Acknowledgements

Agradecimientos...

Introduction

Esta tesis está estructurada de la siguiente forma

- Titulo
- Abstract: Español e Ingles
- Introduccion al propio manuscrito de la tesis
- State of the ART for BCI
  - BCI
  - EEG
  - Abordaje BCI / EEG Basado en las waveforms
- Histogram of oriented gradients of signal plots applied to bci
- Alpha Waves
- Motor Imagery
- P300
- Conclussions
- References
- Appendices
  - Historia de BCI en Argentina (en castellano)
  - SIFT
  - Descriptor Space

The search for

In terms of Schwartz Laboratory, the bandwidth of communication based on HCI devices seems very low (cite)

Motivations are as follows

Objectives of this work

Where are we. BCI plateau

BCNI Horizon, what the people is saying

Status in Argentina

Reference to thesis

OpenBCI and the Wearables movement

Neuro....everythig

List of Figures

Chapter 1

Visually Decoding Brain Signals

Esta sección contiene el estado del arte del método

BCI + EEG

Cómo es el abordaje basado en Waveforms

Machine Learning

Shearlets

Scalar Space Theory

Diffusion Tensor Imagin

La idea es estructurar el paso a paso de como se puede ir usando el descriptor de gradientes de sift para mapear informacion. Primero con una señal cruda, luego agregarle informacion extra, luego agregar ruido al azar, y finalmente empezar con información real de señales. El tema luego se focaliza en EEG especificamente para BCI.

Describir la importancia de la impedencia (basado en el libro de Signal processing for neuro) con el paper que habla sobre EEG mas la pagina 144 del libro 2 de lotte.

Aca tambien pueden ir las referencias a la tesis de spinelli

Pattern Matching

Esta es la razon porque el metodo funciona ya que lo que termina detectando es de manera masiva esas formas especificas que son las que le dan a las ondas alfa y mu sus nombres.

In human electrophysiology, oscillations with stereotyped nonsinusoidal shapes include the sensorimotor mu rhythm, motor cortical beta oscillation, and cortical slow oscillations. The mu rhythm oscillates at an alpha frequency (around 10 Hz) and was

named because its waveform shape resembles the Greek character m (Figure 1A). It is characterized by the fact that one extremum (e.g., its peak) is consistently sharper than the other (e.g., its trough); it is also described as an arch, comb, or wicket shape [4–10]. In addition to the sensorimotor mu rhythm, we have recently highlighted that motor cortical beta oscillations also have striking nonsinusoidal features [11]. These beta oscillations manifest a sawtooth shape in that their voltage either rapidly rises before more slowly falling off, or vice versa (Figure 1B).

Chapter 2

Histogram of Oriented Gradients of Signal Plots

Contiene el método y el enfoque.

Mental Chrometry and averaging

Broadly speaking, I would say there are three categories of neuroimaging: structural, functional, and chemical. These can then be subdivided into non-invasive, semi-invasive, and invasive, which delineate the degree of physical invasiveness involved in the imaging method. That is, cutting open the skull and implanting electrodes would be considered invasive, whereas putting the electrodes on the head (such as in scalp EEG) is non-invasive. Because I'm not proficient in animal imaging methods I will focus on human studies, most of which are non- or semi-invasive, with a few exceptions.

Structural Neuroimaging Any technique that images structures of the brain. This would include CT (Computed Tomography), MRI (Magnetic Resonance Imaging), and DTI (Diffusion Tensor Imaging).

CT scanning is non-invasive uses x-rays to image tissue density. It is very rapid and can detect cerebral hemorrhaging in the early (acute) stage. It is most often, therefore, used for medical purposes.

Structural MRI is non-invasive and often provides better contrast resolution than CT with similar (and again, often better) spatial resolution. Unlike CT, structural MRI provides excellent tissue delineation, allowing users to visualize boundaries between grey and white matter in the brain, for example. Structural MRI is often used

in neuroimaging to calculate volume of different brain regions or to define regions of brain damage or tumor.

DTI is non-invasive and can be done on most research MRI scanners. It involves using a special scanning and reconstruction sequence to image the flow (or, more specifically, constraints in the flow) of water through the brain. Because water flow is constrained by the axons (white matter) in the brain, it can be used to image large axonal connections between brain regions.

Functional Neuroimaging Any technique that quantifies some metric of brain activity. This would include EEG (ElectroEncephaloGraphy), MEG (MagnetoEncephaloGraphy), fMRI (functional MRI), PET/SPECT (Positron Emission Tomography/Single Positron Emission Computed Tomography), NIRS (Near-InfraRed Spectroscopy), and, to a certain extent, TMS (Transcranial Magnetic Stimulation) and TDCS (Transcranial Direct Current Stimulation), along with several others.

Chapter 3

The Histogram of Oriented Gradients of Signal Plots

In this section the generalities of the method will be described.

Image transformation and variants to transform a signal into an image.

sinuplot, spectrogram, scalogram

Chapter 4

Alpha Wave and Motor Imaginary: the power of masses

First describe what are alpha waves

Describe the dataset generated

Describe how it was also used to test a public dataset.

Chapter 5

Motor Imagery

Chapter 6

P300

Chapter 7

Conclusions

BCI Security (IEEE Paper Life Science)

Sleep staging is one of the most important steps in sleep analysis. It is a very time consuming task consisting of classifying all 30 second pieces of an approximately eight hour recording into one of six sleep stages: wakefulness, S1 (light sleep), S2, S3, S4 (deep sleep), REM (rapid eye movement) sleep. A sleep recording is made with a minimum setting of four channels: electro-encephalogram (EEG) from electrodes C3 and C4 1, electro-myogram (EMG) and electro-oculogram (EOG).

In order to classify each 30 second segment of sleep according to the classical [Rechtschaen Kales 1968] (RK) rules, the human scorer looks for defined patterns of waveforms in the EEG, for rapid eye movements in the EOG and for EMG level. It is therefore a valuable goal to try and automate this process and quite some work has already been done in trying to replicate RK sleep staging with diverse automatic methods (see [Hasan 1983] and [Penzel et al. 1991] for overviews). There is however a considerable dissatisfaction within the sleep research community concerning the very basis of RK sleep staging [Penzel et al. 1991]: RK is based on a prede

ned set of rules leaving much room for sub jective interpretation;

Chapter 8

Legal and Ethical Implications

BCI Security (IEEE Paper Life Science)

Sleep staging is one of the most important steps in sleep analysis. It is a very time consuming task consisting of classifying all 30 second pieces of an approximately eight hour recording into one of six sleep stages: wakefulness, S1 (light sleep), S2, S3, S4 (deep sleep), REM (rapid eye movement) sleep. A sleep recording is made with a minimum setting of four channels: electro-encephalogram (EEG) from electrodes C3 and C4 1, electro-myogram (EMG) and electro-oculogram (EOG).

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Appendix A

BCI en Argentina

El propósito de este apéndice es ofrecer información del estado de esta disciplina en Argentina. Desde ya, se omiten trabajos específicos que de ninguna manera han sido adrede, y se solicita disculpas pertinentes por las mismas, por quedar fuera del radar. Parte del relevamiento fue realizado mediante el monitor de la fundación Sadosky de TICs.

Los primeros trabajos fueron realizados

Appendix B

Título Apéndice

Appendix C

SIFT