



Reunión 14 -15 Febrero 2008 en Fornalutx Mallorca

Asistentes: Investigadores de la UPM, Universidad de las Islas Baleares, Universidad de la Laguna y de la Politécnica de Barcelona con Francisco del Pozo Coordinador del Proyecto MADR.IB se reunieron en Fornalutx con los siguientes

Objetivos:

- Generar una propuesta para el programa de ERA-NET Neuron (7 de abril de 2008) en Neurociencia aprovechando el know how generado en el proyecto MADR.IB sobre nanomarcadores, tratamiento de neuroimágenes, conectividad cerebral...
- Preparar un Workshop sobre sincronización de redes neuronales aplicable a técnicas de diagnóstico precoz para el Deterioro Cognitivo Leve (DCL)

Resultados:

- Redactado un borrador de la propuesta “EDAD: Early Diagnosis of Alzheimer’s Disease” y que figura a continuación. Posteriormente se desarrolló y se presentó en Abril 07, 2008 al programa "European research projects on neurodegenerative diseases of the central nervous system" de ERA-Net NEURON JTC 2008 para resolución en otoño 2008 y desarrollo a partir de enero 2009 (proyecto de 3 años)
- Programado un workshop MADR.IB sobre “Synchronizability and network topology in artificial and natural neural networks”. Realizado con posterioridad los días 24 y 25 de Abril de 2008

EDAD: Early Diagnosis of Alzheimer’s Disease

ABSTRACT (v.024_15/02/2008) (NEURON ERA-NET)

Traditionally, early diagnosis of brain neurodegenerative diseases has been addressed mostly by means of single-scale approaches such as neuroimaging, biochemical or genetic markers. However, these markers are not sufficiently specific by themselves to provide a precise and timely detection of these disorders. Consequently, multi-scale studies that address this problem from different complementary approaches are desired. In Alzheimer’s disease, for instance, single-scale approaches currently in use are MR-volumetry, neuropsychological assessment, genetic markers such as APOE-4, and PET scans, among others. Beta-amyloid marker (PET-PIB) or synchronization analyses of global brain activity constitute novel approaches that could improve the early diagnosis of dementia. Indeed, changes in the synchronization patterns among different brain areas provide a good assessment to characterize the performance of subjects in higher cognitive tasks. Specifically, recent results suggest that synchronization analyses allow distinguishing between control groups and patients with Alzheimer’s disease. Despite these promising outcomes, very little is known about the relationship between changes in synchronization patterns and other biological features associated to Alzheimer’s disease, as revealed e.g. by genetic markers or PET-PIB analysis. In this project we propose the development of a multi-scale approach for early



and sensitive diagnosis of Alzheimer's disease. A probabilistic-based approach will integrate the study of synchronization patterns during higher cognitive tasks, recorded

from MEG, with the results obtained using standard genetic markers, MR-volumetry/VBM, and PET analysis, in order to predict which Mild Cognitive Impairment (MCI) patients will develop dementia. Additionally, mathematical modelling based on both interacting neuronal assemblies and neural mass models will allow us to relate in a systematic way the biomolecular changes occurring in the brain with its synchronization state, in order to obtain a better understanding of the multi-scale character of the disease from a fundamental perspective. The outcome of this proposal will allow us to:

- a) determine the relationship between biomolecular changes related to Alzheimer's disease, changes in functional connectivity as assessed by synchronization analysis, and the progressive impairment of cognitive abilities associated to the disease, and
- b) define a combined robust index for an early diagnosis of Alzheimer's disease that integrates information from the genetic test, MR-volumetry/VBM, PET-PIB and MEG synchronization analysis

PIB - Pittsburgh Compound B

VBM – Voxel Based Morphometry

MEG – Magnetoencephalography

MR – Magnetic Resonance

PET – Positron Emission Tomography

Este borrador, con ligeras modificaciones, dio lugar a la propuesta con el mismo nombre que se presentó a la Convocatoria NEURON el 7 de abril de 2008.