Empowering Diffusion MRI Measures by Integrating White and Grey Matter Morphology

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Country

USA

Title of project or programme

Empowering Diffusion MRI Measures by Integrating White and Grey Matter Morphology

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

349162.3853

Start date of award

01/09/2015

Total duration of award in years

2

Keywords

Acquired Cognitive Impairment... Aging... Alzheimer's Disease... Alzheimer's Disease including Alzheimer's Disease Related Dementias (AD/ADRD)... Bioengineering... Brain Disorders... Clinical Research... Clinical Research - Extramural... Dementia... Diagnostic Radiology... Mental Health... Mental Illness... Networking and Information Technology R&D... Networking and Information Technology R&D - Computing-enabled human interaction, communication, and augmentation... Neurodegenerative... Neurosciences

Research Abstract

DESCRIPTION (provided by applicant): We will develop and apply novel geometric algorithms

to brain diffusion MRI images obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) and Australian twin datasets. Despite major advances in brain imaging measures on grey matter, there is still a lack of efficient brain multimodal imaging algorithms by integrating brain white matter and grey matter morphology. In the current project, we will develop novel diffusion MRI analysis methods using quasiconformal geometry and volumetric harmonic map. Specifically, we will develop 1) multimodal brain surface parcellation for tractography and network analysis, and 2) brain white matter multivariate tensor-based morphometry to measure white matter morphometry. The proposed system will focus on developing a coherent computational framework to integrate both white and grey matter morphology and compute their complete geometric features to capture subtle brain white matter changes. This may provide an effective way to pinpoint unique brain network structure or subregional areas for diagnostic group difference comparison and identify genetic effects that might account for some of the structural variations in a large population. To investigate the reliability and practicality of our method, we seek to 1) construct structural brain network with tractography on multimodal surface parcellation results, and 2) compute brain white matter multivariate tensor-based morphometry (WM-mTBM) features. The computed connectivity network measures and the WM-mTBM features will be validated by 1) between-diagnostic-group comparisons in the ADNI dataset, and 2) genetic influence analysis in the Australian twin dataset.

Further information available at:

Types:
Investments < €500k

Member States:
United States of America

Diseases:
N/A

Years:
2016

Database Categories:
N/A

Database Tags:
N/A