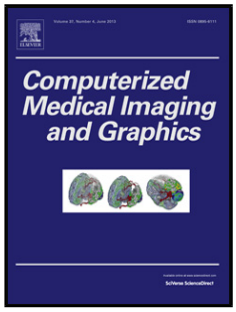

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Adaptive fusion of texture-based grading for Alzheimer's disease classification

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Abstract

Alzheimer's disease is a neurodegenerative process leading to irreversible mental dysfunctions. To date, diagnosis is established after incurable brain structure alterations. The development of new biomarkers is crucial to perform an early detection of this disease. With the recent improvement of magnetic resonance imaging, numerous methods were proposed to improve computer-aided detection. Among these methods, patch-based grading framework demonstrated state-of-the-art performance. Usually, methods based on this framework use intensity or grey matter maps. However, it has been shown that texture filters improve classification performance in many cases. The aim of this work is to improve performance of patch-based grading framework with the development of a novel texture-based grading method. In this paper, we study the potential of multi-directional texture maps extracted with 3D Gabor filters to improve patch-based grading method. We also proposed a novel patch-based fusion scheme to efficiently combine multiple grading maps. To validate our approach, we study the optimal set of filters and compare the proposed method with different fusion schemes. In addition, we also compare our new texture-based grading biomarker with state-of-the-art methods. Experiments show an improvement of AD detection and prediction accuracy. Moreover, our method obtains competitive performance with 91.3% of accuracy and 94.6% of area under a curve for AD detection.

Keywords: Patch-based grading fusion, multi-features, Alzheimer's disease classification, Mild Cognitive Impairment

[1] Data used in preparation of this article were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database (`adni.loni.usc.edu`). As such, the investigators within the ADNI contributed to the design and implementation of ADNI and/or provided data but did not participate in analysis or writing of this report. A complete listing of ADNI investigators can be found at: `http://adni.loni.usc.edu/wp-content/uploads/how_to_apply/ADNI_Acknowledgement_List.pdf`.