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NeuroImage

Volume 45, Issue 4, 1 May 2009, Pages 1151-1161

White matter lesion extension to automatic brain tissue segmentation on MRI

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<https://doi.org/10.1016/j.neuroimage.2009.01.011>

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Abstract

A fully automated brain tissue segmentation method is optimized and extended with white matter lesion segmentation. Cerebrospinal fluid (CSF), gray matter (GM) and white matter (WM) are segmented by an atlas-based k -nearest neighbor classifier on multi-modal magnetic resonance imaging data. This classifier is trained by registering brain atlases to the subject. The resulting GM segmentation is used to automatically find a white matter lesion (WML) threshold in a fluid-attenuated inversion recovery scan. False positive lesions are removed by ensuring that the lesions are within the white matter. The method was visually validated on a set of 209 subjects. No segmentation errors were found in 98% of the brain tissue segmentations and 97% of the WML segmentations. A quantitative evaluation using manual segmentations was performed on a subset of 6 subjects for CSF, GM and WM segmentation and an additional 14 for the WML segmentations. The results indicated that the automatic segmentation

accuracy is close to the interobserver variability of manual segmentations.



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Keywords

MRI; Brain tissue segmentation; White matter lesions; White matter hyperintensities

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