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Segmenting multiple sclerosis lesions using a spatially constrained k-nearest neighbour approach.

Summary: We propose a method for the segmentation of Multiple Sclerosis lesions. The method is based on probability maps derived from a $k$-nearest neighbours classification. These are used as a non parametric likelihood in a Bayesian formulation with a prior that assumes connectivity of neighbouring voxels. The formulation is solved using the method of iterated conditional modes (ICM). The parameters of the method are found through leave-one-out cross validation on training data after which it is evaluated on previously unseen test data. The multi modal features investigated are 3 structural MRI modalities, the diffusion MRI measures of fractional anisotropy (FA), mean diffusivity (MD) and several spatial features. Results show a benefit from the inclusion of diffusion primarily to the most difficult cases. Results shows that combining probabilistic $k$-nearest neighbour with a Markov random field formulation leads to a slight improvement of segmentations.

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