NiftySeg
Open-source software for medical image segmentation, label fusion and cortical thickness estimation

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NiftySeg is an open-source framework for image segmentation, bias field correction, label fusion and cortical thickness estimation. Image segmentation is based on an Expectation-Maximisation algorithm with bias field correction and a Markov random field for local consistency. The label fusion algorithm, called STEPS, uses both local similarity and rater performance to fuse labels. Finally, the cortical thickness is measured using a Laplacian based metric within a Khalimsky complex.

Methods:

Multi-modal Segmentation: Building from a well established framework for both segmentation and bias correction, NiftySeg introduces a tool for maximum a posteriori segmentation with a novel iterative modification of the prior information to reduce segmentation bias [1]. The framework also introduces and explicit partial volume classes and a locally varying MRF-based model for enhancement of sulci and gyri, achieving a better overall balance in the bias-variance tradeoff inherent to the segmentation task.

Label Fusion: Several classic fusion algorithms like majority voting, STAPLE and SBA are available within NiftySeg. In addition to the classical fusion techniques, a new algorithm called STEPS [2] is also available. STEPS incorporates a local similarity metric to estimate the expected image-based performance of each classifier on a voxel-by-voxel basis into a STAPLE formulation, resulting in a higher label fusion accuracy.

Cortical Thickness Estimation: The cortical thickness algorithm available in NiftySeg is a Khalimsky space based thickness estimation algorithm called KaTE [3]. This algorithm is topologically correct and partial-volume aware and uses a multi-stage Laplacian field to obtain a sub-voxel accurate cortical thickness estimate.

References: