mritc—A package for MRI tissue classification

Dai Feng, Merck & Co., Inc.
Luke Tierney, The University of Iowa

MRI tissue classification (segmentation) is a process during which anatomically meaningful labels are assigned to each voxel of an MR image. It is critical in the study of brain disorders such as Alzheimer's disease.

The package provides several functions to conduct MRI tissue classification. The methods include using the normal mixture model fitted by the EM algorithm, the hidden Markov normal mixture model at the voxel level fitted by the Iterated Conditional Mode algorithm, the Hidden Markov Random Field EM algorithm, or the Bayesian method, the higher resolution model fitted by Markov chain Monte Carlo, and the Gaussian partial volume hidden Markov random field model fitted by the modified EM algorithm. Initial values for different approaches can be obtained through multilevel thresholding using a fast algorithm for Otsu's Method.

For the data, the "Analyze", "NIfTI", and raw byte file formats are supported. Facilities for visualization of classification results and various performance evaluation indices are provided.

To improve speed, table lookup methods are used in various places and some computations are performed by embedded **C** code and **C** using Open MP to parallelize loops.