Abstract

The paper presents a method for automatic segmentation and calculation of tissue volume in brain MRI images. This is essential for radiologists since different diseases alter the tissue volume. Since the boundaries are complex, Modified Fuzzy C means (MFCM) is used to segment brain MRI image into three tissues namely white matter (WM), grey matter (GM) and cerebrospinal fluid (CSF). The MFCM segmentation results obtained are input to the level set methodology for refinement of results. We have used the methodology on 100 different brain MRI images of both male and female. The percentage of WM, GM and CSF calculation is done using pixel counting method. The results indicate that there is no much difference in the tissue
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volumes of male and female. This method can be used to estimate the tissue volume in
different diseases and in different age groups.

References

- Bricq S. , Collet Ch. , and Armspach J. P. , (2008), Unifying framework for multimodal
  brain MRI segmentation based on Hidden Markov Chains, Medical Image Analysis, 12, 6,
  639-652.
- Cai W. , Chen S. , and Zhang D. , (2007), Fast and robust fuzzy c-means clustering
  algorithms incorporating local information for image segmentation, Pattern Recognition, 40,
  825–838.
  for segmenting biomedical images using intensity neighborhoods and dimension reduction,
  with spatial information for image segmentation, Computerized Medical Imaging and Graphics,
  30, 1, 9-15.
- Ciptadi, A. , Chen C. , Zagorodnov, V. , (2009), Component analysis approach to
  estimation of tissue intensity distributions of 3D images, IEEE 12th International Conference on
  Computer Vision, 1765-1770.
- Clark M. C. , (1994), Segmenting MRI Volumes of the Brain With Knowledge-Based
  Clustering, MS Thesis, Department of Computer Science and Engineering, University of South
  Florida.
- Forouzanfar M. , Forghani N. , and Teshnehlab M. , (2010), Parameter optimization of
  improved fuzzy c-means clustering algorithm for brain MR image segmentation, Engineering
  Applications of Artificial Intelligence, 23, 2, 160-168.
  ECG classifier, Proceedings of the 11th World Congress on Soft Computing in Industrial
  Applications (WSC11), Advances in Soft Computing, 189–199.
  approach to expectation-maximization and level set segmentation applied to stem cell and brain
  MRI images, IEEE International Symposium on Biomedical Imaging: From Nano to Macro,
  1446-1450.
- Mancas M. , Gosselin B. , and Macq B. , (2005), Segmentation Using a Region Growing
  Thresholding, Proc. of the Electronic Imaging Conference of the International Society for
  Optical Imaging (SPIE/El 2005), USA.
- Masroor M. A. and Mohammad D. B. , (2008), Segmentation of Brain MR Images for
  Tumor Extraction by Combining K-means Clustering and Perona-Malik Anisotropic Diffusion
  Model, International Journal of Image Processing, 2,1, 27-34.
- Osher S. , Fedkiw R. , Level Set Methods and Dynamic Implicit Surfaces,
- Seixas F. L. , Damasceno J. , Da Silva M. P. , de Souza A. S. , and Saade D. C. M.
  (2007), Automatic Segmentation of Brain Structures Based on Anatomic Atlas, Seventh

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