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Validation of an automatic method of segmentation and parcellation of the corpus callosum

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Abstract
This work has the objective of validate an automatic method of segmentation and parcellation of the corpus callosum that uses the watershed transformation and consider the subject's brain structure.

Key words: corpus callosum, segmentation, parcellation.

Introduction

The corpus callosum is the biggest white matter structure in human brain and connects the cortical regions of both hemispheres. Many researches related to mental disorder and diseases need to analyze the corpus callosum properties according to its segmentation and parcellation [1].

This research's objective is to validate an automatic method of segmentation and parcellation of the corpus callosum using the watershed transformation [3], developed by our research group, capable of produce a parcellation according to the subject's brain microstructure.

Results and Discussion

In order to validate the watershed segmentation, manual segmented corpus callosum were acquired as ground truth. For the watershed parcellation comparison, it was developed in the web-based platform for medical image analysis Adessowiki an algorithm based on Hofer's and Witelson's geometric parcellation schemes [2].

In this research as in many medical applications, the register is necessary to compare and analyze images in different modalities, in this case, the images of the corpus callosum segmentation by watershed and manual job. To do the register of the images, it would be used the FSL tool for brain imaging data, but after making some tests, the register result was not satisfactory. Image 1 shows the subject's brain image after a skull stripping process, provided by the FSL.

The geometric algorithm's implementation was made using the programming language Python/Numpy, and it can be easily modified to support other similar geometric parcellation schemes. The algorithm output is a labeled 2D image that indicates each corpus callosum cortical subdivisions, as shown in figure 2.

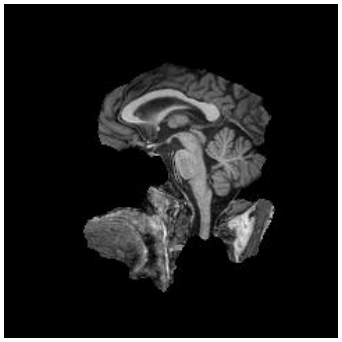

Image 1 – Skull Stripping Image by FSL

Image 2 – Geometric Parcellation

Conclusions

Without an acceptable register, it was not possible to compare the watershed segmentation and the ground truth segmentation.

The geometric parcellation algorithm represents an improvement for the web-based platform for medical image analysis and will be useful in future related research. Also, it allows to quickly obtain a description of the patient's corpus callosum characteristics, saving medical professional from manually measure the parcels.

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[1] Paul, L.K., Journal of neurodevelopment disorders, 2011.
[2] Hofer, S., Frahm, J., NeuroImage, 2006.
[3] Freitas, P., Rittner, L., Appenzeller, S., Lotufo, R., Sibgrapi, 2011..