Connected Threshold Segmentation of Ventricles in the Brain

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Abstract

This document describes an implementation of Connected Threshold Segmentation to isolate the ventricles using Insight Toolkit www.itk.org.

This paper is accompanied with the source code, input data, parameters and output data that the authors used for validating the algorithm described in this paper. This adheres to the fundamental principle that scientific publications must facilitate reproducibility of the reported results.

Contents

Using filters from the Insight Toolkit, and example code for 2D image segmentation I apadpted the code to work for segmentation on 3D images of the brain to segment out the ventricles.

1 Experiment

The motivation behind this experiment is to provide experience with the three pillars of Open Science: Open Data, Open Source and Open Access. It also provides experience with segmentation of medical images, namely segmenting ventricles within an MRI of the a normal brain. Using Connected Threshold Segmentation I segmented the ventricles.The input used was an MRI scan from the MIDAS collection at Kitware, specifically Normal-008-T2.

2 Method

The method used for segmenting the MRI is Connected Threshold Segmentation, which is a region growing segmentation method. In Connected Threshold Segmentation, an upper limit and lower limit are given, and an object is defined as anything connected to the seed point by volumes with intensities in between the limits.

Since the code is included with the paper, less time has to be spent in describing the code, and more time can be used for describing how to use the algorithm in particular types of images.

For questions on the basis of the scientific method the reader is refered to [2, 1].

3 Instructions

To recreate the experiment, run cmake on the supplied source code, making sure to set the ITK directory to wherever ITK is installed, then simply run:

```
ConnectedThreshold Normal008-T2.mha Normal008-T2-out.mha
```

4 Results

The resulting image shows the segmented ventricles of the brain. The ventricles are most notable around the slice at z=71.

5 Software Requirements

You need to have the following software installed:

- Insight Toolkit 3.4.
- CMake 2.4

Note that other versions of the Insight Toolkit are also available in the testing framework of the Insight Journal. Please refere to the following page for details

http://www.insightsoftwareconsortium.org/wiki/index.php/IJ-Testing-Environment

References

[1] K. Popper. *Open Society and Its Enemies*. Princenton University Press, 1971. 2

[2] K. Popper. *The Logic of Scientific Discovery*. Routledge, 2002. 2