Confidence connected segmentation

Release 0.00

Arunachalam Narayanaswamy[1]

October 18, 2007

[1]Rensselaer Polytechnic Institute, Troy

Abstract

This document describes a tiny application developed using the Insight Toolkit, ITK www.itk.org. The goal of the document is to facilitate ease of use of the application by following the guidelines given in the document. The application does not claim to achieve anything more than the segmentation of the data given with this submission. 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

1 Motivation **1**

2 Confidence connected image filter **2**

3 Input, Output and parameters **2**

4 Software Requirements **2**

5 Results **2**

1 Motivation

The confidence connected image filter from ITK was used to develop a simple application that achieves segmentation of an MRI image of the human brain to extract the ventricle. Automated segmenting of the human ventricle is both time saving and less erroneous than a manual segmentation by a domain expert. The manual identification of parameters only have to be done once for an entire data set and thus, not very inefficient. Quantitative values regarding the segmented output could also be calculated directly.

2 Confidence connected image filter

Confidence connected image filter basically takes up a set of seed points and grows regions around it which have intensity centered around mean at a maximum deviation of 'multiple' times of the standard deviation of the pixels in the 'Neighborhood radius' from theOC seed points. This process is iterated over and over again to achieve a good segmentation result. The resulting segmented output is a binary image with the two intensities chosen to be 0 or 255, without loss of generality.

3 Input, Output and parameters

The input image for testing was Normal001-T2.mha from kitware's MIDAS database [1]. It was converted using ITK to .mhd format so that it can be viewed using Paraview. The output image is a binary image with values 0 or 255. The first argument to the program is the path to the input file, and the second is the path to the output file to be generated. Execute the program without any arguments to see the help for usage.

The following index was used for the seed point.

```
index[0]=196;
index[1]=220;
index[2]=87;
```

The Name of the filter used for segmentation is `itk::ConfidenceConnectedImageFilter`

The following parameters were used for initiating the segmentation

```
confidenceConnected->SetReplaceValue( 255 );
confidenceConnected->SetMultiplier( 1.5 );
confidenceConnected->SetNumberOfIterations( 6);
```

4 Software Requirements

You need to have the following software installed:

- Insight Toolkit 2.4.
- CMake 2.2

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

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

5 Results

The 3D image was segmented succesfully and the output has been rendered in 3D using Paraview and a 2D maximum intensity projection has also been shown in 1

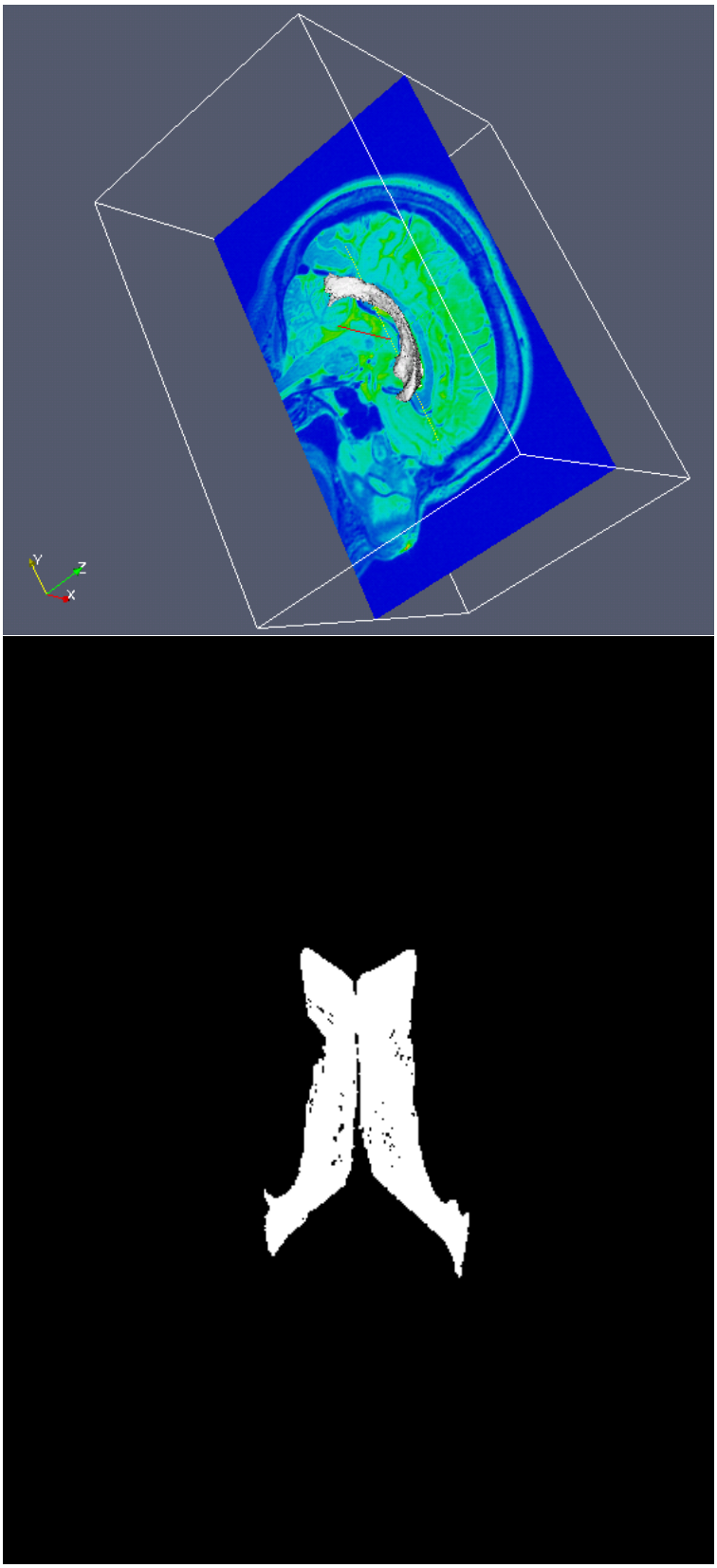

Figure 1: A screenshot of the segmented output loaded by Paraview and the 2D maximum intensity projection

References

[1] E. Bullitt, D. Zeng, G. Gerig, S. Aylward, S. Joshi, J. K. Smith, W. Lin, and M. G. Ewend. Vessel tortuosity and brain tumor malignancy: a blinded study. *Acad Radiol*, 12(10):1232–1240, October 2005. 3