Kenneth Johnson
Open Source Software Practice

Technical Report

Experiment

Input Data:
Normal007-T2.mha (from MIDAS - Kitware)

Process:
For this assignment, we had to do the following:

- Obtain realistic medical data from a data repository
- Select an ITK image segmentation method
- Implement a minimal segmentation application
- Run the application on the data and experiment with parameter selection
- Write a reproducible report on your findings and post it to the Insight Journal

Motivation:
This project was oriented to expose students to the concepts of

- Open Data
- Open Source
- Open Access

That are the three pillars of Open Science.

It also exposes students to the characteristics of medical image segmentation and how it is applied to clinical problems.

Method

The segmentation method I chose was Confidence Connected, a Region Growing Method. My first reference (listed below) gives a nice description of the Region Growing approach:

The fundamental drawback of histogram-based region detection is that histograms provide no spatial information (only the distribution of gray levels). Region-growing approaches exploit the important fact that pixels which are close together have similar gray values.

Start with a single pixel (seed) and add new pixels slowly
(1) Choose the seed pixel
(2) Check the neighboring pixels and add them to the region if they are similar to the seed
(3) Repeat step 2 for each of the newly added pixels; stop if no more pixels can be added.

Specifically, Confidence Connected does this with Standard Deviation and an X Multiplier, as described in the class notes.

References:
www.cse.unr.edu/~bebis/CS791E/Notes/RegionGrowing.pdf
http://public.kitware.com/OpenSourceSoftwarePractice/images/7/72/InsightToolkit-II.pdf

Instructions

To Replicate:

- Build ConfidenceConnected in CMake using ConfidenceConnected.cxx and CMakeLists.txt
- Build ALL_BUILD in Microsoft Visual Studio .NET 2003
- Download Normal007-T2.mha (from MIDAS – Kitware)
- Find ConfidenceConnected.exe
- With ConfidenceConnected.exe and Normal007-T2.mha in the same directory, Run:

```
> ConfidenceConnected.exe Normal007-T2.mha Output.mha 97.0 122.0 64.0
```

Results

- A file, Output.mha will be created, which you can view in ImageViewer (as seen below)
- The Ventricle is clearly visible on and around Z-Slice 64!