Extending DeViDe – Fourfold

Final Assignment for the TU Delft course *IN4307 Medical Visualization*

J.B. van Velzen1 and R. Nieuwenhuizen1

1TU Delft, The Netherlands

**Abstract***The ABSTRACT is to be in fully-justified italicized text, between two horizontal lines, in one-column format, below**the author and affiliation information. Use the word “Abstract” as the title, in 9-point Times, boldface type, leftaligned to the text, initially capitalized. The abstract is to be in 9-point, single-spaced type. The abstract may be up to 3 inches (7.62 cm) long.*

*Leave one blank line after the abstract, then add the subject categories according to the ACM Classification Index (see* [*http://www.acm.org/class/1998/*](http://www.acm.org/class/1998/)*).*

Categories and Subject Descriptors (according to ACM CCS): I.4.10 [Computer Graphics]: Image Representation—Volumetric

1. **Introduction**

At the beginning of the course, we were introduced to DeViDe, or the Delft Visualization and Image processing Development Environment. This software package is also used during the practical assignments, where we got an actual taste of what was possible with DeViDe. Because of the experiences we had in the practical exercises, we decided to use DeViDe for the final project.

During the practical exercises we obtained some experience with segmentation from DICOM data, but we always felt that the experience we had obtaining a specific segmented result from a DICOM dataset could use some improvement.

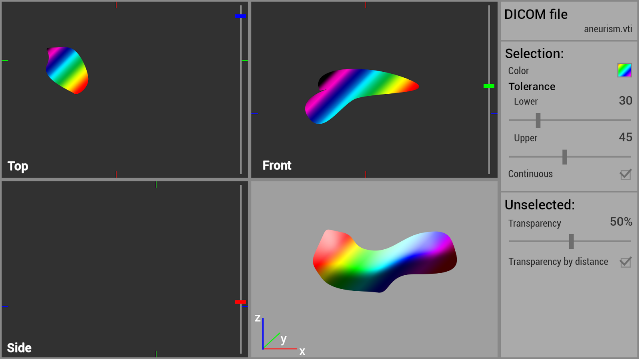
1. **Related work**

In DeViDe, off course there were some comparable viewers. Examples are the *slice3dVWR* we used a lot in the practical. Other viewers that we were pointed to by the assistants -for which we thank you- are the EmphysemaViewer and the SkeletonAUIViewer. These provided a nice skeleton for us to start with.

Furthermore, we looked at other software that displays data the way we would like. This inspired us to implementing some of the features described in the next paragraph.

1. **Proposed method**

The purpose is to create a DeViDe module that can create a view like Figure 1. The module will contain of a frame with three two-dimensional views displaying the CT or MRI slices, and a three-dimensional view, displaying a contour generated by these slices. The user can manipulate the views using controls from a dedicated control panel. The exact specifications are listed next.



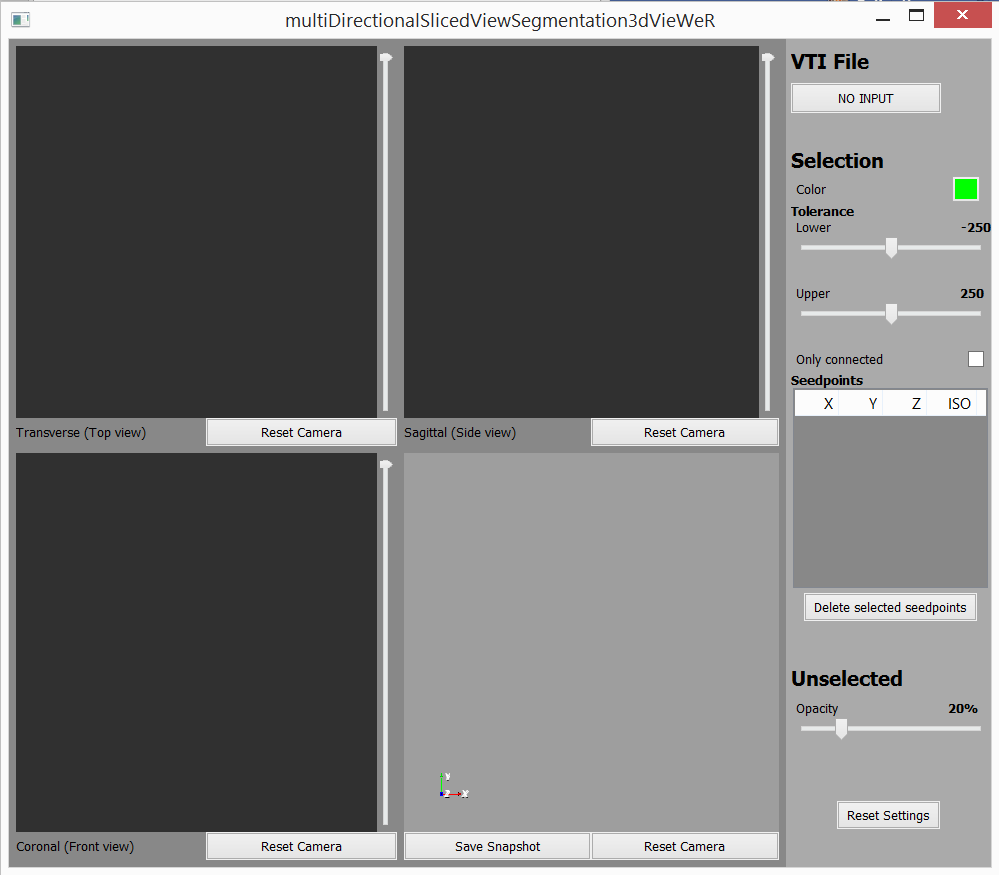
**Figure 1:** *A rough design for the desired user interface and functionality.*

* 1. **Specifications**
* The new DeViDe module will have the working title *‘multiDirectionalSlicedViewSegmentation3dVieWeR’*.
* The module should load a frame with 4 views (transverse/axial, sagittal, coronal, and 3D) and a sidebar for the user to influence the segmentation settings.
* VTKImageData can be loaded into the module through DeViDe’s network and its contents will be displayed in the previously mentioned views.
* In all views, colored lines will show you the location of the other views relative to the current. (X in red, Y in green, Z in blue)
* Sliders on all three 2D views can be used to navigate through the slices in the data. Locations of the colored lines in the other 2 2D views will be updated live accordingly.
* By clicking on a region in one of the 2D views, that entire region should be selected and highlighted all 4 views (2D and 3D). This region will be determined by a region-growing algorithm, and the selected settings in the sidebar.
* These sidebar settings include:
* For the selected area:
* The Selection Color,
* The Selection Tolerance,
* The Region-Growing Method and
* The Continuity of the Selection.
* For the unselected area:
* The Transparency,
* The Option to make the unselected area more transparent when it is further away from the selected area.

1. **Results**

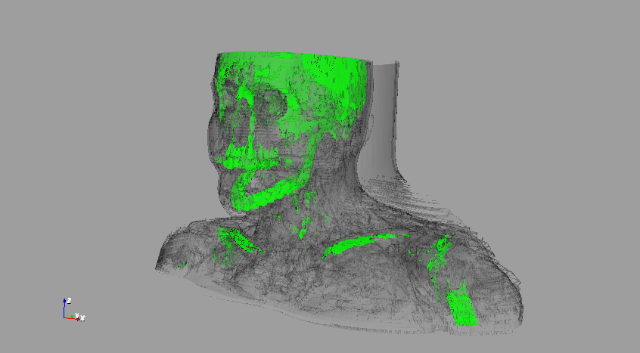
The result of this project is quite alike the original plan. Some of the ideas were left out due to new findings, those will be described later in this section. For now, we will start at the beginning.

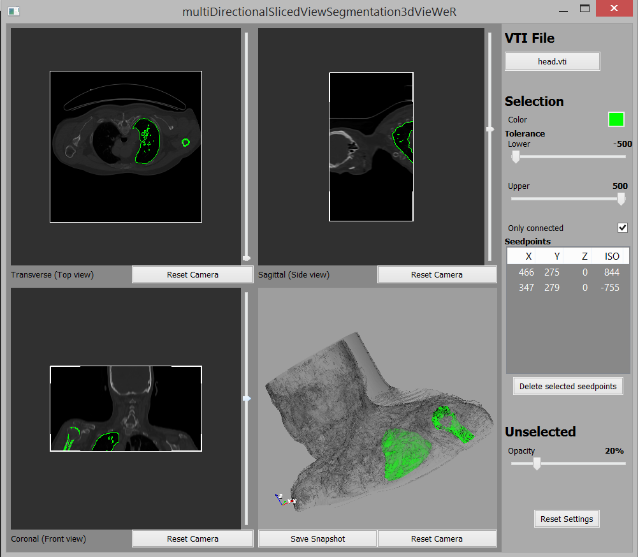
When starting up DeVIDE with the new module included. (using %PATH\_TO\_DeVIDE-RE%/dre.cmd devide –extra-module-paths %PATH\_TO\_MODULE%), you will be able to locate the *multiDirectionalSlicedViewSegmentation3dVieWeR* in the module list. Load one into your network, and you will see the frame like in figure 2.



**Figure 2:** *The default multiDirectionalSlicedViewSegmatation3dVieWeR view.*

At this point, you can choose either to load up a vtiRDR in your network as well, and then execute the network, or you can directly choose a file from your file system.





1. **Conclusion**

DeViDe was in need of help and we came to the rescue ?

1. **Future work**

This module has some improvements that can be made, but were left out. One of those improvements is to make it possible to select a different color for each seed point, this would greatly improve the segmentation options, and the visibility of the results.

For further improvements the colored indicators from the original specifications could be added. It might be difficult to create them as an overlay in the vtk framework, but it would be nice to see how the other views are zoomed, compared to a specific 2d view.