MEDICAL IMAGING
Lab Report 2 - MevisLab

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1 Introduction

The aim of this lab is to learn the basic structure and use of the MevisLab framework for quick prototyping of medical imaging applications. The lab course mainly focuses on studying Basic MevisLab filters and structure, How to develop medical image analysis prototypes, and Developing a breast boundary segmentation framework. The following sections explain the modules used in MevisLab and the results for breast image segmentation.

2 Algorithm

The modules used are as follows.

- **ImageLoad** used to open the given images on MevisLab.
- **AnonymizeMacro** to anonymize the files.
- **Info** to view the file information.
- **GaussSmoothing** Initially, Gaussian smoothing, with $\sigma = 5$, is applied on the anonymized image. The image is pre-processed with smoothing so that the contours on the segmented image would be smooth.
- **RegionGrowing** Next, the region growing algorithm is applied on the smoothed images, to obtain a binary segmented image displaying only the breast. At this stage some noise was observed in few of the images near the boundaries.

- **Morphology** We used this module to remove the noise from the segmented image by using some basic morphological techniques. We achieved this by performing *Opening* i.e, closing the background pixels. Two morphological operations were performed, *erosion* and followed by *dilation*.
- **ImageSave** To save the final segmented images in the desired format.
- **View2D** To display and observe the final output images.

Together with the Gaussian Smoothing and Binary Morphological operations, the Region Growing algorithm works well on the breast images for fixed parameters. The following images show the modules used in MevisLab and the parameters used for Region Growing on all the images.

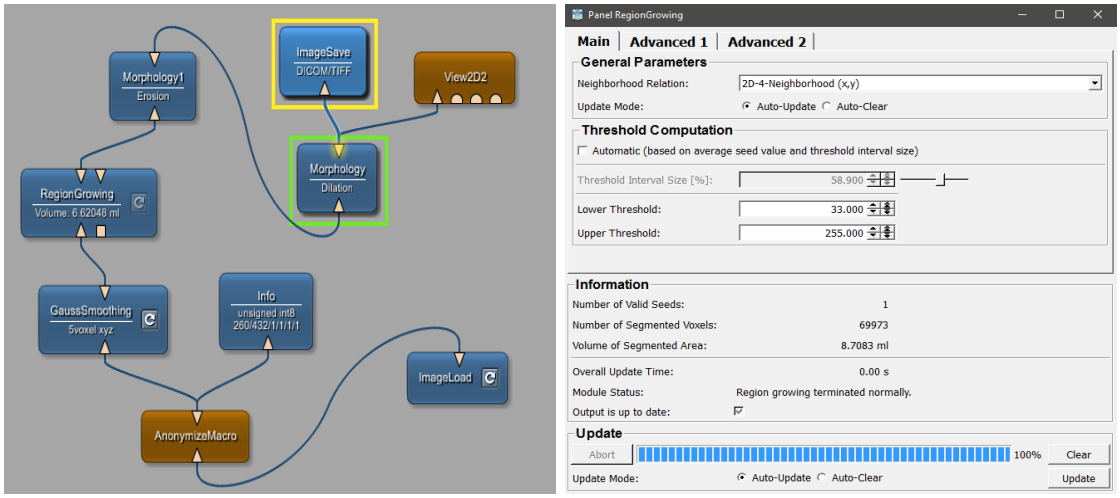

Figure 1: From Left: (a)MevisLab Module Algorithm; (b)Region Growing parameters

3 Results And Limitations

The following images show the results for all the 5 breast images.

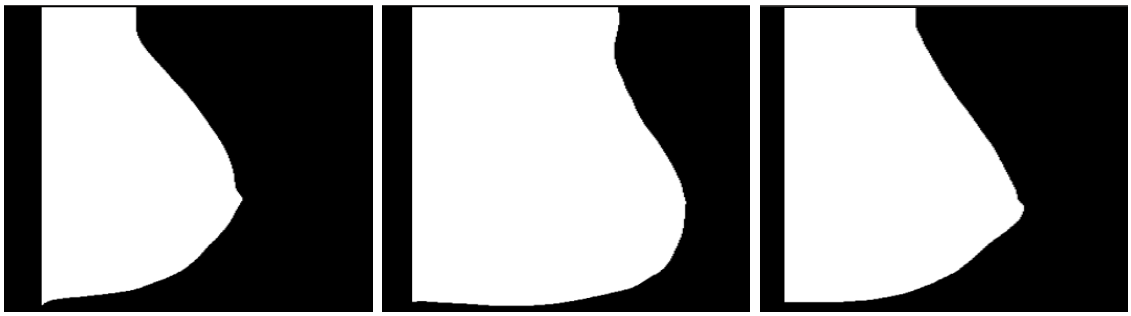

Figure 2: Images 1,2 and 3

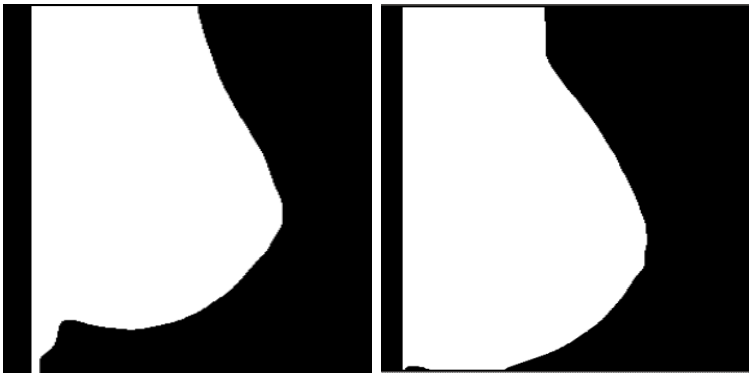

Figure 3: Images 4 and 5

As we can see from the results, there is still some unnecessary detail in *image*4 for example. Such noise was removed from all the images by using the binary morphological operations. We can also see from the images that the edges are smooth including most of the required detail. This is the result of Gaussian smoothing before applying the Region-Growing algorithm. We also had to test various parameters and thresholds for each module on each of the images. After some tweaking and testing, the parameters shown in figure 1 were fixed for region growing.
We can observe from the images that, there is still some detail missing. After applying smoothing and morphological operations we could reduce the detail loss as opening of the segmented image adds an extra layer compensating for the black regions on the boundary of the breast. We could also eliminate rough edges with the help of smoothing. But there were still some sharp edges remaining in a few of the images which could not be avoided.

4 Conclusion

breast images were successfully segmented after checking different threshold sizes. Segmented image detail was enhanced with the help of smoothing and morphological techniques. A set of parameters were fixed so that the algorithm has minimal user interface.