University of Girona

Spain

Medical Imaging Analysis
Lab 2 - MevisLab

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1 Introduction

The lab 2 of medical imaging is about getting familiar with Medical Image processing and Visualization (Mevislab) by a simple example. It is a framework for medical image processing and scientific visualization. We are provided with five different images and the task for the lab is to develop an automatic breast boundary segmentation system, which can be applied to almost all the breast images.

2 Breast Boundary Segmentation

As we know, image segmentation is still a tough topic in the area of computer vision. Compared with normal image segmentation, the segmentation of medical images is more difficult because of the complicated structures of the different parts of the human body.

2.1 Procedure for Breast Image Segmentation

We have proposed steps for breast boundary segmentation with respect to the blocks we have practised and implemented. These steps are represented in the form of different blocks in Mevislab. Whole segmentation procedure is shown as follows, and we analyse line by line in detail.
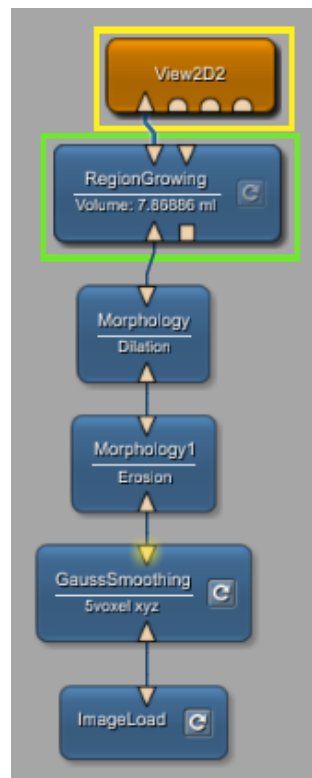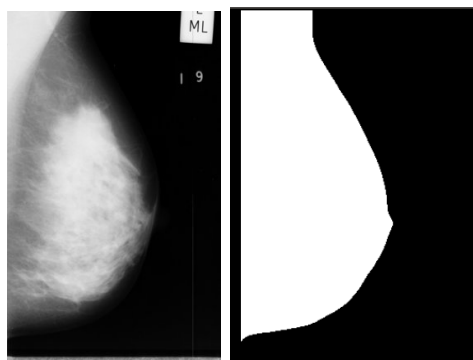

Figure 1: Steps for Breast Boundary Segmentation

Procedure and Analysis

- **ImageLoad** This block is used to load the new images

- **GaussSmoothing** This block is used to smooth the contours of the image. We have used Gaussian filter with $sigma = 4.5$ to smooth the breast image for the sake of removing unexpected noise.

- **Morphology** Morphology is basically used for segmentation of the images. It subdivides the image into regions. It is based on opening and closing. Opening is described as Erosion followed by Dilation while closing is vice-versa. Here, in our case we used opening operation on the smoothed image to eradicate all pixels in regions that are too tiny to include the structuring element. Here the structuring element is often called a query, because it is inquiring the image looking for small objects to strain out of the image.

- **RegionGrowing** It performs a segmentation on an image which examine the neighboring pixels of a set of points, acknowledged as seed points, and conclude whether the pixels could be classified to the cluster of seed point. Due to morphological operation(opening) applied in the previous step, the users don't necessitate to opt for the seed point manually consequently there is no need of human intrusion.

- **View2D** The block represents to display the image output in 2D.

3　Result

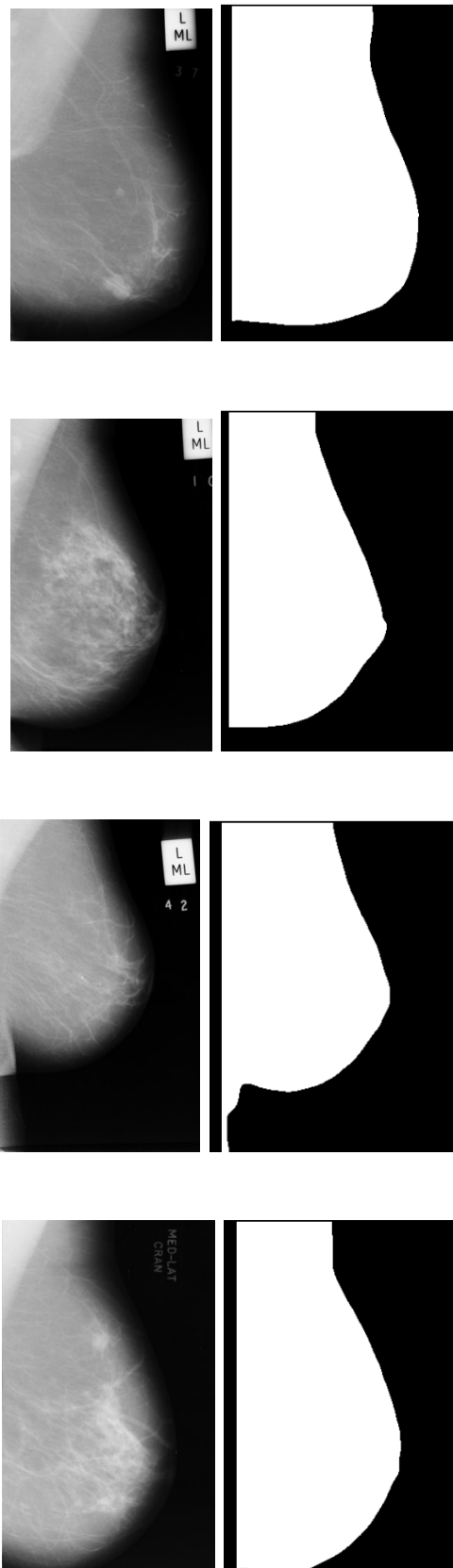Breast Boundary Segmentation results of different breast images are shown below.

Figure 2: Breast Boundary Segmentation Results

4 Limitations

Although we use region growing method for segmentation, it has some limitations.

- **Local method**: No global view of the problem.

- **Gradient problem**: Pre-defined variance i.e threshold value is required for segmenting the image, otherwise it may lead to gradient problem.

An automatic and adaptive segmentation threshold value selection method is required, which considers the uncertainty of breast image and extracts concepts from characteristics of the region to be segmented like human being.

5 Encountered Problems

The problems we encountered in the process was about tweaking parameters correctly (in case of GaussSmoothing and RegionGrowing block) for different breast images, but this was solved by adding morphology blocks of erosion and dilation.

6 Conclusion

In this session, we mainly took advantage of Mevislab and implemented a breast boundary segmentation system which mainly consist of 4 steps in total for the whole process. The system satisifies the "fully automatic" requirement and can be applied to most of the breast images. Also we identified the limitations of our method and point out the solutions to overcome them.