Computer Aided Diagnosis
Lung segmentation

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1 Problem description

2 Fully convolutional network

Paper by Long et al [1]

3 Region growing in MeVisLab

We used a second approach for segmenting the lungs from the CT scans which is the more conventional approach of using region growing, in order to compare the results of our FCN with the current 'standard'. The biggest challenge of this approach is that in order to traditionally use region growing for segmentation, seed points need to be automatically selected inside the area that needs to be segmented. Since this is a difficult task, the decision is made to circumvent this problem by using region growing in a different way. The following algorithm is used for segmentation in MeVisLab:

- Threshold the image with threshold value 1000.

- Apply region growing to the image, four times, with a corner pixel of the first slice as seed point.

- Add the resulting four images to the thresholded image.

- Threshold the resulting image with value 1000. An example result can be seen in figure B.1.

- Invert the resulting image. All that is left are the lungs and some other artifacts. An example can be seen in figure B.2a.

- Do a connected components analysis on the resulting image, and select only the largest component from the image (the lungs).

- Since there are still black holes in the lungs (veins), closing is applied to the image with a 10x10x1 spherical kernel. An example of the resulting segmentation mask can be seen in figure B.2b.

This approach circumvents the need to find specific region growing seed points, since we take the same seed points for each image, namely the four corner pixels of the first slice. The results gathered with this method seem fairly promising. More on the results of using this segmentation method is discussed in the section 4.

4 Results

5 Conclusion

A Contributions

Luc Nies:

Steven Reitsma:

Harmen Prins:

Inez Wijnands: Contributed to the initial implementation of the fully convolutional network. Contributed to creating the MeVisLab segmentation method. Implemented the evaluation method for the segmentations (Dice score).

Tom van de Poll: Contributed to the initial implementation of the fully convolutional network. Contributed to creating the MeVisLab segmentation method and responsible for troubleshooting this method. Implemented the method for looping the MeVisLab segmentation method over the data.
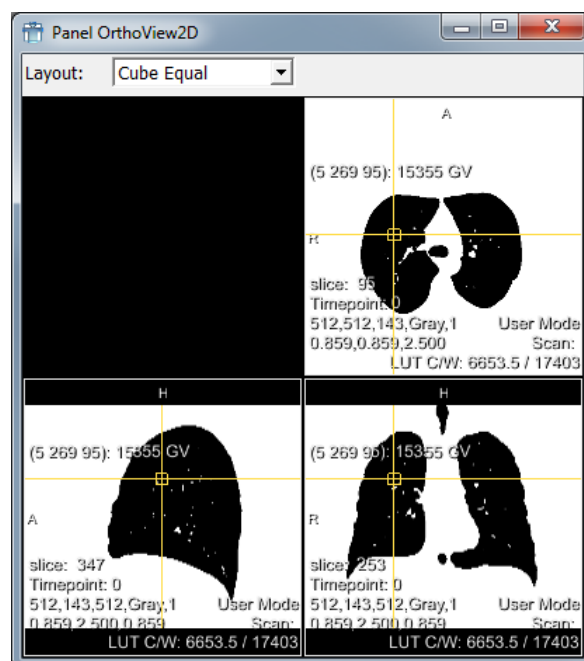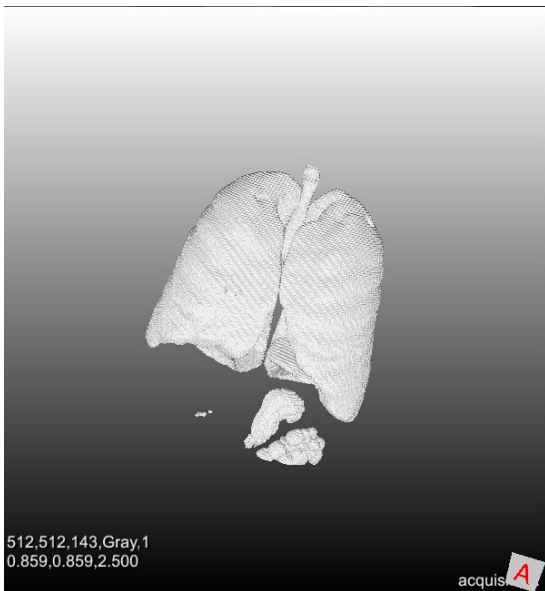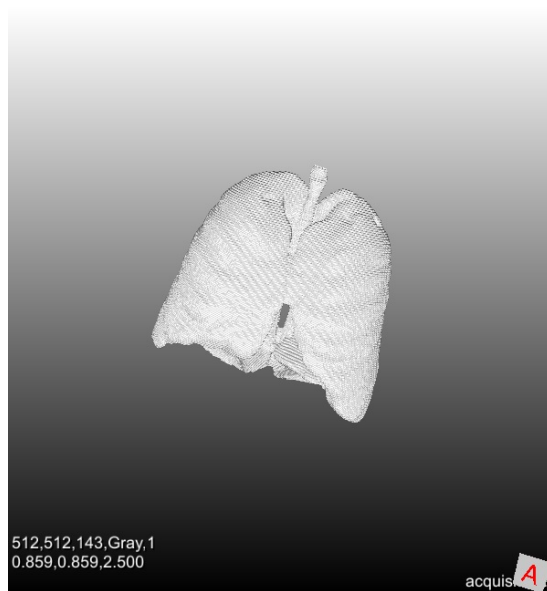
B Figures

Figure B.1: The thresholded image after region growing.

References

[1] Jonathan Long, Evan Shelhamer, and Trevor Darrell, *Fully convolutional networks for semantic segmentation*, Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2015, pp. 3431–3440.

(a) After the inversion step.

(b) After connected component analysis and closing.

Figure B.2: Results of the segmentation