OCTSEG software manual

OCTSEG = Optical Coherence Tomography Segmentation and Evaluation GUI

# Abstract

The purpose of this document is to describe the algorithm and functionality of the OCTSEG software. This software segments the retinal layers, especially the retinal nerve fiber layer (DNFL) on OCT-volume scans. This document provides additional information to the original OCTSEG user manual.

Contents

[Abstract 1](#_Toc410393126)

[Introduction 1](#_Toc410393127)

[Main Features 2](#_Toc410393128)

[Supported data formats 2](#_Toc410393129)

[Functionality 2](#_Toc410393130)

[Compilation and Distribution 2](#_Toc410393131)

[Screenshots 2](#_Toc410393132)

[References 4](#_Toc410393133)

# Introduction

OCTSEG (Optical Coherence Tomography Segmentation and Evaluation GUI) is a graphical user interface (GUI) written in MATLAB for research purpose. With this software, the retinal layers and the blood vessels of retinal OCT scans can be segmented. Tools for the manual correction of the automated segmentations are provided. The program gives segmentations or resulting thickness measurements on the retinal layers may be exported as a CSV file, which is readable by standard software (e.g. Excel).

OCTSEG software has been originally developed by Markus Mayer, Pattern Recognition Lab, University of Erlangen Nuremberg, Germany (Meyer) and released in 2012. The algorithms used in this software are partly described in (Mayer, Hornegger, Mardin, & Tornow, 2010) and partly in this document. The software has been modified to run on few example data from AMC for the EYR4 “A flightpath for OCT imaging project” (Almasian, 2013) by Elena Ranguelova from the Netherlands eScience center (NLeSc) at the end of 2014/beginning of 2015.

This version is available at the NLeSc repository, (Ranguelova, 2015), and is the subject to this document. The original octsegManual.txt and other related documentation being referred to in this text are available at the folder of this document (OCTSegmentation/help) unless specified otherwise.

# Main Features

## Supported data formats

* Circular OCT scans as well as Optic Nerve Head (ONH) centered volumes. The supported data format as Heidelberg Engineering Spectralis OCT RAW data (.vol extension)
* OCT data stored as image files (.tif, .pgm, .jpg) is also supported. Multiple images can be read in as volumes using user generated .list files (a text file format).

## Functionality

* Automated segmentation of 6 prominent retinal layers (including the inner limiting membrane, outer nerve fiber layer boundary, and retinal pigment epithelium)
* Automated segmentation of the blood vessel positions on circular scans
* Batch processing of circular scans
* Manual correction of possible segmentation errors
* Visualization of the data and the segmentation results, including enface views and thickness maps
* Export of the segmentation results to CSV text files

### Phantom segmentation

Currently the software does not support directly from the GUI segmentation of phantom data (either in CSV or BIN files). Initial version of a separate software, which could eventually be added to OCTSEG can be found at (OCTSegmentation/PhantomSegmentation).

# Algorithms

Part of the algorithms implemented by OCTSEG are described party in (Mayer, Hornegger, Mardin, & Tornow, 2010). The main source for understanding the algorithms (OCTSegmentation/algo) is the code (Ranguelova, 2015). Here only the mail ideas are explained.

# Compilation and Distribution

The software has been compiled using MATLAB version 7.6.0.324 (R2008a) with compiler version 4.8 and is freely available as a stand-alone application (Ranguelova, 2015). The followed procedure for compiling and packaging for redistribution is according to the **Deploying Matlab application (Windows)** tutorial (KU Leuven) which is also to be found at the current document's folder. Please note, that the version numbers in the tutorial are slightly different than the one mentioned above. To be deployed on a machine without MATLAB installed, one should follow the instruction in the tutorial as of section Deploying a Matlab application (KU Leuven), page 8 and also according to the readme.txt file in the distribution folder (OCTSegmentation/Executables/octseg/distrib).

A compiled version of a very initial partial segmentation of 2D CSV phantoms is also available at (OCTSegmentation/Executables/phantomseg/distrib).

# Screenshots

These screen shots are given here only as additional illustration of the explanations given in the original software documentation (octsegManual.txt).

The screenshots are from running the program within MATLAB. When using the stand-alone compiled version of the software, the GUI windows have the same appearance, only the command window is the Windows command window (compare Figure 1 and Figure 2).

Figure 1 and Figure 2 show the main window of the GUI. It is used for loading, segmenting, importing and exporting data. For detailed description of the modes, information tables and menu commands, please refer to the original documentation (octsegManual.txt) available also at the current document's folder.

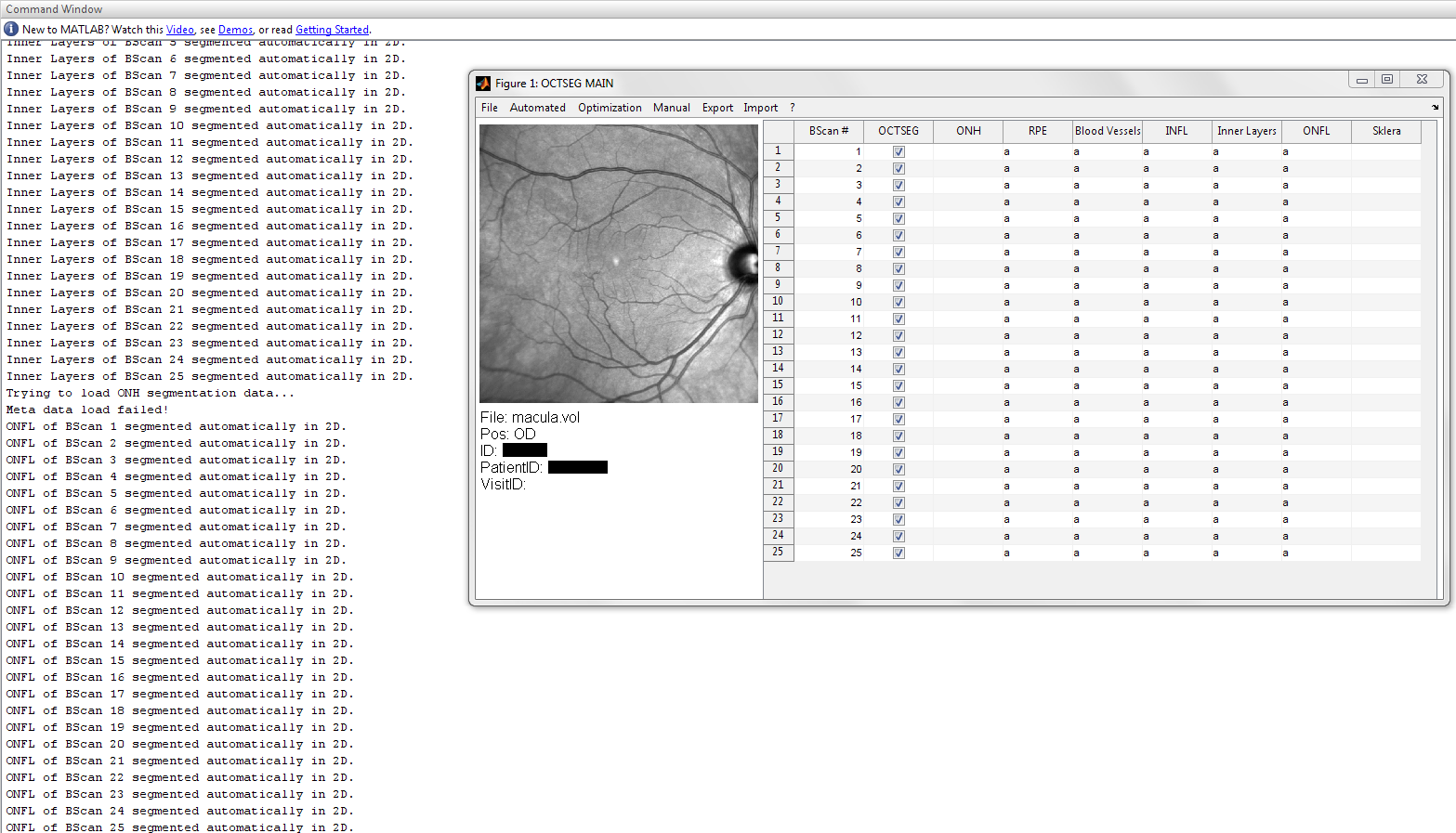


Figure Main window (in MATLAB). Automatic segmentation of Spectralis volume.

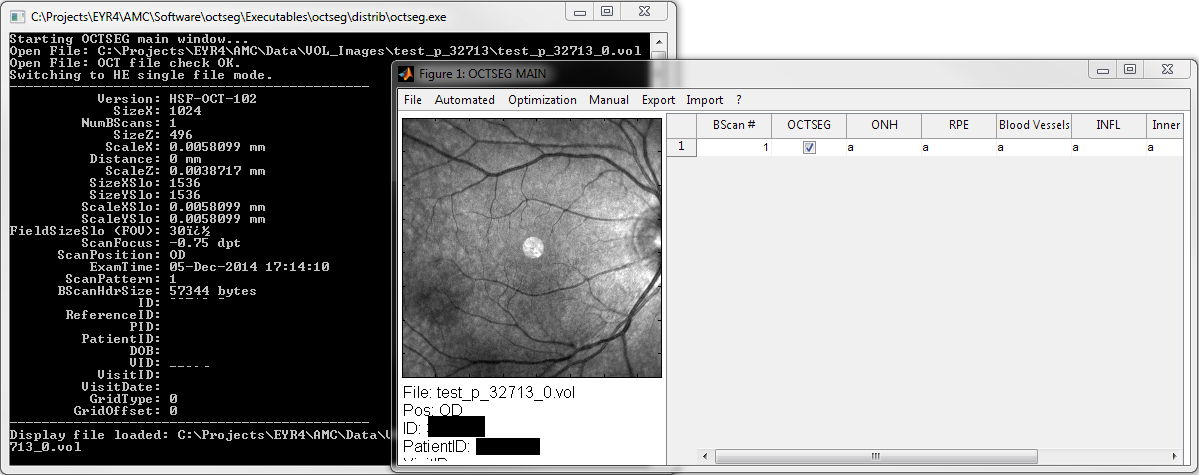


Figure Main window (stand-alone application). Loading of the test VOL images.

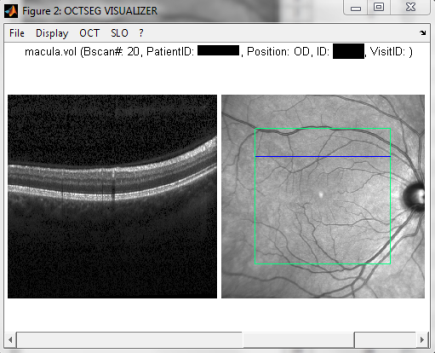
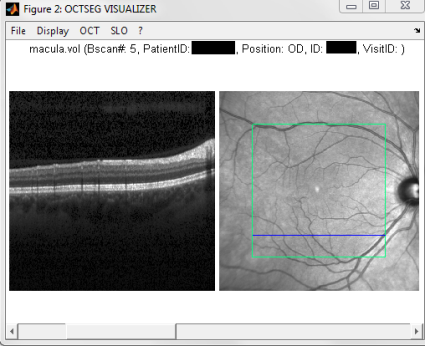
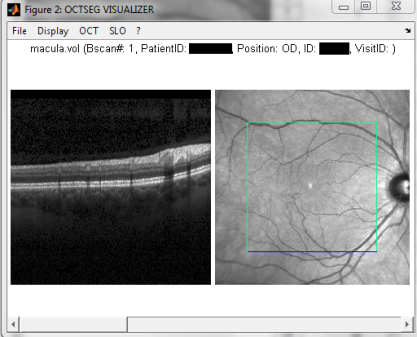


Figure OCT and SLO views

# References

Almasian, M. (2013, October). *A Lightpath for Optical Coherence Tomography Imaging*. Retrieved from https://blog.surfnet.nl/?p=2747

KU Leuven. (n.d.). *Deploying Matlab application (Windows).* Retrieved from https://admin.kuleuven.be/icts/onderzoek/wetsoft/software/matlab/pdf/matlab-deploytool-standalone

Mayer, M., Hornegger, J., Mardin, C., & Tornow, R. (2010). Retinal Nerve Fiber Layer Segmenation on FD-OCT Scans of Normal Subjects and Glaucoma Patients. *Biomedical Optics Express*, 1358-1383.

Meyer, M. (n.d.). *OCTSEG*. Retrieved from OCTSEG: http://www5.cs.fau.de/en/research/software/octseg/

Ranguelova, E. (2015). *OCT Segmentation*. Retrieved from https://github.com/NLeSC/OCTSegmentation