

Thomas Theelen: IMAGEJ FOR IMAGE PROCESSING AND 3D ANALYSIS OF SPECTRAL DOMAIN OCT

Abstract

INTRODUCTION

Modern imaging with spectral domain optical coherence tomography (SD-OCT) allows for high-resolution imaging of the eye. Many commercial SD-OCT's are available, however, post-acquisition image processing software provided by the manufacturers does not always fit the users' needs. We investigated the power of ImageJ as an open-source software to process SD-OCT images and to perform 3D analysis of scan volumes.

METHODS

After SD-OCT scan import as AVI file, images were transferred to 8-bit gray values. A general scale of 5 microns/pixel was applied. Then, a coronal scan was reconstructed using the program menu stacks/reslice. Because original B-scans were of 61 microns distance from each other, the resulting coronal image series were resized accordingly and interpolated. Then, area measurements could be performed in all 3 dimensions. Details of coronal scans were segmented to allow for qualitative analysis of single tissue layers. Finally, the VolumeViewer plugin was used to allow for interactive 3D investigation of the acquired SD-OCT scans.

RESULTS

SD-OCT image processing with ImageJ allowed for 3D reconstruction of the central retina and the optic nerve. Area measurements of diverse tissue layers were possible. 3D volume reconstructions gave illustrative impressions of the cases.

CONCLUSIONS

SD-OCT scan series can easily be processed and analyzed in 3 dimensions using ImageJ. By using a customizable software, individual needs for clinical care or research can be met. The development of own macros or plugins in ImageJ may facilitate repeated identical image analysis processes.

Keywords

optical coherence tomography, ImageJ, image processing, three-dimensional reconstruction, image segmentation

Short CV

Thomas Theelen is Associate Professor and staff ophthalmologist at the Department of Ophthalmology, Radboud University Nijmegen Medical Centre, since 2003. He studied Medicine at the University of Aachen (Germany). In July 1995, he obtained his M.D. at the Institute of Anatomy, University of Aachen (Germany), and in July 2011 is earned his Ph.D. in Retinal Imaging at the Radboud University Nijmegen Medical Centre.

He has (co-)authored 34 peer-reviewed journal publications and two main book chapters, and he is a reviewer for several high-ranking scientific journals. His current research focuses on functional imaging of the retina and automated retinal image analysis.

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