



UNIVERSITÄT ZU LÜBECK



Program: Biomedical Engineering

Master's Thesis

Title:

Design and Performance Evaluation of a Free-Space Low-Cost Spectral-Domain Optical Coherence Tomography Imaging System

Summary:

Optical Coherence Tomography (OCT) is an imaging technique which is based on interferometry using a low coherence light source. OCT enables high resolution depth information of scattering samples and presents these as tomograms, i.e. B-scans and volumes. Its main medical imaging application is in the field of ophthalmology, as it allows to obtain detailed images from different segments of the eye. Typically the acquisition cost of OCT systems are high and so far no company offers an inexpensive device. For example the Telesto-II Spectral-Domain OCT (SD-OCT) imaging system from Thorlabs costs approximately 60,000 €.

The goal of this thesis was to design a low-cost OCT setup for retinal imaging and evaluate its performance. A comparison of a low-cost OCT setup to a conventional SD-OCT setup was evaluated by measuring the resolution, signal-to-noise ratio, signal fall-off and sensitivity of both setups.

Ex-vivo retina images of a porcine and in-vivo human retina were obtained with the low-cost OCT setup. The quality was affected by the speed of the camera and motion artifacts had a negative influence on the OCT images. Apart from these, the images of the low-cost OCT setup were comparable to images acquired with a commercial SD-OCT system. Due to this, the results were promising. It is desirable to continue working towards cost-effective alternatives for OCT systems.

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Date of completion: 31 July 2015