universität wien

FAKULTÄT FÜR MATHEMATIK
Dekan Univ.-Prof. Dr. Christian Krattenthaler

Einladung zur öffentlichen Defensio von

Cong Shi

Thema der Dissertation:

High-resolution imaging for photoacoustic tomography and optical coherence tomography

Abstract: The first part of my thesis deals with photoacoustic tomography taking into account acoustic attenuation. We first present a unified attenuation model and then analyze the existence and uniqueness for the solution of this attenuation model. Then we divide the known attenuation models into two classes, called strong and weak attenuation. We show that for strong attenuation, the singular values of the attenuated photoacoustic operator decay exponentially, and in the weak attenuation case the singular values of the attenuated photoacoustic operator decay polynomially.
Then for weak attenuation models, we introduce a novel reconstruction method. It is a temporal universal back-projection formula and works exactly for quadratic measurement surfaces or curves. At the end, we show some numerical experiments in constant attenuation medium and general weak attenuation medium in 2D.
In the second part of my thesis, we discuss how to image the dynamics of metabolic activity of cells using optical coherence tomography. We give a new multi-particle dynamical model to simulate the movements of the collagen and the cell metabolic activity, and develop an efficient signal separation technique for sub-cellular imaging. We present several numerical simulations to illustrate and validate our approach.

Prüfungssenat:

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Zeit: Dienstag, 22. August 2017 , 13:30 Uhr

Ort: Fakultät für Mathematik,Vis Lab Raum 1.131 , Oskar-Morgenstern-Platz 1