

Veranstaltungen im Sommersemester 2015

Das fünfundzwanzigste Treffen des Rhein-Main Arbeitskreises findet

Freitag, den 10. Juli 2015, 15:00 Uhr

an der

TU Darmstadt, Fachbereich Mathematik,
Dolivostrasse 15

statt.

Programm

15:00 Uhr: [Prof. Dr. Bastian von Harrach \(Universität Stuttgart\)](#)

Inverse problems and medical imaging

Medical diagnosis has been revolutionized by noninvasive imaging methods such as computerized tomography (CT) and magnetic resonance imaging (MRI). These great technologies are based on mathematics. If the patient's interior was known then we could numerically simulate the outcome of physical measurements performed on the patient. Medical imaging requires solving the corresponding inverse problem of determining the patient's interior from the performed measurements. In this talk, we will give an introduction to inverse problems in medical imaging, and discuss the mathematical challenges in newly emerging techniques such as electrical impedance tomography (EIT), where electrical currents are driven through a patient to image its interior. EIT leads to the inverse problem of determining the coefficient in a partial differential equation from (partial) knowledge of its solutions. We will describe recent mathematical advances on this problem that are based on monotonicity relations with respect to matrix definiteness and the concept of localized potentials.

15:45 Uhr: Tee/Kaffee

16:15 Uhr: [Dr. Ronny Bergmann \(TU Kaiserslautern\)](#)

A Second Order Non-smooth Variational Model for Restoring Manifold-valued Images.

In many real world situations, measured data is noisy and nonlinear, i.e., the data is given as values in a certain manifold. Examples are InSAR images and the hue channel of HSV, where the entries are phase-valued, directions in $\mathbb{R}^n$, which are data given on S^{n-1} , and diffusion tensor magnetic resonance imaging, where the obtained data items are symmetric positive definite matrices.

In this talk we extend the recently introduced total variation model on manifolds by a second order TV type model. We first introduce second order differences on manifolds in a sound way using the induced metric on Riemannian manifolds.

By avoiding a definition involving tangent bundles, this definition allows for a minimization employing the inexact cyclic proximal point algorithm, where

the proximal maps can be computed using Jacobian fields. The algorithm is then applied to several examples on the aforementioned manifolds to illustrate the efficiency of the algorithm.

17:00 Uhr: [Prof. Dr. Christoph Erath \(TU Darmstadt\)](#)

Adaptive Coupling of Finite Volume and Boundary Element Methods

In many fluid dynamics problems the boundary conditions may be unknown, or the domain may be unbounded. Also mass conservation and stability with respect to dominating convection is substantial. Therefore, we introduce a (rather) new discrete scheme to address these issues. More precisely, we couple the finite volume method and the boundary element method and provide some theoretical results. Also robust a posteriori estimates are developed and analysed, which allow us to use an adaptive mesh-refinement algorithm. This strategy turns out to be very suitable for the numerical treatment of transmission problems, which have singularities or boundary/internal layers. Several numerical examples illustrate the analytical results and the effectiveness of the new conservative adaptive coupling method.

anschließend: Nachsitzung

Informationen zur Anreise finden Sie [auf dieser Seite](#).

Der Workshop ist eine gemeinsame Veranstaltung mit dem [DFG-Schwerpunktprogramm 1324 EqIS](#) (*Mathematische Methoden zur Extraktion quantifizierbarer Information aus komplexen Systemen*).