Institut für Mathematik
und Wissenschaftliches Rechnen
Karl-Franzens-Universität Graz

INVITATION

Dr. Carola-Bibiane Schoenlieb
Fellow of Jesus College, Cambridge, UK

Title: Noise estimation by PDE-constrained optimization

Time: Wednesday, 19.12.2012, 10.00 Uhr

Place: HS 11.02, IMWS, Heinrichstraße 36, 8010 Graz

Abstract

A key issue in image denoising is an adequate choice of the correct noise model. In a variational approach this amounts to the choice of the data fidelity and its weighting. Depending on this choice, different results are obtained.

In this talk I will discuss a PDE-constrained optimization approach for the determination of the noise distribution in total variation (TV) image denoising. An optimization problem for the determination of the weights correspondent to different types of noise distributions is stated and existence of an optimal solution is proved. A tailored regularization approach for the approximation of the optimal parameter values is proposed thereafter and its consistency studied. Additionally, the differentiability of the solution operator is proved and an optimality system characterizing the optimal solutions of each regularized problem is derived. The optimal parameter values are numerically computed by using a quasi-Newton method, together with semismooth Newton type algorithms for the solution of the TV-subproblems. The talk is furnished with numerical examples computed on simulated data.

Dr. Bertram Duering
Department of Mathematics, University of Sussex, UK

Title: Structure preserving methods for Wasserstein gradient flows

Time: Wednesday, 19.12.2012, 11.10 Uhr

Place: HS 11.02, IMWS, Heinrichstraße 36, 8010 Graz

Abstract

Evolution equations with an underlying gradient flow structure have since long been of special interest in analysis and mathematical physics. In particular, transport equations that allow for a variational formulation with respect to the L2-Wasserstein metric have attracted a lot of attention recently. The gradient flow formulation gives rise to a natural semi-discretization in time of the evolution by means of the minimizing movement scheme, which constitutes a time-discrete minimization problem for the (sum of kinetic and potential) energy. On the other hand, nonlinear diffusion equations of fourth (and higher) order have become increasingly important in pure and applied mathematics. Many of them have been interpreted as gradient flows with respect to some metric structure.

When it comes to solve equations of gradient flow type numerically, schemes that respect the equation's special structure are of particular interest. We present a fully discrete variant of the minimizing movement scheme for the numerical solution of the nonlinear fourth order Derrida-Lebowitz-Speer-Spohn equation in one space dimension, and discuss possible extensions to higher approximation order and to higher space dimensions.

10:50 COFFEE & CAKE!

Prof. Dr. Karl **Kunisch** & Prof. Dr. Klemens **Fellner**