Veranstaltungen im Wintersemester 2013/14

Das zweiundzwanzigste Treffen des Rhein-Main Arbeitskreises findet

Freitag, den 7. Februar 2014, 15:00 Uhr,

an der

Philipps-Universität Marburg, Fachbereich Mathematik und Informatik,
Hans-Meerwein-Straße, D-35032 Marburg, SR XV (Ebene C4)

statt.

Programm

15:00 Uhr: Dr. Martin Gutting (Universität Siegen)
Multiscale Analysis on the Earth's Surface Accelerated by the Fast Multipole Algorithm
By the use of an underlying Runge sphere harmonic scaling functions and wavelets can be constructed on regular surfaces such as the surface of the Earth. They allow a space{frequency decomposition of geophysical quantities on the surface. Moreover, due to their localizing properties regional modeling or the improvement of a global model is possible. The acceleration of the convolution by the fast multipole method is possible for certain types of harmonic scaling functions and wavelets. The main idea of the fast multipole algorithm consists of a hierarchical decomposition of the computational domain into cubes and a kernel approximation for the more distant points. The kernel evaluation is performed directly only for points in neighboring cubes on the finest level. The contributions of the other points are transferred into a set of coeffcients. The kernel approximation is applied on the coarsest possible level using translations of these coefficients. This reduces the numerical effort of the convolution for a prescribed accuracy of the kernel approximation. Multiscale methods are known to possess a tree algorithm that allows the computation of the lower frequency scales from a starting scale that contains the highest frequency parts of the signal. The application of the fast multipole method can accelerate the computation of this starting point as well as the tree algorithm itself. Applications to gravitational field modeling are presented. Finally, the extension to boundary value problems is considered where the boundary is the known surface of the Earth itself.

15:45 Uhr: Tee/Kaffee

16:15 Uhr: Dipl.-Math. Max Nattermann (Univ. Marburg)
Robust Optimal Design of Experiments and a Higher Order Sensitivity Analysis of Parameter Estimation Problems
When dealing with the task of estimating parameters by the use of a set of noisy data, the number of available measurements is limited.
Therefore, in optimum experimental design it is tried to identify the system settings with those measurements which allow the most reliable estimate.

In this talk we are going to present properties and examples of a new and robust objective function of optimum experimental design, which is based on a higher order sensitivity analysis of the underlying parameter estimation problem.

17:00 Uhr: Dr. Nikolaos Sfakianakis (Johannes Gutenberg-Universität Mainz)
Mathematical modeling and numerical simulation of cancer dynamics
One of the primer aims in cancer research is to understand the way cancer cells interact with their environment, the dynamics and phenomena they develop, the way they react and adjust to external stimuli, how they move, proliferate, and how they metastasize. This aim is highly interdisciplinary involving medical, biological, and mathematical components. In this direction, our research effort focuses on the mathematical modeling and the numerical simulations of the first step of tumour dynamics: the invasion of the Extracellular Matrix. The models that we work on are Advection-Reaction-Diffusion systems, where the motility of the cells is dominated by the advection/taxis dynamics. We include in the models Cancer Stem Cells as well as the dynamical transitions between differentiated and cancer stem cells. We study the consequences of heterogeneities -caused by the presence of both cancer cell types- on the invasion of the extracellular matrix. To this end we employ a plethora of numerical methods adjusted to fit the needs of such systems. The dynamics though of the solutions are quite rich and very fine numerical grids are necessary to consistently resolve the dynamics. To alleviate the numerical burden of very fine grids we use mesh refinement techniques to increase the grid resolution only locally.
Joint work with: M. Lukacova, N. Hellmann, and N. Kolbe
Thanks: "Alexander von Humboldt Foundation" and the "Center for Computational Sciences in Mainz".

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*).