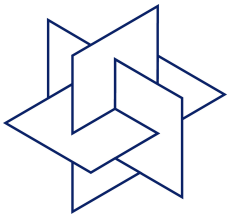

DFG Research Center MATHEON
Mathematics for key technologies

MATHEON Multiscale Seminar*

organised by R. Klein (FU), D. Peterseim (HU), K. Schmidt (TU), and B. Wagner (TU)

TU Berlin, MA 415, **Friday November 30th 2012**, 9.30am

Daniel Peterseim (HU Berlin)

A New Multiscale Method for (Semi-)Linear Elliptic Problems

We propose and analyze a new multiscale method for solving (semi-)linear elliptic problems with heterogeneous and highly variable coefficients. For this purpose we construct a generalized finite element basis that spans a low dimensional global multiscale space based on some coarse mesh. The basis is assembled by performing localized linear fine-scale computations in small patches that have a diameter of order $H|\log(H)|$ where H is the coarse mesh size. Without any assumptions on the type of the oscillations we give a rigorous proof for the linear convergence of the energy error with respect to the coarse mesh size without any pre-asymptotic effects. Moreover, we show that the discretized operator captures small eigenvalues of the partial differential operator very accurately (in a superconvergent way). The results are illustrated in numerical experiments.

Ludwig Gauckler (TU Berlin)

Modulated Fourier expansion: Multiscale expansions for analysing oscillatory Hamiltonian systems

Modulated Fourier expansions are multiscale expansions in time for analysing weakly nonlinear oscillatory systems over long times, both continuous and discrete systems, in finite and infinite dimensions. In the talk we will consider a finite dimensional oscillatory Hamiltonian system coupled to a slow motion as a model problem. We will discuss the exchange of energy between the fast (oscillatory) and the slow system, and we will explain how modulated Fourier expansions can be used to explain the lack of any energy exchange on long time intervals.

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* The MATHEON Multiscale Seminar takes place approximately three times per term with one or two talks about recent work on partial differential equations with multiple scales. Please contact one of the organisers if want to be invited by e-mail or if you would like to contribute a talk.
Webpage: `http://www.tu-berlin.de/?multiscale-seminar`