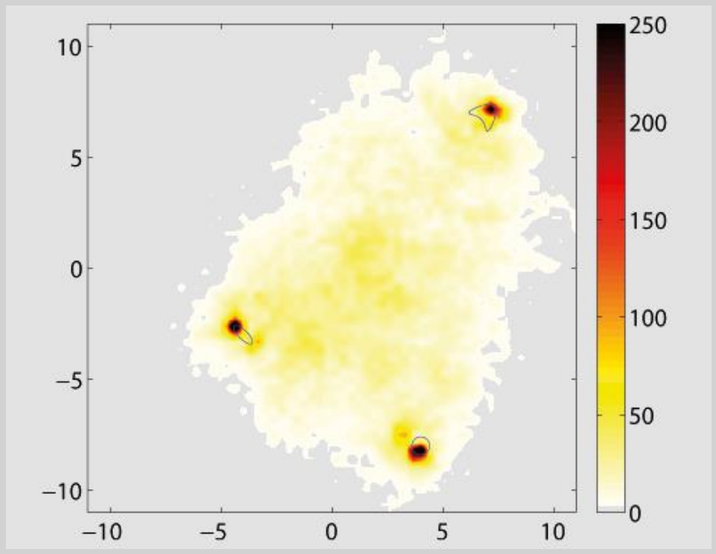

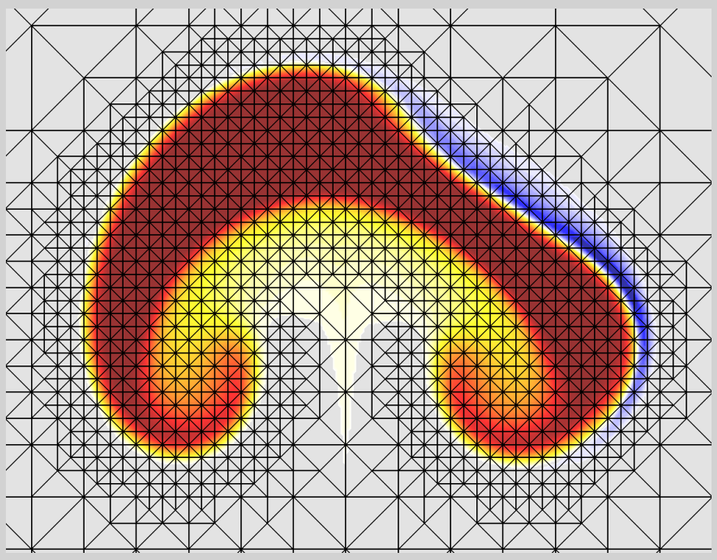

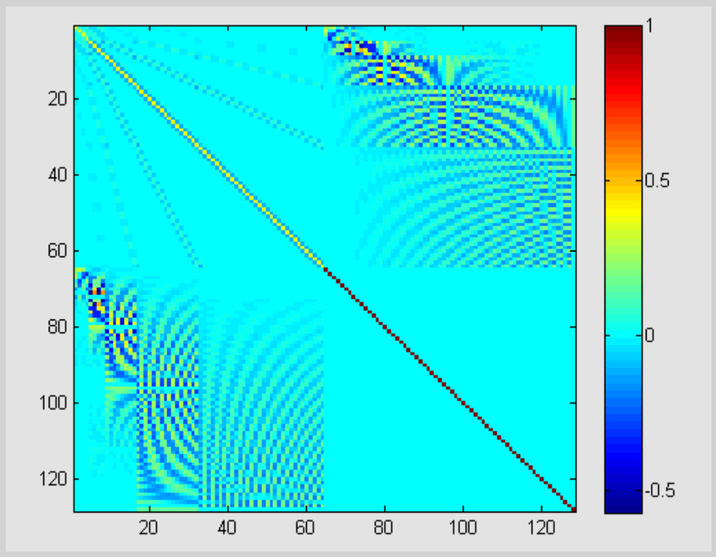

Oberseminar Numerik

Herr Prof. Dr. Alexander Kurganov

16.06.16
14:15 Uhr
Raum: 04-426
Staudingerweg 9, 55128 Mainz

„Fast Explicit Operator Splitting Method for Nonlinear PDEs “

Abstract:

Operator splitting methods are widely used to numerically solve PDEs. The main idea behind the construction of such methods is splitting different differential operators and treating them separately using appropriate numerical methods. The splitting error can be controlled by adjusting the splitting time steps, which sometimes can be taken very large. In the latter case, the splitting method may be extremely efficient. The simplest -- yet nontrivial -- example to illustrate this possibility is convection-diffusion equations in the convection-dominated regime. In this case, the (nonlinear) convection equation can be solved explicitly using a shock-capturing method, while the linear diffusion equation can be solved exactly. This leads to a fast explicit operator splitting method, which I will present and analyze in the first part of the talk.

I will then focus on a recent application of the fast explicit operator splitting method to phase-field models. I will consider nonlinear the diffusion equations for thin film epitaxy with slope selection and Cahn–Hilliard equations. The equations are split into nonlinear and linear parts. The nonlinear part is solved using a method of lines together with an efficient large stability domain explicit ODE solver. The linear part is solved by a pseudo-spectral method, which is based on the exact solution and thus has no stability restriction on the time-step size. I will demonstrate the performance of the proposed methods on a number of one- and two-dimensional numerical examples, where different stages of coarsening such as the initial preparation, alternating rapid structural transition and slow motion can be clearly observed.

Hierzu sind alle herzlich eingeladen.

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