

Graduate Seminar on Efficient Simulation

Prof. Dr. Carsten Burstedde

1 Summary

In this seminar we will investigate numerical methods for the simulation of viscous flow. This applies for example to the behavior of lava or ice. We will extend the treatment to the modeling of two-phase flow, where we have a mixture of air and water, or water and oil for example. In this case, we have to consider how the two phases are represented numerically, and how physical effects like surface tension can be taken into account.

Basic knowledge on interpolation, numerical quadrature, finite element methods for elliptic PDEs and saddle point systems will be advantageous.

The seminar presentations (50 minutes) should be self-consistent and understandable without requiring specialized prior knowledge. A four-page written summary in L^AT_EX must be turned in by email or in print until January 31, 2015, with a border of 1 in and 11 pt font size.

The seminar will take place on Mondays at 3:00pm c.t. in room 6.020, Wegelerstr. 6.

2 Topics

1. Numerical methods for saddle point systems
2. Block-preconditioning discretized saddle point systems
3. The least-squares commutator (BFBt) preconditioner
4. Numerical methods for advection-diffusion equations
5. The volume of fluid method
6. The level set method and its implementation
7. Gradient augmented level set methods
8. The jet scheme for solving the advection equation
9. Numerical modeling of surface tension

References

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