

Parallel Adaptive Simulation of Processes from Science and Engineering

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Keynote Summary

Numerical simulation has become one of the major topics in Computational Science. To promote modeling and simulation of complex problems new strategies are needed allowing for the solution of large, complex model systems. Crucial issues for such strategies are reliability, efficiency, robustness, usability, and versatility. After discussing the needs of large-scale simulation we point out basic simulation strategies such as adaptivity, parallelism and multigrid solvers. To allow adaptive, parallel computations the load balancing problem for dynamically changing grids has to be solved efficiently by fast heuristics. These strategies are combined in the simulation system UG ("Unstructured Grids") being presented in the following. In the second part of the seminar we show the performance and efficiency of this strategy in various applications. In particular, the application and benefit of parallel adaptive multigrid methods to modelling drug permeation through human skin is shown in detail.