Einladung zum Vortrag

Analysis and Applications of Isogeometric Finite Elements

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We have developed fast implementations of B-spline/NURBS based finite element solvers, written using PETSc. PETSc is frequently used in software packages to leverage its optimized and parallel implementation of solvers, however we also are using PETSc data structures to assemble the linear systems. These structures in PETSC (called DA's) were originally intended for the parallel assembly of linear systems resulting from finite differences. We have reworked this structure for linear systems resulting from isogeometric analysis based on tensor product spline spaces. The result of which is the **PetIGA** framework for solving problems using isogeometric analysis which is scalable and greatly simplified over previous solvers.

This infrastructure has enabled research in the performance of higher continuous spaces. When presenting convergence results, it is common to see plots of a measure of error versus numbers of degrees of freedom. In some sense, these plots link the accuracy of a discretization (error) to the cost (numbers of degrees of freedom). However, this ignores the cost of the linear solver. We studied the cost of solving linear systems resulting from higher continuous finite element spaces when using a direct solver and discovered that higher continuous linear systems can cost up to 2-3 times more time and memory to solve than their C^0 counterparts. We will we discuss similar findings for iterative solvers, while in this case the impact of continuity is less detrimental.

Our infrastructure has also allowed us to develop scalable solvers for a variety of problems. We have chosen to pursue nonlinear time dependent problems, such as:

- Cahn-Hilliard
- Navier-Stokes-Korteweg
- Variational Multiscale for Navier-Stokes
- Diffusive Wave Approximation to Shallow Water Equations

We also have solvers for an assortment of linear problems: Poisson, elasticity, Helmholtz, thin shells, advection-diffusion, and diffusion-reaction. All solvers are written to be inherently parallel and run on anything from a laptop to a super computer such as Shaheen, KAUST's IBM-BlueGeneP supercomputer.

Dienstag, 12. Juni 2012
11:00 Uhr **MW 1237**

Für weitere Informationen: http://www.lnm.mw.tum.de/dates-and-events/events-at-lnm/

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