JOHANNES KEPLER UNIVERSITÄT LINZ
INSTITUT FÜR NUMERISCHE MATHEMATIK
o.Univ.-Prof. Dr. Ulrich Langer

Talk announcement

MSc Christoph Hofer
(Doctoral Program Computational Mathematics)

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Exact and Inexact IETI-DP Solvers for Continuous and Discontinuous Galerkin IgA Equations

In this talk, we construct and investigate fast solvers for large-scale linear systems of algebraic equations arising from isogeometric analysis (IgA) of diffusion problems with heterogeneous diffusion coefficient on multipatch domains. In particular, we investigate the adaption of the Dual-Primal Finite Element Tearing and Interconnecting (FETI-DP) method to IgA, called Dual-Primal IsogEometric Tearing and Interconnecting (IETI-DP) method, [2]. We consider the cases where we have matching and non-matching meshes on the interfaces. In the latter case we use a discontinuous Galerkin (dG) method to couple the different patches. This requires a special extension of the IETI-DP method to the dG-IgA formulation, see [1]. We use ideas from the finite element case in order to formulate the corresponding IETI-DP method, called dG-IETI-DP. We design the dG-IETI-DP method in such a way that it can be seen as a IETI-DP method on an extended discrete interface space. Furthermore, we extend the dG-IETI-DP method to the case of non-matching interfaces due to incorrect segmentation producing gaps and overlaps in the domain decomposition, [4]. We investigate inexact versions utilizing multigrid methods, cf. [3], for the formulation with an energy minimizing primal subspace. These methods are highly suited for parallelization. We investigate the scaling behaviour up to 1024 cores. We present numerical results for complicated two and three dimensional domains. We observe that the condition number κ behaves like $O((1+\log(H/h))^2)$, and is robust with respect to jumping diffusion coefficients and changing mesh-sizes across patch interfaces. We also study the dependence of κ on the underlying polynomial degree p of the NURBS used.