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

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ABSTRACT

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, see [2]. We consider the cases where we have matching and non-matching meshes on the interfaces as well as non-matching interfaces (segmentation crimes). In the latter two cases 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 focus on the parallelization of the method as well as inexact versions utilizing multigrid methods, cf. [3], for the formulation with an energy minimizing primal subspace. We investigate the scaling behaviour up to 1024 cores. Numerical results are presented 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 used NURBS. Moreover, the influence of their smoothness in the interior of the patches on κ and the parallel scalability is investigated.

REFERENCES

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