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Talk announcement

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Towards a p-robust convergence analysis for Isogeometric Tearing and Interconnecting (IETI) methods

Isogeometric Analysis (IgA), as originally proposed, is a spline-based finite element approach with global geometry function. Since more complicated domains cannot be represented by just one such geometry function, the whole domain is usually decomposed into subdomains, in IgA typically called patches, where each of them is represented by its own geometry function.

A standard Galerkin discretization yields a large-scale linear system. For its solution, domain decomposition approaches are the methods of choice. We consider a variant of the FETI-method with a standard scaled Dirichlet preconditioner known as the Isogeometric Analysis Tearing and Interconnecting (IETI) method. We will discuss convergence analysis, focusing on the dependence of the condition number of the preconditioned system on the spline degree p.

Previously, a convergence theory has been provided that is accurate concerning the dependence of the condition number on the grid size. There, an auxiliary problem with p=1 was introduced. The proof uses the fact that the stiffness matrices of the original and the auxiliary problem are spectrally equivalent. The constants in this spectral equivalence are independent of the grid size but grow exponentially in p.

In this presentation, we will see a direct convergence proof, i.e., a convergence proof that is solely based on the spline spaces of interest and that does not use such an auxiliary problem. This allows us to get rid of the exponential dependence in p. We will discuss the dependence of all estimates on p.