Multi-level pre-conditioners for the p-Version of the Finite Element Method

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In this talk, we discretize a uniformly elliptic second order boundary value problem in 2D by the p-version of the finite element method. An inexact Dirichlet-Dirichlet domain decomposition pre-conditioner for the system of linear algebraic equations is investigated. The ingredients of such a pre-conditioner are an pre-conditioner for the Schur complement, an pre-conditioner for the sub-domains and an extension operator operating from the edges of the elements into their interior. Using methods of multi-resolution analysis, we propose a new method in order to compute the extension efficiently. This type of extension is optimal, i.e. the $H^1(\Omega)$-norm of the extended function is bounded by the $H^{0.5}(\partial\Omega)$-norm of the given function. Numerical experiments show the optimal performance of the presented extension.

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