Fast Solvers for hp-FEM Discretized PDE-Constrained Optimization Problems

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In this talk, we investigate the minimization of a quadratic functional

$$J(u, y) = \frac{1}{2} \int_\Omega (y - y_d)^2 dx + \frac{\alpha}{2} \int_\Omega u^2 dx$$

governed the boundary value problem

$$-\triangle y + y = u \quad \in \Omega$$

with some boundary conditions for y. This problem is discretized by hp-finite elements. The main focus of this talk is the development of efficient solution methods for the corresponding system of linear algebraic equations. We consider the solvers:

- a conjugate gradient method in a special inner product, following Schöberl/Zulehner
- the minimal residual method (MINRES)

In both methods, efficient preconditioners for mass and stiffness matrix acclerate the convergence speed of the iterative method. This contribution presents overlapping hp-FEM preconditioners for mass and stiffness matrix.

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