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The Reinvigoration of a Coarse Space *†

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Abstract

A new coarse space for iterative substructuring was introduced by Dryja, Smith, and Widlund over a decade ago [SIAM J. Numer. Anal., 31 (1994), pp.1662-1694]. Similar to the coarse spaces for FETI and Balancing Domain Decomposition methods, the new one could be constructed in an algebraic manner for general unstructured meshes. This coarse space, however, received relatively less attention in the literature and was not used as extensively in iterative solvers. In this talk, we describe how recent interest has given new life to this coarse space. Both overlapping Schwarz and iterative substructuring preconditioners can benefit from the energy-minimizing features of the coarse space. A survey of recent applications will be presented, including theory for subdomains with less regular geometry, almost incompressible elasticity, and problems in H(curl). Use of the coarse space in a production level solver for parallel structural dynamics has shown significant performance and robustness benefits, particularly when addressing problems with a large number of constraint equations.

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