

FROSch - A Parallel Implementation of the GDSW Domain Decomposition Preconditioner in Trilinos

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The FROSch (Fast and Robust Overlapping Schwarz) library, a parallel implementation of the GDSW (Generalized Dryja Smith Widlund) preconditioner, has recently been integrated into Trilinos as part of the package ShyLU. The GDSW preconditioner has been introduced by Dohrmann, Klawonn, and Widlund in 2008 and is a two-level overlapping Schwarz preconditioner with an energy-minimizing coarse space that is inspired by non-overlapping domain decomposition methods, such as FETI-DP and BDDC methods. It is robust for a wide class of problems, e.g., solid or fluid mechanics, and can be constructed in an algebraic way. In particular, the coarse space can be constructed from the fully assembled matrix without an additional coarse triangulation, even for irregular subdomains. However, the preconditioner can benefit from additional information about the problem.

This talk gives an overview of the FROSch code, its features, and user-interface and shows the parallel scalability and robustness of the solver for several problems. In particular, FROSch is applied to scalar elliptic problems, linear elasticity, and nonlinear elasticity in fluid-structure interaction applications and as a monolithic preconditioner for saddle-point problems. Parallel scalability of the code is shown up to a maximum of 64K cores using a direct coarse solver on one core.