

Nonlinear FETI-DP and Quasi-Newton Methods

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Nonlinear FETI-DP (Finite Element Tearing and Interconnecting – Dual-Primal) methods are domain decomposition methods for the solution of nonlinear finite element problems. In the classical Newton-Krylov-Domain-Decomposition approach, the problem of interest is linearized first and then a domain decomposition method, such as Balancing Domain Decomposition (BDD), Balancing Domain Decomposition by Constraints (BDDC), Finite Element Tearing and Interconnecting (FETI-1), FETI-DP or overlapping Schwarz methods, is used for the solution of the Newton system. In nonlinear domain decomposition method, this order is interchanged. In a first step a nonlinear domain decomposition is built, this provides nonlinear subproblems and, possibly, a nonlinear coarse problem. Afterwards the nonlinear decomposition is linearized.

Quasi-Newton methods compute a solution of the discretized problem by using quadratic subproblems. These subproblems are obtained by updating some initial approximation of the Hessian with the gradient of the objective. This provides superlinear convergence and, by the Sherman-Morrison-Woodbury formula, a fast computation of the quasi-Newton update for the current iterate.,

This talk discusses the combination of Nonlinear FETI-DP and quasi-Newton methods.

References:

- [1] <https://doi.org/10.1007/978-0-387-40065-5>
- [2] <https://doi.org/10.1137/130920563>
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