

Inexact FETI-DP Methods

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Abstract

In this talk, a special family of nonoverlapping domain decomposition methods is considered, the dual-primal FETI (FETI-DP) methods. Here, a decomposition into nonoverlapping subdomains is used. The term dual-primal refers to the idea of enforcing some (primal) continuity constraints across the interface between the subregions throughout the iteration as in primal methods, while other constraints are enforced by using dual variables, i.e., Lagrange multipliers. The selection of the primal constraints is important in order to obtain invertible subdomain problems but they also provide a coarse problem which is needed for numerical and parallel scalability. To obtain scalable methods, in two dimensions, it is sufficient to choose continuity across the interface at selected nodes on the interface boundaries but in three dimensions more elaborate choices, e.g., averages over subdomain edges are needed. In standard FETI-DP methods, the interface variables are eliminated directly which corresponds to the direct solution of the coarse problem and the subdomain problems. For very large problems of tens or even hundreds of millions of variables, the number of primal constraints may become very large which leads to a bottleneck when direct solvers are used for the coarse problem. Similarly, if very large subdomains are used, inexact solvers instead of direct ones would be preferable. In this talk, we introduce inexact FETI-DP methods which allow for the inexact solution of the coarse problem as well as for the subdomain problems while still maintaining a scalable method.

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