A FETI-DP PRECONDITIONER FOR MORTAR METHODS IN THREE DIMENSIONS[*]

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Abstract. A FETI-DP method is developed for three dimensional elliptic problems with mortar discretization. Mortar matching conditions are considered as the continuity constraints in the FETI-DP formulation. Among them, face average constraints are selected as primal constraints in our FETI-DP formulation to achieve an algorithm as scalable as two dimensional problems. A Neumann-Dirichlet preconditioner is used in the FETI-DP formulation and it gives the condition number bound

$$C \max_{i=1,\cdots,N} \left\{ (1 + \log{(H_i/h_i)})^2 \right\},$$

where H_i and h_i are sizes of domain and mesh for each subdomain, respectively. When the subdomain with the smaller coefficient is chosen as the nonmortar side across the interface, the constant C is independent of H_i, h_i, and the coefficients of the elliptic problem. The proposed algorithm can be applied to two dimensional elliptic problems with edge average constraints only as primal constraints and it can be generalized to geometrically non-conforming subdomain partitions. Numerical results present the performance of the algorithm for elliptic problems with discontinuous coefficients.

Key words. FETI-DP, non-matching grids, mortar methods, preconditioner

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