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MULTILEVEL PRECONDITIONERS FOR LAGRANGE MULTIPLIERS IN DOMAIN IMBEDDING*

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Abstract. A domain imbedding method where the Dirichlet boundary conditions are treated using boundary supported Lagrange multipliers is considered. The discretization leads to a saddle-point problem which is solved iteratively by using either the PMINRES method with a block-diagonal preconditioner or the PCG method in an Uzawa type approach. In both cases, the preconditioning of the Schur complement related to Lagrange multipliers is based on a special sparse implementation of BPX/MDS method. The developed preconditioning technique is well-suited even for three-dimensional problems in domains with complicated shapes. Several numerical experiments for two-dimensional and three-dimensional problems demonstrate the efficiency and the applicability of the proposed method.

Key words. domain imbedding method, Lagrange multipliers, multilevel methods, preconditioning

AMS subject classifications. 65F10, 65N22, 65N55

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