DOMAIN DECOMPOSITION METHODS:
Formulations of Iterative Substructuring Methods
without Recourse to Lagrange Multipliers

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ABSTRACT

In a recent paper [1] we introduced a new approach to iterative substructuring methods that, without recourse to Lagrange multipliers, yields positive definite preconditioned formulations of the Neumann-Neumann, FETI and other related types. As it is well-known standard formulations are based on the use of Lagrange multipliers [2].

In this talk it is explained how such multipliers-free formulations are done, both at the functions level and at the matrix level. In the latter case a systematic theory of piecewise-defined matrices is applied.

The new results are an outgrowth of the theory of partial differential equations in 'discontinuous piecewise-defined functions' [3]. The Lagrange multipliers are not required because our work is developed in an environment of piecewise-defined functions, or piecewise defined matrices, in which the functions-discontinuities are not an anomaly that need being corrected.

Attractive features of the new formulations are their generality, directness and simplicity. In particular they are easier to implement; indeed, the new methods permit deriving the matrix equations in a very explicit manner, so that the programming effort required for its implementation is very much reduced [4].

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