Domain Decomposition Method for Strongly Mixed Boundary Value Problems for Poisson Equations

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Abstract: Recently we proposed a domain decomposition method (DDM) for solving Dirichlet problem for second order elliptic equation, where differently from other DDMs, the value of normal derivative on interface is updated from iteration to iteration. In this paper we develop the method for solving mixed boundary value problems (BVPs), where boundary conditions are of different types on different sides of a rectangle and the transmission of boundary conditions occurs not only in vertices but also in an inner point of a side of the rectangle. Such mixed problems often arise in mechanics and physics. We reduce these problems to sequences of weakly mixed problems for Poisson equation in the sense that on each side of the rectangle there is given only type of boundary conditions, and for the later ones there are available many efficient algorithms. The convergence of the method is proved and numerical experiments confirm the efficiency of the method.

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