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The Fat Boundary Method: Convergence and Error Analysis

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Abstract: The *Fat Boundary Method* (FBM), introduced by B. Maury, is a fictitious domain type method for solving partial differential equations in a domain with holes $W \cup \bar{B}$ – where B is a collection of smooth open subsets (the holes) – that consists in splitting the initial problem into two parts to be coupled via Schwartz type iterations: the solution, with a fictitious domain approach, of a problem set in the whole domain W , for which fast solvers can be used, and the solution of a collection of independent problems defined on narrow strips around the connected components of B , that can be performed fully in parallel.

We will analyze the FBM in the framework of a finite element discretization and prove convergence of the Schwartz iterations and an almost optimal error estimate for the resulting discrete solution.

[1] B. Maury, *A Fat Boundary Method for the Poisson Equation in a Domain with Holes*, J. of Sci. Computing, 16 (2001), no. 3, pp. 319–339

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