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Finite element analysis of a coupling eigenvalue problem on overlapping domains. (English)
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A nonstandard elliptic eigenvalue problem on a rectangular domain, consisting of two overlapping rectangles, where the interaction is expressed through an integral coupling condition is considered. Finite element (FE) discretizations with and without numerical quadrature are derived The error analysis is affected by the nonlocal coupling condition, which requires the introduction and error estimation of a suitably modified Lagrange interpolant on the FE mesh. As a consequence, the resulting error estimates are suboptimal compared to the ones for the classical eigenvalue problems.

Reviewer: Wilhelm Heinrichs (Essen)

MSC:

65N25	Numerical methods for eigenvalue problems for boundary value problems involving PDEs
65N15	Error bounds for boundary value problems involving PDEs
65N30	Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
35P15	Estimates of eigenvalues in context of PDEs

Cited in **3** Documents

Keywords:

eigenvalue problem; nonlocal coupling condition; finite elements; elliptic eigenvalue problem; error analysis

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References:

[1] Ciarlet, P.G., The finite element method for elliptic problems, (1978), North-Holland Amsterdam · Zbl 0445.73043

[2] Gerke, H., Optimal control of soil venting: mathematical modeling and applications, (1999), Birkhäuser Basel · Zbl 0919.73001

[3] Mehmeti, F.A.; Nicaise, S., Nonlinear interaction problems, Nonlinear anal. theory meth. appl., 20, 1, 27-61, (1993) · Zbl 0817.35035

[4] Nečas, J., LES Méthodes directes en théorie des équtions elliptiques, (1967), Masson Paris

[5] Raviart, P.A.; Thomas, J.M., Introduction à l'analyse numérique des équations aux Dérivées partielles, 2ième tirage, (1993), Masson Paris

[6] Vanmaele, M.; Van Keer, R., An operator method for a numerical quadrature finite element approximation for a class of second-order elliptic eigenvalue problems in composite structures, RAIRO - math. mod. num. anal., 29, 3, 339-365, (1995) · Zbl 0836.65113

[7] Zeníšek, A., Nonlinear elliptic and evolution problems and their finite element approximations, (1990), Academic Press New York · Zbl 0731.65090