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Schur complement domain decomposition algorithms for spectral methods. (English)

Zbl 0687.65106

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Schur complement domain decomposition algorithms for spectral methods are considered. Both the Funaro-Maday-Patera weak C^1 matching on the interfaces [cf. *A. T. Patera, J. Comput. Phys.* 54, 468-488 (1984; Zbl 0535.76035)] and *S. A. Orszag's* exact C^1 matching [ibid. 37, 70-92 (1980; Zbl 0476.65078)] are considered. Numerical results show that the condition number of the Schur complement system is of order $O(n^2)$. It is shown how this can be improved to nearly $O(1)$ by a boundary probe preconditioned.

Reviewer: [W.Heinrichs](#)

MSC:

- [65N35](#) Spectral, collocation and related methods for boundary value problems involving PDEs
- [65F10](#) Iterative numerical methods for linear systems
- [35J05](#) Laplace operator, Helmholtz equation (reduced wave equation), Poisson equation
- [65Y05](#) Parallel numerical computation
- [65F35](#) Numerical computation of matrix norms, conditioning, scaling

Cited in 4 Documents

Keywords:

preconditioning; Poisson equation; parallel algorithms; preconditioned conjugate gradient; Schur complement domain decomposition algorithms; spectral methods; condition number

Full Text: [DOI](#)

References:

- [1] Björstad, P.E.; Widlund, O.B., Iterative methods for the solution of elliptic problems on regions partitioned into substructures, *SIAM J. numer. anal.*, 23, 1097-1120, (1986) · [Zbl 0615.65113](#)
- [2] Chan, T.F., Analysis of preconditioners for domain decomposition, *SIAM J. numer. anal.*, 24, 382-390, (1987) · [Zbl 0625.65100](#)
- [3] Chan, T.F.; Goovaerts, D., Domain decomposition methods with inexact subdomain solves, ()
- [4] Chan, T.F.; Resasco, D., A survey of preconditioners for domain decomposition, ()
- [5] Concus, P.; Golub, G.H.; O'Leary, D.; Bunch, J.; Rose, D., A generalized conjugate gradient method for the numerical solution of elliptic partial differential equations., *Sparse matrix computation*, 309-322, (1976), New York
- [6] Curtis, A.R.; Powell, M.J.D.; Reid, J.K., On the estimation sparse Jacobian matrices, *J. inst. math. appl.*, 13, 117-119, (1974) · [Zbl 0273.65036](#)
- [7] Dryja, M., A capacitance matrix method for Dirichlet problem on polygonal region, *Numer. math.*, 39, 51-64, (1982) · [Zbl 0478.65062](#)
- [8] Funaro, D.; Quarteroni, A.; Zanolì, P., An iterative procedure with interface relaxation for domain decomposition methods, ()
- [9] Golub, G.H.; Mayers, D., The use of pre-conditioning over irregular regions, () · [Zbl 0564.65067](#)
- [10] Gottlieb, D.; Hussaini, M.Y.; Orszag, S.A., Theory and applications of spectral methods, ()
- [11] Orszag, S.A., Spectral methods for problems in complex geometries, *J. comput. phys.*, 37, 70-92, (1980) · [Zbl 0476.65078](#)
- [12] Patera, A.T., A spectral element method for fluid dynamics: laminar flow in channel expansions, *J. comput. phys.*, 54, 468-488, (1984) · [Zbl 0535.76035](#)
- [13] Quarteroni, A.; Sacchi Landriani, G., Domain decomposition preconditioners for the spectral collocation method, () · [Zbl 0675.65116](#)
- [14] Schwarz, H.A., Über eine grenzübergang durch alternirendes verfahren, (), 133-143

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