DOMAIN DECOMPOSITION AND PRECONDITIONING METHOD FOR LINEAR PARTIAL DIFFERENTIAL EQUATIONS SYSTEMS

Owe Axelsson

Department of Mathematics, University of Nijmegen,
Postbus 9010 NL-6500 GL Nijmegen, Netherlands,
e-mail : axelsson@sci.kun.nl

Lahcen Laayouni

Department of Mathematics, University of Nijmegen,
Postbus 9010 NL-6500 GL Nijmegen, Netherlands,
e-mail : laayouni@sci.kun.nl

Keywords: Domain decomposition, multilevel preconditioners, partial differential systems, hierarchical basis, optimal order preconditioners

Abstract

This talk concerns a preconditioning method of AMLI type [3] for the solution of linear partial differential equations systems. An earlier idea of this study was proposed in [2] for scalar case. In this work we want to make some further extension of the study done in [1], in particular we propose to give a robust preconditioning iterative schemes using domain decomposition methods. Based on a special approximation of the Schur complement blocks corresponding to the new nodes after a proper step of static condensation at every discretization level we propose a robust preconditioner. The robustness is in the sense that the condition number is independent of both problem and discretization parameters.

References

[1] O. Axelsson, L. Laayouni and S. Margenov, On multilevel preconditioners which are optimal with respect to both problem and discretization parameters, in progress.

[2] O. Axelsson and S. Margenov, An optimal order multilevel preconditioner with respect to problem and discretization parameters, Proceedings of Second International Workshop on Scientific Computing and Applications, Kananaskis, Canada, June 2000, to appear

[3] O. Axelsson and P. S. Vassilevski, Algebraic multilevel preconditioning methods, I, Numer. Math., 56 (1989), 157 -177.