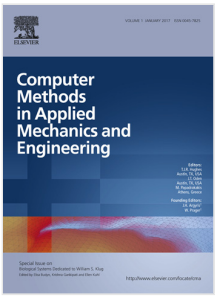
Accepted Manuscript



Multigrid methods for convection-diffusion problems discretized by a monotone scheme

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PII: S0045-7825(16)30382-6
DOI: http://dx.doi.org/10.1016/j.cma.2017.01.004
Reference: CMA 11289

To appear in: *Comput. Methods Appl. Mech. Engrg.*

Received date: 14 May 2016
Revised date: 30 November 2016
Accepted date: 3 January 2017

Please cite this article as: N.R. Bayramov, J.K. Kraus, Multigrid methods for convection-diffusion problems discretized by a monotone scheme, *Comput. Methods Appl. Mech. Engrg.* (2017), http://dx.doi.org/10.1016/j.cma.2017.01.004

Multigrid methods for convection-diffusion problems discretized by a monotone scheme

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Abstract

We study multigrid (MG) methods for the solution of systems of linear algebraic equations obtained from a stable discretization of convection-diffusion problems by an exponential fitting scheme. The latter ensures the stability of the simplest possible coarse grid operators obtained from Galerkin projections based on graph matching. Linear and nonlinear MG preconditioners are defined in the framework of algebraic multilevel iteration. The option of using polynomial smoothers is investigated in context of nonsymmetric problems and a systematic performance comparison is presented for various algorithms on a representative set of two- and three-dimensional test problems.

Keywords: convection-diffusion equation, exponential fitting scheme, AMLI-cycle multigrid, variable-step preconditioning, polynomial smoother, Faber polynomials

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