Parallel performance of an iterative solver based on the Golub-Kahan bidiagonalization

Carola Kruse[1], Masha Sosonkina[2], Mario Arioli[3], Nicolas Tardieu[4], Ulrich Ruede[1,5]
[1]Cerfacs, 42 Avenue Gaspard Coriolis, Toulouse, France
[2]Department of Modeling, Simulation and Visualization Engineering,
Old Dominion University, Norfolk, USA
[3]Libera Universita Mediterranea, Strada Statale, Casamassima, Italy
[4]IMSIA, UMR 9219 EDF-CNRS-CEA-ENSTA, Université Paris Saclay,
Palaiseau Cedex, France
[5]Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany
`kruse@cerfacs.fr`

We present an iterative method based on a generalization of the Golub-Kahan bidiagonalization for solving indefinite matrices with a 2x2 block structure. We focus in particular on our recent implementation of the algorithm using the parallel numerical library PETSc. Since the algorithm is a nested solver, we investigate different choices for parallel inner solvers and show its strong scalability for a Poiseuille flow test problem. The algorithm is found to be highly scalable for large sparse problems.

Keywords: Golub-Kahan bidiagonalization, iterative solver, PETSc, parallel performance.