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BLOCK PRECONDITIONING FOR CHALLENGING MULTIPHYSICS SYSTEMS

MATTHIAS MAYR[*], JOHN N. SHADID[†], HAIM WAISMAN[⊗] AND SUVRANU DE[∅]

[*] University of the Bundeswehr Munich, Germany
matthias.mayr@unibw.de, www.unibw.de/imcs-en/

[†] Sandia National Laboratories, Albuquerque, NM
University of New Mexico, Albuquerque NM
jnshadi@sandia.gov

[⊗] Columbia University, New York City, NY
hw2286@columbia.edu

[∅] Rensselaer Polytechnic Institute, Troy, NY
des@rpi.edu

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ABSTRACT

Multiphysics systems are often characterized by the highly nonlinear interaction of a myriad of complex, multiple time- and length-scale physical mechanisms. All of them impact the conditioning of the resulting blocked system of linearized equations to be solved within an iterative nonlinear solver. For the robust, efficient, and scalable solution of the most challenging systems in science and engineering applications, physics-informed approximate block factorization preconditioners are required.

This minisymposium addresses the most important and active research topics for block preconditioning for challenging multiphysics systems, including

- physics-based block preconditioning
- multi-level preconditioners
- approximate block factorizations
- preconditioned iterative solvers for multiphysics systems
- the interplay of physics, algorithms, implementation, and hardware aspects

for applications in solid mechanics, e.g. contact and fracture problems, fluid-structure interaction and volume-coupled problems, e.g. reactive flows, magneto-hydrodynamics, or plasma physics applications, among others.

The aim of this minisymposium is to provide a forum for researchers to discuss promising developments and advances in block preconditioning for large sparse linear systems of equations arising from multiphysics and multiscale discretizations.