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Title:

Block Preconditioners for an Incompressible Magnetohydrodynamics Problem

Preconditioning

Author

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We focus on preconditioning techniques for a mixed finite element discretization of an incompressible magnetohydrodynamics (MHD) problem. Upon discretization and linearization, a 4×4 non-symmetric block-structured linear system needs to be (repetitively) solved. One of the principal challenges is the presence of a skew-symmetric term that couples the fluid velocity with the electric field. Our proposed technique exploits the block structure of the underlying linear system, utilizing and combining effective preconditioners for the mixed Maxwell and Navier-Stokes subproblems. The preconditioner is based on dual and primal Schur complement approximations to yield a scalable solution method. Large scale numerical results demonstrate the effectiveness of our approach.

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