Multipreconditioned GMRES for Shifted Systems

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An implementation of GMRES with multiple preconditioners (MPGMRES) is proposed for solving shifted linear systems with shift-and-invert preconditioners. With this type of preconditioner, the Krylov subspace can be built without requiring the matrix-vector product with the shifted matrix. Furthermore, the multipreconditioned search space is shown to grow only linearly with the number of preconditioners. This allows for a more efficient implementation of the algorithm. The proposed implementation is tested on shifted systems that arise in computational hydrology and the evaluation of different matrix functions. The numerical results indicate the effectiveness of the proposed approach. Joint work with Tania Bakhos, Peter K. Kitanidis, Scott Ladenheim, and Arvind K. Saibaba.

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