On some strategies for Jacobian-free preconditioning of sequences of nonsymmetric linear systems

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An appealing property of Newton-Krylov methods for the solution of nonlinear algebraic systems is that they lend themselves well for matrix-free implementations where multiplication with the Jacobian is replaced by a difference approximation. However, this makes the computation of robust LU-type preconditioners for the Jacobians significantly more challenging. In this talk we address various matrix-free preconditioning techniques for the special case where we wish to *update* preconditioners from previous linear systems.