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BICGSTAB(L) FOR LINEAR EQUATIONS INVOLVING UNSYMMETRIC MATRICES WITH COMPLEX SPECTRUM*

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Abstract. For a number of linear systems of equations arising from realistic problems, using the Bi-CGSTAB algorithm of van der Vorst [17] to solve these equations is very attractive. Unfortunately, for a large class of equations, where, for instance, Bi-CG performs well, the convergence of Bi-CGSTAB stagnates. This was observed specifically in case of discretized advection dominated PDE's. The stagnation is due to the fact that for this type of equations the matrix has almost pure imaginary eigenvalues. With his BiCGStab2 algorithm Gutknecht [5] attempted to avoid this stagnation. Here, we generalize the Bi-CGSTAB algorithm further, and overcome some shortcomings of BiCGStab2. In some sense, the new algorithm combines GMRES(l) and Bi-CG and profits from both.

Key words. Bi-conjugate gradients, non-symmetric linear systems, CGS, Bi-CGSTAB, iterative solvers, GMRES, Krylov subspace.

AMS subject classification. 65F10.

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