A method for the solution of nearly-Hermitian linear systems

M. Embree, J. A. Sifuentes, K. Soodhalter, D. B. Szyld, and F. Xue
Department of Mathematics
Temple University
Philadelphia, USA
szyl@temple.edu

We consider the solution of $n \times n$ linear systems in which the skew-Hermitian part of the coefficient matrix is of low rank ($s \ll n$). Matrices of this form include discretizations of integral equations derived from wave scattering applications (Lippmann-Schwinger operators) as well as path following methods. Such a linear system can be interpreted as a Schur complement of a larger $(n+s) \times (n+s)$ system, and we can apply the Sherman-Morrison-Woodbury identity to solve this larger system with great savings in storage and computational effort. Most of the effort is spent solving $s$ Hermitian systems. We present numerical results demonstrating the competitiveness of the new method.