OPTIMAL COMPLEX SIM–SOR FOR INTERSECTING LINES SPECTRA

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Abstract

We consider the application of Semi-Iterative methods (SIM) to the standard Successive Over-Relaxation (SOR) method, with complex relaxation parameter ω, under the assumptions that the associated Jacobi matrix J is "weakly cyclic of index 2" and "consistently ordered" and that the spectrum $\sigma(J)$ belongs to one or several line segments of the form $[-\mu, \mu]$, $\mu \in \mathcal{C}$, with $1 \notin [-\mu, \mu]$. By using results from approximation and from potential theory in the complex domain, we provide the region of optimal choice of $\omega \in \mathcal{C}$, along with the exact region of convergence, for the combination SIM-SOR. Our work was motivated by recent results of M. Eiermann and R.S. Varga (Linear Algebra Appl., **182**, pp. 257–277 (1993), and pp. 47–73 in *Numerical Linear Algebra*, L. Reichel et al (eds), de Gruyter, 1993).