Mathematics > Numerical Analysis

A subspace shift technique for solving close-to-critical nonsymmetric algebraic Riccati equations

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The worst situation in computing the minimal nonnegative solution X_* of a nonsymmetric algebraic Riccati equation $\mathcal R(X)=0$ associated with an M-matrix occurs when the derivative of $\mathcal R$ at X_* is near to a singular matrix. When the derivative of $\mathcal R$ at X_* is singular, the problem is ill-conditioned and the convergence of the algorithms based on matrix iterations is slow; however, there exist some techniques to remove the singularity and restore well-conditioning and fast convergence. This phenomenon is partially shown also in the close-to-critical case, but the techniques used for the null recurrent case cannot be applied to this setting. We present a new method to accelerate the convergence and amend the conditioning in close-to-critical cases. The numerical experiments confirm the efficiency of the new method.

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