

Solving a Matrix Polynomial by Newton's Method

Seo, Jong Hyeon and Kim, Hyun-Min

ABSTRACT

One of well known and much studied nonlinear matrix equations is the matrix polynomial which has the form $M(X) = A_0X^m + A_1X^{m-1} + \dots + A_m$, where A_0, A_1, \dots, A_m and X are $n \times n$ complex matrices. Newton's method was introduced a useful tool for solving the equation $M(X) = 0$. Here, we suggest an improved approach to solve each Newton step and consider how to incorporate line searches into Newton's method for solving the matrix polynomial. Finally, we give some numerical experiments to show that line searches reduce the number of iterations for convergence.