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Minimization of the Pseudospectral Abscissa of a Matrix Polynomial with Applications to Damping Optimization

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We consider a matrix polynomial dependent on several parameters. The minimization of its spectral abscissa, the real part of its rightmost eigenvalue, over the parameters is motivated by stability considerations on the associated higher-order linear control system, yet comes with computational challenges especially due to the non-Lipschitz nature of the spectral abscissa. We instead propose approaches to minimize the pseudospectral abscissa, the real part of the rightmost eigenvalue attainable over all perturbations of the matrix polynomial of prescribed norm. The efficiency and applicability of the proposed approaches are illustrated on several large matrix polynomials depending on parameters, especially those arising from damping optimization.

Authors: MENGI, Emre (Koc University);   Prof. MEHRMANN, Volker

Presenter: MENGI, Emre (Koc University)

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