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Pseudospectra of matrix functions

We study the spectrum of matrix functions  $F(\lambda) = \sum_{i=1}^m A_i p_i(\lambda)$ , where  $A_i \in \mathbb{C}^{n \times n}$ , and  $p_i : \mathbb{C} \rightarrow \mathbb{C}$  are entire functions. A complex number  $\lambda \in \mathbb{C}$  is called an *eigenvalue* of  $F$  if  $\det(F) = 0$ . We are interested in the behaviour of the eigenvalues of  $F$  under perturbation of the coefficient matrices  $A_i$ .

For this we discuss *pseudospectra*  $\Lambda_{\epsilonpsilon}(F)$  of matrix functions  $F$ . We derive a computable formula for  $\Lambda_{\epsilonpsilon}(F)$  and present applications to the stability analysis of higher-order differential equations and delay-differential equations. We also discuss the consequences of structured perturbations of the matrices  $A_i$ .

The presentation is based on joint work with K. Green and W. Michiels.