Relative perturbation theory for definite matrix pairs and hyperbolic quadratic eigenvalue problem

Ninoslav Truhar
Department of Mathematics, University of Osijek,
Osijek, Croatia, ntruhar@mathos.hr

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Abstract

We will present relative perturbation theory for a definite matrix pairs $A - \lambda B$, where both A and B are nonsingular Hermitian matrices, respectively. Obtained results show that upper bounds for eigenvalues as well as for eigenvectors of perturbed pair $\widetilde{A} - \lambda\widetilde{B}$, are similar to the bounds for the diagonalizable eigenvalue problem.

We will also show, how the obtained results can be applied on the quadratic hyperbolic eigenvalue problem $(\lambda^2 M+\lambda C+K)x = 0$, where M and K are Hermitian positive definite, and for C holds $(x^*Cx)^2 > 4(x^*Mx)(x^*Kx)$ for all $x \in \mathbf{C}^n$, $x \neq 0$.