PERTURBATION OF PURELY IMAGINARY EIGENVALUES
OF HAMILTONIAN MATRICES UNDER STRUCTURED
PERTURBATIONS

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Abstract. The perturbation theory for purely imaginary eigenvalues of Hamiltonian matrices
under Hamiltonian and non-Hamiltonian perturbations is discussed. It is shown that there is a
substantial difference in the behavior under these perturbations. The perturbation of real eigenvalues
of real skew-Hamiltonian matrices under structured perturbations is discussed as well and these
results are used to analyze the properties of the URV method for computing the eigenvalues of
Hamiltonian matrices.

Key words. Hamiltonian matrix, Skew-Hamiltonian matrix, Symplectic matrix, Structured
perturbation, Invariant subspace, Purely imaginary eigenvalues, Passive system, Robust control,
Gyroscopic system.

AMS subject classifications. 15A18, 15A57, 65F15, 65F35.

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