

# An extended Hessenberg form for Hamiltonian matrices

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## Abstract

A unitary symplectic similarity transformation for a special class of Hamiltonian matrices to extended Hamiltonian Hessenberg form is presented. Whereas the classical Hessenberg form links to Krylov subspaces, the extended Hessenberg form links to extended Krylov subspaces. The presented algorithm generalizes thus the classic reduction to Hamiltonian Hessenberg form and offers more freedom in the choice of Hamiltonian condensed forms, to be used within an extended Hamiltonian QR algorithm. Theoretical results identifying the structure of the extended Hamiltonian Hessenberg form and proofs of uniqueness of the reduction process are included. Numerical experiments confirm the validity of the approach.

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