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Short title: Complementarity forms of theorems of Lyapunov and Stein over quaternions.

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Review text:

The text is suitable for graduate students and researchers in complex (and quaternion) matrix analysis. Complimentary complex matrix theorems of Lyapunov and Stein [Seethrama Gowda M, Parthasarathy T, Lin. Alg. and Its Appl., Vol. 320, pp 131–144, 2000] are extended to quaternion matrix analysis.

First complex (and quaternion) square matrices, Hermitian matrices, positive semidefinite matrices, their eigenvalues (e.v.) (and multiplicities), adjoint matrices, positive stability and spectral radius are defined. The vanishing of a matrix for a negative semidefinite commutator with its linear transformation $L(X)$ is called P_1 property (P if $XL = LX$). An inner product is defined using a trace of the adjoint matrix product. Hermitian matrices lead to a Euclidean space. The relation of semidefinite linear complementarity (SDLC) to the P property is explained [Karamardian S, J. Opt. Th. and Appl. 19(2), pp 227–232, 1976].

The two main theorems on quaternion square matrices first relate positive stability, P_1 , P properties and SDLC solutions with positive definite matrix properties. The second main theorem treats quaternion matrices with adjoint matrix e.v. (standard e.v.) in the open unit disk of the complex plane and generalizes Stein's theorem (and its complimentary form) over quaternions.

Comments to the MR Editors: I am sorry to be so late with this submission.