Electronic Journal of Linear Algebra ISSN 1081-3810
A publication of the International Linear Algebra Society
Volume 18, pp. 801-820, December 2009

ELA
http://math.technion.ac.il/iic/ela

THE EIGENVALUE DISTRIBUTION OF SCHUR COMPLEMENTS OF NONSTRICTLY DIAGONALLY DOMINANT MATRICES AND GENERAL $H-$MATRICES[*]

CHENG-YI ZHANG[†], SHUANGHUA LUO[‡], FENGMIN XU[§], AND CHENGXIAN XU[¶]

Abstract. The paper studies the eigenvalue distribution of Schur complements of some special matrices, including nonstrictly diagonally dominant matrices and general $H-$matrices. Zhang, Xu, and Li [Theorem 4.1, The eigenvalue distribution on Schur complements of H-matrices. *Linear Algebra Appl.,* 422:250–264, 2007] gave a condition for an $n\times n$ diagonally dominant matrix A to have $|J_{R_+}(A)|$ eigenvalues with positive real part and $|J_{R_-}(A)|$ eigenvalues with negative real part, where $|J_{R_+}(A)|$ ($|J_{R_-}(A)|$) denotes the number of diagonal entries of A with positive (negative) real part. This condition is applied to establish some results about the eigenvalue distribution for the Schur complements of nonstrictly diagonally dominant matrices and general $H-$matrices with complex diagonal entries. Several conditions on the $n \times n$ matrix A and the subset $\alpha \subseteq N = \{1, 2, \cdots, n\}$ are presented so that the Schur complement A/α of A has $|J_{R_+}(A)| - |J^{\alpha}_{R_+}(A)|$ eigenvalues with positive real part and $|J_{R_-}(A)| - |J^{\alpha}_{R_-}(A)|$ eigenvalues with negative real part, where $|J^{\alpha}_{R_+}(A)|$ ($|J^{\alpha}_{R_-}(A)|$) denotes the number of diagonal entries of the principal submatrix $A(\alpha)$ of A with positive (negative) real part.

Key words. Eigenvalue distribution, Schur complements, (Generalized) Diagonally dominant matrices, General $H-$matrices.

AMS subject classifications. 15A15, 15A18.

[*]Received by the editors March 5, 2009. Accepted for publication November 25, 2009. Handling Editor: Joao Filipe Queiro.

[†]Department of Mathematics of School of Science, Xi'an Jiaotong University, Xi'an, Shaanxi 710049, P.R. China (chengyizhang@yahoo.com.cn).

[‡]Department of Mathematics of School of Science, Lanzhou University of Technology, Lanzhou, 730050, P.R. China (iwantflyluo@163.com).

[§]School of Electronic and Information Engineering and Institute for Information and System Science, Xi'an Jiaotong University, Xi'an, 710049, P.R. China (fengminxu@mail.xjtu.edu.cn). The work of this author was supported by the National Natural Science Foundations of China (70531030), the National 973 Program of China (2007CB311002) and the open fund of Key Laboratory of Precision Navigation and Timing Technology, Chinese Academy of Sciences.

[¶]SKLMSE Lab. and Department of Mathematics of School of Science, Xi'an Jiaotong University, Xi'an, 710049, P.R. China (mxxu@mail.xjtu.edu.cn). The work of this author was supported by the National Natural Science Foundation of China (10671152).