Electronic Journal of Linear Algebra ISSN 1081-3810
A publication of the International Linear Algebra Society
Volume 10, pp. 31-45, February 2003

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

A CONTRIBUTION TO COLLATZ'S EIGENVALUE INCLUSION THEOREM FOR NONNEGATIVE IRREDUCIBLE MATRICES*

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Abstract. The matrix calculus is widely applied in various branches of mathematics and control system engineering. In this paper properties of real matrices with nonnegative elements are studied. The classical Collatz theorem is unique and immediately applicable to estimating the spectral radius of nonnegative irreducible matrices. The coherence property is identified. Then the Perron–Frobenius theorem and Collatz's theorem are used to formulate the coherence property more precisely. It is shown how dual variation principles can be used for the iterative calculation of $x = X[A]$ and the spectral radius of A, where x is any positive n-vector, $X[A]$ is the corresponding positive eigenvector, and A is an $n \times n$ nonnegative irreducible real matrix.

Key words. Collatz's theorem, Coherent property, Eigenvalues.

AMS subject classifications. 15A48, 15A18, 15A42.

*Received by the editors on 3 May 2000. Accepted for publication on 11 January 2003. Handling Editor: Hans Schneider.

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