Electronic Transactions on Numerical Analysis.
Volume 26, pp. 1-33, 2007.

ISSN 1068-9613.

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A STRUCTURED STAIRCASE ALGORITHM FOR SKEW-SYMMETRIC/SYMMETRIC PENCILS*

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Abstract. We present structure preserving algorithms for the numerical computation of structured staircase forms of skew-symmetric/symmetric matrix pencils along with the Kronecker indices of the associated skew-symmetric/symmetric Kronecker-like canonical form. These methods allow deflation of the singular structure and deflation of infinite eigenvalues with index greater than one. Two algorithms are proposed: one for general skew-symmetric/symmetric pencils and one for pencils in which the skew-symmetric matrix is a direct sum of 0 and $\mathcal{J} = \begin{bmatrix} 0 & I \\ -I & 0 \end{bmatrix}$. We show how to use the structured staircase form to solve boundary value problems arising in control applications and present numerical examples.

Key words. structured staircase form, linear-quadratic control, H_∞ control, structured Kronecker canonical form, skew-symmetric/symmetric pencil, skew-Hamiltonian/Hamiltonian pencil

AMS subject classifications. 65F15, 15A21, 93B40

* Received April 11, 2005. Accepted for publication June 27, 2006. Recommended by P. Van Dooren.

† Department of Mathematics, University of Kansas, Lawrence, KS 44045, USA. This author was partially supported by National Science Foundation grants 0098150, 0112375, 9977352 and by *Deutsche Forschungsgemeinschaft* through the DFG Research Center MATHEON *Mathematics for key technologies* in Berlin.

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