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STRUCTURE PRESERVING ALGORITHMS FOR PERPLECTIC EIGENPROBLEMS*

D. STEVEN MACKEY†, NILOUFER MACKEY‡, AND DANIEL M. DUNLAVY§

Abstract. Structured real canonical forms for matrices in $\mathbb{R}^{n\times n}$ that are symmetric or skew-symmetric about the anti-diagonal as well as the main diagonal are presented, and Jacobi algorithms for solving the complete eigenproblem for three of these four classes of matrices are developed. Based on the direct solution of 4×4 subproblems constructed via quaternions, the algorithms calculate structured orthogonal bases for the invariant subspaces of the associated matrix. In addition to preserving structure, these methods are inherently parallelizable, numerically stable, and show asymptotic quadratic convergence.

Key words. Canonical form, Eigenvalues, Eigenvectors, Jacobi method, Double structure preserving, Symmetric, Persymmetric, Skew-symmetric, Perskew-symmetric, Centrosymmetric, Perplectic, Quaternion, Tensor product, Lie algebra, Jordan algebra, Bilinear form.

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†School of Mathematics, University of Manchester, Sackville Street, Manchester, M60 1QD, UK (smackey@ma.man.ac.uk).

‡Department of Mathematics, Western Michigan University, Kalamazoo, MI 49008, USA (nil.mackey@wmich.edu, http://homepages.wmich.edu/~mackey/). This work was supported in part by NSF Grant CCR–9619514, and Engineering and Physical Sciences Research Council Visiting Fellowship GR/515563.

§Applied Mathematics and Scientific Computation Program, University of Maryland, College Park, MD USA (ddunlavy@cs.umd.edu, http://www.math.umd.edu/~ddunlavy).