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Editorial

Advances in Matrices, Finite and Infinite, with Applications 2014

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Matrix theory either finite or infinite has increasingly proved to be a key element in many different modern scientific fields, far beyond its natural mathematical environment. This volume exposes the growing sophistication of the techniques involving matrices as well as some of many applications.

Classification of modular Lie algebras has recently been the subject of many authors. In particular, alteration techniques play a major role. Natural filtration for Cartan types has been shown to be invariant in infinite dimensional case. In this issue, Q. Mu in "*Natural filtrations of infinite-dimensional modular contact superalgebras*" establishes that the natural filtration is invariant under automorphisms in the case of Lie algebras. The author uses ad-nilpotent elements techniques.

It is well known that rank of matrix plays an important role in matrix theory and has many applications in other areas. In the paper "*Some results on characterizations of matrix partial orderings*" by H. Wang and J. Xu, five matrix partial orderings defined in $\mathbb{C}^{m\times n}$ are considered and the (left/right- and both sided-) star and sharp partial orderings are characterized by applying rank equalities.

Comparison theorems between the spectral radii of different matrices are useful tools for judging the efficiency of preconditioned. In S.-X. Miao and Y. Cao's paper "*On comparison theorems for splittings of different semimonotone matrices*," the authors gave some comparisons for the spectral radii of matrices arising from proper splittings of different semimonotone matrices.

In the work reported by G. M. L Gladwell et al. in the paper "*A test matrix for an inverse eigenvalue problem*," a simple derivation of a set of explicit expressions is provided for the components of a Jacobi matrix of order $n \times n$. This matrix has the property that its eigenvalues come from the set $\{0, 2, \ldots, 2n - 2\}$ while also satisfying the additional condition that the eigenvalues of the leading principal $(n - 1) \times (n - 1)$ submatrix belong to the set $\{1, 3, \ldots, 2n - 3\}$. As an application, an explicit solution for a spring-mass inverse problem is presented.

The combined matrix of a nonsingular matrix A is defined as $C(A) = A \circ (A^{-1})^T$, where $\circ$ means the Hadamard product. Combined matrices appear in the chemical literature, where they represent the relative gain array. Furthermore, the study of combined matrices yields the relation between the eigenvalues and diagonal entries of a diagonalizable matrix. It is well known that the row and column sums of a combined matrix are always equal to one, and, consequently, if $C(A)$ is entrywise nonnegative, then it has interesting properties and applications since it is a doubly stochastic matrix. In the paper "*Nonnegative combined matrices*" of R. Bru et al., the matrices which have nonnegative combined matrices are investigated. In particular, combined matrices of different classes of matrices, such as totally positive and totally negative matrices, and also when A is totally nonnegative and totally nonpositive, are studied.

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