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Editorial

Linear and Nonlinear Matrix Equations

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Matrix equations have practical applications in many areas such as computational mathematics, biology, electricity, dynamic programming, stochastic filtering, statistics, solid mechanics, and control and system theory. In recent years, a large number of papers have studied several linear and nonlinear matrix equations.

This special issue is devoted to publishing the latest and significant results on linear and nonlinear matrix equations on all their aspects. Its goals are to highlight recent advances and developments on the many facets, techniques, and results of linear and nonlinear matrix equations.

The topics included in this special issue are iterative solutions of matrix equations, closed-form solutions and solvability of matrix equations, quaternion matrix equations, and perturbation analysis of matrix equations.

We received nineteen papers in the interdisciplinary research fields. This special issue includes seven high quality-peer-reviewed articles.

In the following, we briefly review each of the papers that are published.

In the paper entitled "*Norm-constrained least-squares solutions to the matrix equation $AXB = C$*," A. Xu and B. Z. Peng propose an iterative method to compute the least-squares solutions of the matrix equation $AXB = C$ over the norm inequality constraint.

In the paper entitled "*Iterative solution to a system of matrix equations*," Y. Lin and Q. W. Wang introduce an efficient iterative algorithm to solve the system of linear matrix equations $A_1X_1B_1 + A_2X_2B_2 = E$ and $C_1X_1D_1 + C_2X_2D_2 = F$, with real matrices X_1 and X_2. By this iterative algorithm, the solvability of the system can be determined automatically.

In the paper entitled "*existence and uniqueness of the positive definite solution for the matrix equation$X = Q + A^*(\widehat{X} - C)^{-1}A$*," D. Gao proves that the matrix equation $X = Q + A^*(\widehat{X} - C)^{-1}A$ has a unique positive definite solution via variable replacement and fixed point theorem. Also the basic fixed point iteration for the matrix equation is given.

In the paper entitled "*Perturbation analysis of the nonlinear matrix equation $X - \sum_{i=1}^{m} A_i^* X^{p_i} A_i = Q$*," J. Li derives two perturbation bounds and the backward error of an approximate solution to the nonlinear matrix equation $X - \sum_{i=1}^{m} A_i^* X^{p_i} A_i = Q$ with $0 < p_i < 1$. Also explicit expressions of the condition number for the matrix equation are obtained.

In the paper entitled "*A Note on the* T*-Stein Matrix Equation*," C. Y. Chiang proposes a novel approach to the necessary and sufficient conditions for the unique solvability of the solution X of the T-Stein matrix equation for square coefficient matrices in terms of the analysis of the spectra $\sigma(A^{\mathrm{T}}B)$.

In the paper entitled "*On the low-rank approximation arising in the generalized karhunen-loeve transform*," X. F. Duan et al. consider the low-rank approximation problem arising in the generalized Karhunen-Loeve transform. A sufficient condition for the existence of a solution is derived, and the analytical expression of the solution is given.

In the paper entitled "*The hermitian R-conjugate generalized Procrustes problem*," H. X. Chang et al. consider the Hermitian R-conjugate generalized Procrustes problem to find Hermitian R-conjugate matrix X such that