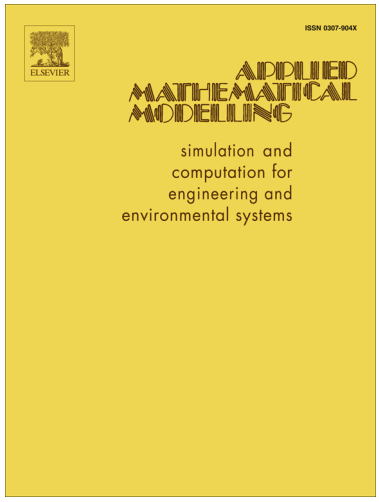

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The matrix iterative methods for solving a class of generalized coupled Sylvester-conjugate linear matrix equations

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Abstract: The conjugate gradients-squared(CGS) method [41] has been considered as an efficient variant of the bi-conjugate gradient (BCG) method. In [44], a more smoothly converging variant of the BCG method which keeps the attractive convergence rate of the CGS method was investigated for the solution of certain classes of nonsymmetric linear systems, so-called bi-conjugate gradient stabilized (Bi-CGSTAB) method. In this paper, we will combine these interesting methods for solving the generalized coupled Sylvester-conjugate matrix equations $A_1XB_1 + C_1\overline{Y}D_1 = E, A_2\overline{X}B_2 + C_2YD_2 = F$ after performing suitable transformation by the properties of Kronecker product and vec operator. Some numerical experiments demonstrate that the introduced iterative methods are more efficient than the existing methods.

Key words: generalized coupled Sylvester-conjugate matrix equation, matrix iterative method, convergence analysis, numerical experiments.

AMS subject classification: 15A24; 65F10; 65F30.

1 Introduction

The linear matrix equations are fundamental and significant in the fields of applied mathematics and control theory [1, 16, 17, 53]. Many research works are related to varieties of systems of matrix equations [2–4, 6–10, 14, 18, 19, 21, 25–28, 32, 36, 38, 40, 42, 43, 45–50, 56, 57, 59, 61]. Specially, the Sylvester matrix equations have been intensively investigated by some researchers

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