On MHSS Iteration Method for the Space Fractional Coupled Nonlinear Schrödinger Equations

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After discretized by an implicit conservative difference scheme, the space fractional coupled nonlinear Schrödinger equations results in a complex linear equations where the coefficient matrix is the imaginary unite times the identity matrix and a symmetric diagonal-plus-Toeplitz matrix. A class of modified Hermitian and skew-Hermitian iteration methods and the corresponding preconditioners are proposed and well studied for the solution of the discretized linear system without complex arithmetics. Theoretical analyses show that the iteration methods are unconditionally convergent, as well as the bounds of the spectral distributions of the preconditioned matrices.Numerical example are presented to illustrate the efficiency and further confirm our analyses.

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