Title: The Higher Accuracy Fourth-Order IADE Algorithm

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Abstract: This study develops the novel fourth-order iterative alternating decomposition explicit (IADE)method ofMitchell and Fairweather (IADEMF4) algorithmfor the solution of the one-dimensional linear heat equationwithDirichlet boundary conditions.The higherorder finite difference scheme is developed by representing the spatial derivative in the heat equation with the fourth-order finite difference Crank-Nicolson approximation.This leads to the formation of pentadiagonalmatrices in the systems of linear equations. Thealgorithmalso employs the higher accuracy of the Mitchell and Fairweather variant.Despite the scheme's higher computational complexity, experimental results show that it is not only capable of enhancing the accuracy of the original correspondingmethod of second-order (IADEMF2), but its solutions are also in very much agreement with the exact solutions. Besides, it is unconditionally stable and has proven to be convergent. The IADEMF4 is also found to be more accurate, more efficient, and has better rate of convergence than the benchmarked fourth-order classical iterative methods, namely, the Jacobi (JAC4), the Gauss-Seidel (GS4), and the successive over-relaxation (SOR4) methods.