A compact finite difference scheme for convection-diffusion-reaction equation

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In this talk, to solve one-dimensional convection-diffusion-reaction equations, we proposed a compact finite difference scheme based on Green’s function representation. To discretize the temporal domain, we use the Crank-Nicolson method (C-N). For solving ODE system derived by C-N, the proposed compact finite difference scheme, requiring only a linear matrix solver for a tridiagonal matrix system, adopted the trapezoidal rule to approximate Green function’s representation. The convergence orders of the proposed scheme in both time and space are covered. To demonstrate the accuracy and efficiency of the proposed scheme, several experiments are conducted. The results show that the proposed method not only has the convergence orders we expected, but also is superior to the other schemes.

References