Li, Zhonghui; Chen, Xiangyong; Qiu, Jianlong; Xia, Tongshui

A novel Chebyshev-collocation spectral method for solving the transport equation. (English)

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Summary: In this paper, we employ an efficient numerical method to solve transport equations with given boundary and initial conditions. By the weighted-orthogonal Chebyshev polynomials, we design the corresponding basis functions for spatial variables, which guarantee the stiff matrix is sparse, for the spectral collocation methods. Combining with direct algebraic algorithms for the sparse discretized formula, we solve the equivalent scheme to get the numerical solutions with high accuracy. This collocation methods can be used to solve other kinds of models with limited computational costs, especially for the nonlinear partial differential equations. Some numerical results are listed to illustrate the high accuracy of this numerical method.

MSC:

65D15 Algorithms for approximation of functions
65L99 Numerical methods for ordinary differential equations
34A45 Theoretical approximation of solutions to ordinary differential equations

Keywords:

Chebyshev polynomial; transport equation; spectral collocation method; weighted orthogonality

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References:


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