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An extension of the spectral tau method for numerical solution of multi-order fractional differential equations with convergence analysis. (English) Zbl 1207.65108

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Summary: The main purpose of this paper is to provide an efficient numerical approach for the fractional differential equations (FDEs) based on a spectral Tau method. An extension of the operational approach of the Tau method with the orthogonal polynomial bases is proposed to convert FDEs to its matrix-vector multiplication representation. The fractional derivatives are described in the Caputo sense. The spectral rate of convergence for the proposed method is established in the $\mathcal{L}^2$ norm. We tested our procedure on several examples and observed that the obtained numerical results confirm the theoretical prediction of the exponential rate of convergence.

MSC:

65L99 Numerical methods for ordinary differential equations
34A08 Fractional ordinary differential equations and fractional differential inclusions
45J05 Integro-ordinary differential equations

Cited in **31** Documents

Keywords:

fractional differential equations; Caputo derivative; tau method; operational approach to the tau method

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