Hosseini, S. Gh.; Mohammadi, F.
A new operational matrix of derivative for Chebyshev wavelets and its applications in solving ordinary differential equations with non analytic solution. (English) Zbl 1250.65091

The authors propose to use a Galerkin method based on Chebyshev wavelets for the solution of initial or boundary value problems in ordinary differential equations. To realize this approach, the differentiation matrix representing higher derivatives is derived. The claim that this yields an efficient integrator for problems with non-analytic solutions is illustrated by several numerical examples, where the coefficients and solutions may display singularities, but not substantiated by comparisons with established standard discretization methods.

Reviewer: Othmar Koch (Baden)

MSC:
65L05 Numerical methods for initial value problems involving ordinary differential equations
65L10 Numerical solution of boundary value problems involving ordinary differential equations
65L60 Finite element, Rayleigh-Ritz, Galerkin and collocation methods for ordinary differential equations
65T60 Numerical methods for wavelets
34A34 Nonlinear ordinary differential equations and systems
34B15 Nonlinear boundary value problems for ordinary differential equations
65D25 Numerical differentiation

Keywords:
Chebyshev wavelets; shifted Chebyshev polynomials; differentiation matrix; Galerkin method; initial or boundary value problems; numerical examples

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