

Paternoster, B.

A phase-fitted collocation-based Runge-Kutta-Nyström method. (English) Zbl 0979.65063
Appl. Numer. Math. 35, No. 4, 339-355 (2000).

The author is concerned with the particular class of second order ordinary differential systems

$$y''(t) = f(t, y(t))$$

with $y(t), f(t, y(t)) \in \mathbb{R}^n$, initial conditions

$$y(t_0) = y_0, \quad y'(t_0) = y'_0$$

and having a periodic or oscillatory solution. She derives collocation based Runge-Kutta-Nyström methods with symmetric points and identifies a three-stage method that is exact in phase for the linear case. The linear stability of the method is investigated by means of a symbolic-numerical package developed by *M. Cafaro* and the author and available at the URL: <http://www.netlib.org/ode/symbolic>. As a consequence of its stability properties, the method is suitable for the numerical solution of systems which exhibit a moderate stiffness. Numerical experiments are reported at the end of the paper.

Reviewer: [Riccardo Fazio \(Messina\)](#)

MSC:

- 65L06** Multistep, Runge-Kutta and extrapolation methods for ordinary differential equations
- 65L60** Finite element, Rayleigh-Ritz, Galerkin and collocation methods for ordinary differential equations
- 65L05** Numerical methods for initial value problems involving ordinary differential equations
- 34A34** Nonlinear ordinary differential equations and systems

Cited in 14 Documents

Keywords:

numerical experiments; Runge-Kutta-Nyström methods; systems; periodic or oscillatory solution; collocation; linear stability

Software:

[rknstabint](#)

Full Text: [DOI](#)

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