

General class of explicit pseudo two-step RKN methods on parallel computers

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Abstract: The aim of this paper is to investigate a general class of explicit pseudo two-step Runge-Kutta-Nystrom methods (RKN methods) of arbitrarily high order for nonstiff problems for systems of special second-order differential equations $y''(t) = f(y(t))$. Order and stability considerations show that we can obtain for any given p , a stable p^{th} -order explicit pseudo two-step RKN method requiring $p - 2$ right-hand side evaluations per step of which each evaluation can be obtained in parallel. Consequently, on a multiprocessor computer, only one sequential right-hand side evaluation per step is required. By a few widely-used test problems, we show the superiority of the methods considered in this paper over both sequential and parallel methods available in the literature.

Index Keywords: Convergence of numerical methods; Differential equations; Runge Kutta methods; Explicit pseudo two-step Runge-Kutta-Nystrom (RKN) method; Second order differential equations; Parallel processing systems

Year: 1999

Source title: Computers and Mathematics with Applications

Volume: 38

Issue: 5

Page : 17-30

Cited by: 3

Link: [Scorpus Link](#)

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Publisher: Elsevier Science Ltd, Exeter, United Kingdom

ISSN: 8981221

CODEN: CMAPD

DOI: 10.1016/S0898-1221(99)00211-4

Language of Original Document: English

Abbreviated Source Title: Computers and Mathematics with Applications

Document Type: Article

Source: Scopus

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