

# Parallel diagonally implicit Runge-Kutta-Nystr m methods

van der Houwen P.J., Sommeijer B.P., Cong N.h.

Centre for Mathematics and Computer Science, P.O. Box 4079, 1009 AB Amsterdam, Netherlands; Faculty of Mathematics, Mechanics and Informatics, University of Hanoi, Thuong dinh, Dong Da, Hanoi, Vietnam

**Abstract:** In this paper, we study diagonally implicit iteration methods for solving implicit Runge-Kutta-Nystr m (RKN) methods on parallel computers. These iteration methods are such that in each step, the iterated method can be regarded as a diagonally implicit Runge-Kutta-Nystr m method (DIRKN method). The number of stages of this DIRKN method depends on the number of iterations and may vary from step to step. Since a large number of these stages can be computed in parallel, and since the total number of stages can be kept small by a suitable choice of the parameters in the iteration process, the resulting variable-stage DIRKN methods are efficient on parallel computers. By using implicit Runge-Kutta Nystr m methods with high stage order, the phenomenon of order reduction exhibited in many problems with large Lipschitz constants does not deteriorate the accuracy of these variable-stage DIRKN methods. By a number of numerical experiments the superiority of the parallel iterated RKN methods over sequential DIRKN methods from the literature is demonstrated. ?? 1992.

**Author Keywords:** Diagonally implicit Runge-Kutta-Nystr m methods; parallelism; predictor-corrector methods

**Index Keywords:** Mathematical Models; DIRKN Methods; High Stage Order; Lipschitz Constants; Parallel Computers; RKN Methods; Runge-Kutta-Nystroem Methods; Mathematical Techniques

Year: 1992

Source title: Applied Numerical Mathematics

Volume: 9

Issue: 2

Page : 111-131

Cited by: 4

Link: [Scopus Link](#)

Correspondence Address: van der Houwen, P.J.; Centre for Mathematics and Computer Science, P.O. Box 4079, 1009 AB Amsterdam, Netherlands

ISSN: 1689274

CODEN: ANMAE

Language of Original Document: English

Abbreviated Source Title: Applied Numerical Mathematics

Document Type: Article

Source: Scopus

Authors with affiliations:

1. van der Houwen, P.J., Centre for Mathematics and Computer Science, P.O. Box 4079, 1009 AB Amsterdam, Netherlands

2. Sommeijer, B.P., Centre for Mathematics and Computer Science, P.O. Box 4079, 1009 AB Amsterdam, Netherlands
3. Cong, N.h., Faculty of Mathematics, Mechanics and Informatics, University of Hanoi, Thuong dinh, Dong Da, Hanoi, Vietnam