Parallel-iterated pseudo two-step Runge-Kutta-Nystr??m methods for nonstiff second-order IVPs

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Abstract: The aim of this paper is to consider parallel iteration schemes for a general class of pseudo two-step Runge-Kutta-Nystr??m (RKN) methods of arbitrary high order for solving nonstiff initial-value problems $y??(t) = f(y(t))$, $y(t_0) = y_0$, $y?(t_0) = y_0$ on parallel computers. Starting with an s-stage pseudo two-step RKN method of order p* with w implicit stages, we apply the highly parallel PC iteration process in $P(EC)^m E$ mode. The resulting PIPTRKN method (parallel-iterated pseudo two-step RKN method) uses an optimal number of processors equal to w ?? p*/2. By a number of numerical experiments, we show the superiority of the PIPTRKN methods proposed in this paper over both sequential and parallel methods available in the literature.

Author Keywords: Parallelism; PC methods; RKN methods

Index Keywords: Initial value problems; Iterative methods; Parallel processing systems; Problem solving; Parallel computers; Runge-Kutta-Nystrom methods; Runge Kutta methods

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