

A class of explicit parallel two-step Runge-Kutta methods

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Abstract: The aim of the present paper is to construct a class of two-step Runge-Kutta methods of arbitrarily high order for application to parallel computers. Starting with an s -stage implicit two-step Runge-Kutta method of order p with $k = p/2$ implicit stages, we apply the highly parallel predictor-corrector iteration process in $P(EC)^mE$ mode. In this way, we obtain an explicit two-step Runge-Kutta method that has order p for all m and that requires $k(m + 1)$ right-hand side evaluations per step of which each k evaluation can be computed in parallel. By a number of numerical experiments we show the superiority of the parallel predictor-corrector methods proposed here over parallel methods available in the literature.

Author Keywords: Parallelism; Predictor-corrector methods; Runge-Kutta methods

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