

# Improving Rates of Convergence of Iterative Schemes for Implicit Runge-Kutta Methods

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## Abstract

Various iterative schemes have been proposed to solve the non-linear equations arising in the implementation of implicit Runge-Kutta methods. In one scheme, when applied to an  $s$ -stage Runge-Kutta method, each step of the iteration still requires  $s$  function evaluations but consists of  $r(>s)$  sub-steps. Improved convergence rate was obtained for the case  $r = s + 1$  only. This scheme is investigated here for the case  $r = ks$ ,  $k = 2, 3, \dots$ , and superlinear convergence is obtained in the limit  $k \rightarrow \infty$ . Some results are obtained for Gauss methods and numerical results are given. (© 2004 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim)