Two-derivative Runge-Kutta methods for differential equations

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Abstract

Two-derivative Runge-Kutta (TDRK) methods are a special case of multi-derivative Runge-Kutta methods first studied by Kastlunger and Wanner [1, 2]. These methods incorporate derivatives of order higher than the first in their formulation but we consider only the first and second derivatives.

In this talk we first present our study of both explicit [3] and implicit TDRK methods on stiff ODE problems. We then extend the applications of these TDRK methods to various partial differential equations [4]. In particular, we show how a 2-stage implicit TDRK method of order 4 and stage order 4 can be adapted to solve diffusion equations more efficiently than the popular Crank-Nicolson method.

References

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