

Hybrid methods for direct integration of special third Order ordinary differential equations

ABSTRACT

In this paper we present a new class of direct numerical integrators of hybrid type for special third order ordinary differential equations (ODEs), $y'''=f(x,y)$; namely, hybrid methods for solving third order ODEs directly (HMTD). Using the theory of B-series, order of convergence of the HMTD methods is investigated. The main result of the paper is a theorem that generates algebraic order conditions of the methods that are analogous to those of twostep hybrid method. A three-stage explicit HMTD is constructed. Results from numerical experiment suggest the superiority of the new method over several existing methods considered in the paper.

Keyword: Hybrid method; Three-step method; B-series; Order conditions; Third order ordinary differential equations; Numerical integrator