

Composite group of explicit Runge-Kutta methods

ABSTRACT

In this paper, the composite groups of Runge-Kutta (RK) method are proposed. The composite group of RK method of third and second order, RK3(2) and fourth and third order RK4(3) based on classical Runge-Kutta method are derived. The proposed methods are two-step in nature and have less number of function evaluations compared to the existing Runge-Kutta method. The order conditions up to order four are obtained using rooted trees and composite rule introduced by J. C Butcher. The stability regions of RK3(2) and RK4(3) methods are presented and initial value problems of first order ordinary differential equations are carried out. Numerical results are compared with existing Runge-Kutta method.

Keyword: Composite groups; Runge-Kutta methods