ABSOLUTE STABILITY OF RUNGE-KUTTA METHOD

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Abstract

The Runge-Kutta method is a popular method for solving initial value problem. It is most accurate and stable method. It arise when Leonhard Euler have made improvements on Euler method to produce Improved Euler method. Then Runge realized this method which is similar method with the second order Runge-Kutta method. A few years later in 1989 Runge acquired Fourth Order of Runge Kutta method and afterwards, it is developed by Heun(1900) and Kutta (1901). Fourth Order Runge-Kutta method intends to increase accuracy to get better approximated solution. This means that the aim of this method is to achieve higher accuracy and to find explicit method of higher order. In this section, we discuss the formulation of method, concept of convergence, stability, consistency for RK4 method. In spite of the fact that Runge Kutta methods are all explicit, implicit Runge Kutta method is also observed. It has the same idea of Euler method. Euler method is the first order accurate; in addition it requires only a single evaluation of $f(t_n, y_n)$ to obtain y_{n+1} from y_n. In contrast, Runge Kutta method has higher accuracy. It re-evaluates the function f at two consecutive points (t_n, y_n) and (t_{n+1}, y_{n+1}). It requires four evaluations per step. Due to this, Runge-Kutta method is quite accurate, and it has faster rates of convergence.

Keywords: *absolute stability, initial value problem, approximate solution*