

ZMATH 2013c.00842

Prentice, J. S. C.

Error in Runge-Kutta methods.

Int. J. Math. Educ. Sci. Technol. 44, No. 3, 434-442 (2013).

Summary: The approximation error in Runge-Kutta (RK) methods applied to scalar problems is studied by means of a master error equation. This equation captures the relationship between local and global errors, and describes the propagation of global error in the RK integration process. Upper bounds on the global error, including the effect of round-off error, initial error and variable stepsize, are derived, and the behaviour of the error under iteration is discussed. The error in stiff differential equations, given certain conditions on the stability function, is correlated with stable/unstable behaviour. The working of local error control via local extrapolation is described and, for the sake of generality, the error for a system of differential equations is also considered.

Classification: N45 N25

Keywords: local error; global error; round-off error; Runge-Kutta

doi:10.1080/0020739X.2012.714492