

On the preservation of Lyapunov functions by Runge–Kutta methods

M. Calvo, P. Laburta, J. I. Montijano, L. Rández

IUMA

Dpto. de Matemática Aplicada

Universidad de Zaragoza, 50009 Zaragoza, Spain

Abstract

In this paper we consider ordinary differential equations with a known Lyapunov function. We study the use of Runge-Kutta methods provided with a continuous extension and a projection technique to preserve any given Lyapunov function. This approach extends previous work of Grimm and Quispel (BIT 45, 2005), allowing the use of Runge–Kutta methods for which the associated quadrature formula does not need to have positive coefficients, such as the well known Dormand and Prince 5(4) pair.