QMC methods for the solution of differential equations with mutiple delayed arguments

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1 Abstract

We apply the Runge-Kutta (Quasi-) Monte Carlo methods of Stengle [6, 7], Lécot, Coulibaly and Koudiraty [4, 1, 3] to delay differential equation with multiple retarded arguments

$$y'(t) = f\left(t, y(t), y(t-\tau_1(t)), \ldots, y(t-\tau_k(t))\right), \quad t \geq t_0, k \geq 1,$$

thus extending our previous result of one retarded argument [2]. The RKQMC methods are combined with the Hermite interpolation method (e.g. [5]) to interpolate the retarded values from the already calculated solution. For heavily oscillating delay differential equations, this method can reduce the error considerably, and even delay instabilities in the numerical solution by some orders of magnitude.

References

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