A class of composite barycentric rational Hermite quadrature method for Volterra integral equations

Seyyed Ahmad Hosseini (Golestan University), Ali Abdi, Kai Hormann

Barycentric rational interpolation offers an elegant approach to avoid a common problem of rational interpolation, namely the occurrence of poles in the interpolation interval, which is undesirable in many situations. More recently, Cirillo and Hormann [1] introduced an iterative approach to the Hermite rational interpolation problem. The main theme of this talk is to introduced quadrature rules based on barycentric rational Hermite interpolation. To this end, a barycentric rational Hermite quadrature, and a composite version of that will be introduced. Then, the proposed composite quadrature formula will be utilized to construct a direct method for solving Volterra integral equations (VIEs)

$$y(t) = g(t) + \int_{t_0}^{t} k(t, s, y(s))\,\mathrm{d}s, \qquad t \in I = [t_0, T], \tag{1}$$

where $g\colon I \to \mathbb{R}^D$ and $k\colon S \times \mathbb{R}^D \to \mathbb{R}^D$ are given functions, D stands for the dimension of the system, and $S = \{(t, s) : t_0 \le s \le t \le T\}$. To show the efficiency of the proposed method in solving VIEs and to validate the theoretical results, some numerical verifications will be presented.

Keywords: Linear barycentric rational interpolation, Hermite interpolation, Quadrature, Volterra integral equations.

References

1. Cirillo, E., Hormann, K.: An iterative approach to barycentric rational Hermite interpolation. Numer. Math. **140**, 939–962 (2018)

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