

The Numerical Solution of Volterra Integral Equations with Highly Oscillatory Kernels

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Owing to the ill-conditioned nature of Volterra integral equations (VIEs) of the first kind, numerical schemes based on higher-order quadrature formulas or on collocation methods using continuous piecewise polynomials are in general unstable. Thus, one has to look for alternative approximation schemes, such as discontinuous collocation or discontinuous Galerkin methods. In the first part of my talk I present a brief review of recent results on relevant theoretical and computational aspects of these numerical methods.

VIEs with highly oscillatory kernels pose additional computational challenges, not least because their solutions may or may not be highly oscillatory. In the second part of the talk I will describe current work on the numerical solution of such problems, including singularly perturbed Volterra equations with highly oscillatory kernels.