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KERNEL PERTURBATIONS FOR VOLTERRA CONVOLUTION INTEGRAL EQUATIONS

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ABSTRACT. This paper investigates how errors in the kernels of Volterra convolution integral equations affect their solutions. The situation is examined for both first and second kind equations with smooth kernels. Various error estimates are derived through the use of an analogue of the interconversion equation of linear viscoelasticity.

1. Introduction. In the analysis of causal processes, the first and second kind convolution Volterra equations

$$(1)\quad (k*y)(t)=\int_0^t k(t-s)y(s)ds=f(t),\qquad f(0)=0,\ 0\le t\le\infty,$$

and

$$(2)\qquad (\lambda y+K*y)(t)=\lambda y(t)+\int_0^t K(t-s)y(s)ds=F(t),$$
$$0\le t\le\infty,\quad \lambda\neq 0,$$

commonly arise as the appropriate models. In such applications, either the kernel k (K and λ for the second kind form) and the inhomogeneous term (output) f (F) are given with the solution (input) y to be determined or the input y and the output f (F) are given with the kernel k (K, for a given λ for the second kind form) to be determined. Representative examples include, for the first kind equations, the modeling of viscoelastic processes [**7, 11**], exponential forgetting [**4, 21**], hydrological applications (Jakeman and Young in

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