

The Reformulation and Numerical Solution of Certain Nonclassical Initial/Boundary Value Problems

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Executive Editor Emeritus

Mathematical Reviews

American Mathematical Society

Ann Arbor, MI 48103

USA

Several physical phenomena are modeled by initial/boundary value problems for parabolic or hyperbolic partial differential equations which are categorized as *nonclassical*. For example, such problems may involve an integral over the spatial domain of a function of the desired solution and/or its first spatial partial derivative which may appear in boundary conditions and /or the governing differential equation itself. Problems of this type arise in such diverse areas as chemical diffusion, heat conduction, population dynamics, vibration problems, nuclear reaction dynamics and certain biological processes.

In general, nonlocal problems are either not in the form required by widely available general-purpose software packages or the application of such software for their solution would be cumbersome and/or inefficient. In this presentation, we consider several examples of nonclassical problems and show how they may be converted to a form to which existing software or standard numerical procedures may be applied in a straightforward manner.