

A Fictitious Time Integration Method for One-Dimensional Nonhomogeneous Backward Heat Conduction Problems

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Summary

In this study, we propose a new numerical approach for solving the nonhomogeneous backward heat conduction problems (BHCPs). A fictitious time I'' is used to transform the dependent variable $u(x, t)$ into a new one by $(1+I'')u(x, t) =: v(x, t, I'')$, such that the original nonhomogeneous heat conduction equation is written as a new parabolic type partial differential equation in the space of (x, t, I'') . Besides, a fictitious viscous damping coefficient can be employed to strengthen the stability of numerical integration of the discretized equations by utilizing a group preserving scheme. Several numerical instances illustrate that the present algorithm can be used to retrieve the initial data very well. Even under the large noisy final data, the fictitious time integration method is also robust against noise.

