Numerical identification of a time-dependent conductivity coefficient

A. Fraguela*, J. A. Infante†, Á. M. Ramos† & J. M. Rey†

This work deals with the approximation of the solution of the inverse problem of determining the conductivity coefficient, when it depends on time. We asume that temperature is known at some points of the medium and these values can be affected by measurement errors. Such a situation arises, for example, in the context of food technology.

We consider a heat transfer equation with a source term depending on temperature and pressure increase. This equation is completed with appropriate initial and boundary conditions. More precisely,

$$\begin{cases} \varrho C \dfrac{\partial T}{\partial t} - k(t)\Delta T = \alpha p'(t) T & \text{in } \Omega \times (0, t_{\mathrm{f}}) \\ k(t) \dfrac{\partial T}{\partial \vec{n}} = h\,(T_{\mathrm{ref}}(t) - T) & \text{on } \partial\Omega \times (0, t_{\mathrm{f}}), \\ T = T_0 & \text{in } \Omega \times \{0\}. \end{cases}$$

The goal is to solve the inverse problem of determining an approximation of function $k(t)$, assumed some temperature values at the boundary and inside the medium are known and they are affected by the errors caused by the measurement devices.

References

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*Facultad de Ciencias Físico–Matemáticas, Benemérita Universidad Autónoma de Puebla (México). fraguela@fcfm.buap.mx
†Departamento de Matemática Aplicada, Universidad Complutense de Madrid (España). {infante, angel, jrey}@mat.ucm.es