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Coefficient inverse problems with computation realization

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This work is to address the computation issue of coefficient inverse problems in two dimension case with experiment performance. The novel point is to construct bi-quadratic polynomials approximate solutions using Taylor expansion for 2-arguments as in [1] and [2].

Let Ω be an open set in $\mathbf{R}^2$ and $Q = \Omega \times (0, T)$, $\partial\Omega$ be the boundary of Ω. Coefficient inverse problem of hyperbolic model in two dimensions will be considered in $\mathbf{R}^2 \times (0, \infty)$ for $(\mathbf{x}, t)$:

$$\begin{cases} \dfrac{1}{\alpha^2}\dfrac{\partial^2 y(\mathbf{x},t)}{\partial t^2} + \beta\dfrac{\partial y(\mathbf{x},t)}{\partial t} - \dfrac{\partial^2 y(\mathbf{x},t)}{\partial \mathbf{x}^2} + \varrho(\mathbf{x})y(\mathbf{x},t) = -s(\mathbf{x},t), \\ \dfrac{\partial y(\mathbf{x},0)}{\partial \eta} + ky(\mathbf{x},0) = y_0(\mathbf{x}). \end{cases} \tag{1}$$

where $\varrho(\mathbf{x})$ is unknown coefficient, and α, β is constants.

Definition 1 *Given the lateral data* $\dfrac{\partial y(\mathbf{x},0)}{\partial \eta} + ky(\mathbf{x},0) = y_0(\mathbf{x})$ *for sufficiently large* T*, coefficient inverse problems is to find unknown coefficient* $\varrho(\mathbf{x})$ *for system (1) in* Ω *approximately.*

Finally, the laboratory experiments are implemented for comparing the exact unknown coefficients and computed coefficients. The simulation results illustrated the effectiveness and feasibility of the paradigm.

References

[1] Wang Q. F. Global convergent algorithm for parabolic coefficient inverse problems, *Proceeding of Conference on Differential and Difference Equations and Applications*, p. 1109, Florida Institute of Technology, USA, 2005.8.

[2] Wang Q. F. Developed identification of coefficient inverse issue for 2D parabolic model by boundary pointwise observation, *Inverse Problems in Applied Sciences–towards breakthrough*, p. 91, Hokkaido University, Japan, 2006.7.