

Allaberen Ashyralyev, Abdullah Said Erdogan (Fatih University, Istanbul, Turkey)

The Numerical Solution of Parabolic Inverse Problem with an Unknown Source Function

The parabolic inverse problem

$$u_t = u_{xx} - \sigma u + p(t)g(x) + f(t, x), 0 < t < T, 0 < x < 1,$$

$$u(0, x) = \varphi(x), 0 \leq x \leq 1,$$

$$u_x(t, 0) = u_x(t, 1) = 0, 0 \leq t \leq T,$$

$$u(t, x^*) = \xi(t), 0 \leq t \leq T$$

where $(u(t, x), p(t))$ is an unknown pair of functions is considered. Here $f(t, x)$, $\varphi(x)$, $\xi(t)$ and $g(x)$ are given sufficiently smooth functions and $\sigma > 0$. Exact and approximate solutions of this problem are presented. Numerical techniques are developed and algorithms are tested on an example.

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