On well-posedness of source identification elliptic problem with nonlocal boundary conditions

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Abstract: We study the well-posedness of the source identification problem for the two dimensional elliptic differential equation with nonlocal boundary conditions:

$$(1) \quad \begin{cases} -\dfrac{\partial^2 u(y,x)}{\partial y^2} - a(x)\dfrac{\partial^2 u(y,x)}{\partial x^2} + \delta u(y,x) = f(y,x) + p(x), \\[2mm] 0 < y < T, 0 < x < l, \\[2mm] u(0,x) = u(T,x), u_y(0,x) = u_y(T,x), \ u(\lambda,x) = \xi(x), 0 \le x \le l, \\[2mm] u(y,0) = u(y,l), \ \ u_x(y,0) = u_x(y,l), \ \ 0 \le y \le T, \end{cases}$$

where $a(x)$, $\xi(x)$ and $f(y,x)$ are given sufficiently smooth functions and $a(x) > 0,\ 0 < \lambda < T, \delta > 0$ is a sufficiently large number. Assume that all compatibility conditions are satisfied.

Applying operator approaches, the exact estimates for the solution of this problem in Hölder norms are established.

Keywords: Well-posedness, elliptic equations, source identification, exact estimates nonlocal value problem

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