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On Stable Difference Scheme for Identification Elliptic Problem with Integral and Second Kind Boundary Conditions

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Abstract: In $[0,1]\times\Omega$, we consider the first order difference scheme for approximately solution of the following source identification elliptic problem

$$\begin{cases} -v_{tt}(x,t) - \sum\limits_{r=1}^{n}(a_r(x)v_{x_r}(x,t))_{x_r} + \sigma v(x,t) = f(x,t) + p(x), \\ x\in\Omega, t\in(0,T), \\ v(x,0)=\varphi(x),\ v(x,T)=\int\limits_0^T \mu(\lambda)\, v(\lambda,x)\, d\lambda + \psi(x), \\ v(\gamma,x)=\xi(x), x\in\overline{\Omega}\ (0<\gamma<T), \\ \frac{\partial}{\partial\vec{n}}v(x,t) = 0,\ x\in S,\ t\in[0,T] \end{cases} \tag{1}$$

with integral and second kind boundary conditions. Here $\Omega=(0,1)^n$, $S=\partial\Omega$, $\overline{\Omega}=\Omega\cup S$, $a_r,\zeta,\varphi,\psi,\ f$ are given functions, $a_r(x)\geq a>0$ $(\forall x\in\Omega)$.

Stability and coercive stability estimates for solution of difference scheme are described. Finally, test example with computation results is given.

Keywords: Difference scheme, elliptic inverse problem, stability.
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