

Well-posedness of a fourth order of accuracy difference scheme for the Neumann type overdetermined elliptic problem

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Abstract: The papers [1], [2] are devoted to high order difference schemes for inverse problems with Dirichlet type overdetermination. In the paper [3], well-posedness of the Neumann type inverse problem of finding a function u and an element p for the elliptic equation

$$\begin{cases} -u_{tt}(t) + Au(t) = f(t) + pt, 0 < t < 1, \\ u_t(0) = \varphi, u_t(\lambda) = \xi, u_t(1) = \psi, 0 < \lambda < 1. \end{cases}$$

was discussed. In the present work, we present a fourth order of accuracy difference scheme for the solution of this identification problem and establish stability, almost coercive stability and coercive inequalities for the solution of difference problem. In application, we study a fourth order approximation of the inverse problem for multidimensional elliptic equation with Neumann type overdetermination and Dirichlet boundary condition.

Keywords: difference scheme, inverse elliptic problem, stability, almost coercive stability, coercive stability

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