ON THE NUMERICAL SOLUTION OF INVERSE PROBLEMS FOR A TWO-DIMENSIONAL SYSTEM OF NAVIER-STOKES EQUATIONS

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Let $\Omega = \{|y| < 1\} \subset R^2$ be an open bounded domain with boundary $\partial\Omega$, $Q_{yt} = \Omega \times (0,T)$, $\Sigma_{yt} = \partial\Omega \times (0,T)$. The following inverse problem of determining functions $\{w(y,t), P(y,t), f(y)\}$ is considered:

$$\partial_t w - \nu\Delta w = g(t)f(y) - \nabla P, \quad (y,t) \in Q_{yt}, \tag{1}$$

$$\operatorname{div} w = 0, \quad (y,t) \in Q_{yt}, \tag{2}$$

$$w(y,t) = 0, \quad (y,t) \in \Sigma_{yt}, \;\; w(y,0) = 0, \quad y \in \Omega, \tag{3}$$

with overdetermination condition:

$$w(y,T) = w_T(y), \tag{4}$$

where $g(t) = \{g_1(t), g_2(t)\}$ and $w_T(y) = \{w_{T1}(y), w_{T2}(y)\}$ are given functions.

For a biharmonic operator in a circle, a generalized spectral problem has been posed. For the latter, a system of eigenfunctions and eigenvalues is constructed, which is used in the report for the numerical solution of the inverse problem in a circular cylinder with specific numerical data. Graphs illustrating the results of calculations are presented.

Some of our results are published in [1]. The report discusses the development of the obtained results for the nonlinear 2-D system of Navier-Stokes.

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REFERENCES

1. *Jenaliyev M., Ramazanov M., Yergaliyev M.* On the numerical solution of one inverse problem for a two-dimensional system of Navier-Stokes equations // Opuscula Mathematica, vol. 42, no 5, (2022), P. 727–749, https://doi.org/10.7494/OpMath.2022.42.5.727