

Study of the initial boundary value problem for the two-dimensional differential equation with fractional time derivative in the sense of Caputo

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Abstract: An initial boundary value problem for a two-dimensional differential equation with a fractional time derivative in the sense of Caputo is studied. This equation is of great applied importance in modeling flow processes and anomalous dispersion.

The uniqueness and continuous dependence of the solution on the input data in differential form is proved. A computationally effective implicit scheme with weights is proposed. A priori estimates are obtained for the solution of the difference problem under the assumption that a solution exists in the class of sufficiently smooth functions. These estimates imply the uniqueness of the solution and the stability of the scheme with respect to the initial data and the right-hand side of the equation. The convergence of the approximate solution to the solution of the differential problem with the second order both in time and space variables is proved. The results of computational experiments confirming the reliability of theoretical analysis are presented.

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