Numerical solution of Sobolev PDEs.

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The consideration of processes in anisotropic mediums often leads to the equations of Sobolev type

$$A_0 D_t^l u + \sum_{k=0}^{l-1} A_{l-k} D_t^k u = f .$$

Here A_0, $A_1, \ldots A_l$ are linear differential operators on special coordinates. Such mediums are ferromagnetics, dielectrics stratified and rotated liquids, plasma etc. For some new Sobolev equations the existence and uniqueness of a classical solution for main initial-boundary value problems is investigated in this work. The asymptotic of a solution is obtained at large time. The construction of the solution is carried out by the method of dynamic potentials. A question about existence of the solution is reduced to a problem of solvability of some integral equation. The uniqueness of the solution is proved by the energy method. In this work the effective numerical method is offered for initial-boundary value problems for Sobolev equations. This method is based on numerical solution of integral equations, which are obtained by method of dynamic potentials. This numerical solution is constructed on quasi-equidistant grids. It allows to apply Richardson method on embedded grids and to increase efficient accuracy order of numerical method.

Numerical results confirm the effectiveness, high accuracy and suitability of offered method.

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