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Information technology for numerical simulation of convective flows of a viscous incompressible fluid in curvilinear multiply connected domains(Article)

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In this paper we describe a method for the numerical construction of curvilinear structured grids in doubly connected regions and numerical modeling of the convective flow of a non-uniformly heated liquid in a curvilinear coordinate system. The study is absolutely unique and conducted in accordance with modern scientific demands. Based on previous surveys and the latest findings in the study area, it brings the acute question of information technology for the numerical simulation of convective flows of a viscous incompressible fluid in curvilinear multiply connected domains to a significantly new level. The study is complex and attempts to analyze the theme thoroughly, taking into account all factors that may influence the final results. The paper presents a complete required set of multiple graphs, detailed equations and schemes in order to increase visualization of obtained results on a viscous incompressible fluid in curvilinear multiply connected domains and simplify the perception of the results for accurate scientific conclusions and further applied usage. In the numerical construction of curvilinear grids in doubly-connected domains, the implicit scheme and the method of fractional steps are used by the equidistribution method and Godunov-Thompson, and in the numerical realization of the equations of an incompressible fluid, an explicit scheme and a method of fractional steps are used. In the direction of the outer and inner boundaries, a cyclic run is used, and in the direction of the normal, a scalar run is used. Calculations were carried out for different cavity configurations, temperature regimes at the boundary. The graphs of numerical calculations of the temperature and current function are obtained. All this makes the current study an important contribution to the development of theoretical concepts and methodological approaches to the use of new information technologies in hydrodynamic studies that takes into account the specific features of the subject area, as well as the development, adaptation and approbation of tools in the process of modeling of natural and technogenic objects. 