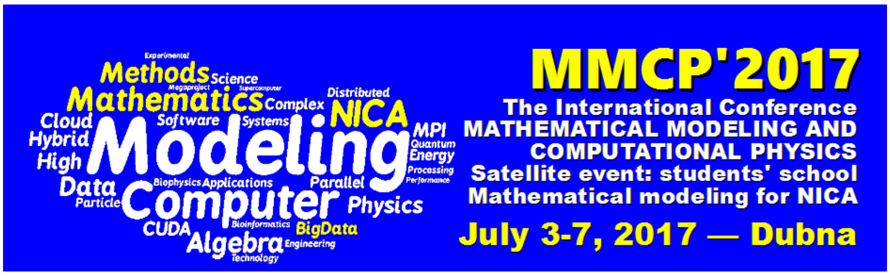

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Interpolation environment of tensor mathematics at corpuscular stage of computational experiment in hydrodynamics

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Stages of direct computational experiments in hydrodynamics based on tensor mathematics tools are represented by conditionally independent mathematical models for calculations separation in accordance with physical processes [1]. Continual stage of numerical modeling is constructed on a small time interval in a stationary grid space. Here coordination of continuity conditions and energy conservation is carried out. Then, at the subsequent corpuscular stage of the computational experiment, kinematic parameters of mass centers and surface stresses at the boundaries of the grid cells are used in modeling of free unsteady motions of volume cells that considered as independent particles. These particles can be subject to vortex and discontinuous interactions, when restructuring of free boundaries and internal rheological states has place.
Transition from one stage to another is provided by interpolation operations of tensor mathematics [2]. Such interpolation environment formalizes use of physical laws for mechanics of continuous media modeling, provides control of rheological state and conditions for existence of discontinuous solutions: rigid and free boundaries, vortex layers, their turbulent or empirical generalizations. In the paper formalized numerical objects with description of minimum necessary computational operations of hydromechanics are presented. They include algorithms for synthesis of polarized corpuscles in grid cells, functional operations for the subsequent reassessment of the state of physical fields with the possibility of refinement or extrapolation of numerical solutions in instability zones, near high-gradient fronts, vortex layers and cavitation surfaces.
Numerical structures and related arithmetic-logical operations of object-oriented programming in C ++ are used as a tool.
Practical examples of application of the proposed approach on several specific problems are given with a discussion of the general and differences with the existing modeling methods.
Short biography note
References

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