



Katedra matematiky

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Lattice Boltzmann Method - a new chapter in CFD

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The Lattice Boltzmann Method emerged as an improved version of cellular automata and is actively developed and improved over recent years. The workhorse of the method is based on the kinetic theory of fluids what gives us many interesting and useful aspects and tools. This alternative numerical method was successfully used in simulation of various problems in CFD, heat transfer, combustion, turbulence modeling etc. Main advantage of the method is its ability to handle a complex geometry with a little computing effort compared to the other classical mesh-based methods like FDM, FEM and FVM. Construction of the method allows to divide the algorithm to two parts: collision and streaming, where collision is nonlinear but local operation and streaming is nonlocal but linear operation, this property ensure the ideal parallelization (e.g. using MPI and/or CUDA frameworks) capability of the numerical scheme. Evolution of the Lattice Boltzmann Method with different collisional operators of the scheme will be presented together with solution of stability issues, incorporation of turbulence models and parallel CUDA version of algorithm. Application of the LBM to the 2D/3D isothermal and nonisothermal flow problems will be presented with focus on the complex geometry cases.