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Titel des Beitrags:
Non-reflecting inflow-outflow boundary conditions for lattice Boltzmann methods using an intrinsically adapted acoustic impedance by separation of sound pressure levels

Abstract:
The lattice Boltzmann method, being a weakly compressible method for solving the Navier Stokes equations, seems to be well suited for simulation of aeroacoustics [1]. This application requires an acoustical free field boundary condition, possibly implemented by a nonreflective boundary. Apart from this issue, the lattice Boltzmann method is known to suffer from spurious pressure waves, usually evolving from poor initialization. These spurious pressure waves would naturally leave the simulation domain when hitting a nonreflective boundary. Unfortunately, the development of nonreflective boundary conditions for the lattice Boltzmann method has proven to be difficult. Current approaches are using sponge layers, low-pass filtering or, most promising, solution of one-dimensional Euler equations at the boundary [2]. However, the latter suffers from flow non-normal to the boundary surface, showing reflective behavior especially in corners of the intersecting boundary surfaces. Here we present a different approach. The sound pressure level is detected via low-pass filtering. The flow through the boundary is split up into a hydrostatic part and a part emerging from the pressure wave $\rho_s$. The well known impedance condition for nonreflection arising from the wave equation

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