Topology optimization of unsteady flow problems using the lattice Boltzmann method - DTU Orbit (13/12/2018)

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This article demonstrates and discusses topology optimization for unsteady incompressible fluid flows. The fluid flows are simulated using the lattice Boltzmann method, and a partial bounceback model is implemented to model the transition between fluid and solid phases in the optimization problems. The optimization problem is solved with a gradient based method, and the design sensitivities are computed by solving the discrete adjoint problem. For moderate Reynolds number flows, it is demonstrated that topology optimization can successfully account for unsteady effects such as vortex shedding and time-varying boundary conditions. Such effects are relevant in several engineering applications, i.e. fluid pumps and control valves.

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