LB methods for modeling coupled transport problems

Manfred Krafczyk, Benjamin Ahrenholz, Sören Freudiger, Sebastian Geller, Jannis Linxweiler, Sonja Uphoff, Martin Schönherr

iRMB, TU Braunschweig, Germany
kraft@irmb.tu-bs.de

The simulation of coupled problems remains one of the big challenges in computational fluid mechanics. This is not only due to the fact that the corresponding model equations for the related disciplines (structural mechanics, fluid mechanics, radiation, aeroacoustics or thermodynamics to name a few) are structurally different, but also operate on different time and space scales.

In our talk we motivate the use of Lattice-Boltzmann models for coupled problems and present examples of thermal turbulent flow driven by radiation, Fluid-Structure-interaction with elastic solids and large deformations and give an outlook to engineering problems desperately waiting for a solution and for which these coupled approaches could be promising.

In addition, we adress the question of what a state-of-the-art Lattice-Boltzmann code should look like in terms of flexibility, adaptivity and distributed computation capabilities especially with respect to specialized hardware such as General Purpose Graphic Processor Units (GPGPUs).