6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

Multifield coupling of a fluid-structure-acoustics interaction problem in low-Mach number turbulent flow

Thorsten Reimann*[1], Neda Ebrahimi Pour[2], Benjamin Uekermann[3] and Dörte C. Sternel[1]

[1] Scientific Computing, Technical University Darmstadt
Mornewegstr. 30, 64293 Darmstadt, Germany
thorsten.reimann@sc.tu-darmstadt.de, www.sc.tu-darmstadt.de/
[2] Simulation Techniques and Scientific Computing, University Siegen
Adolf-Reichwein-Str. 2, 57068 Siegen, Germany
neda.epour@uni-siegen.de, www.mb.uni-siegen.de/sts
[3] Department of Informatics, Technical University of Munich
Boltzmannstraße 3, 85748 Garching b. München, Germany
uekerman@in.tum.de, http://www5.in.tum.de

Keywords: *Multiphysics Problems, Fluid-Structure Interaction, Computational Aeroacoustics, Turbulence, High-Performance Computing*

We discuss a multifield scenario in which noise is generated by turbulent flow around a flexible obstacle, and being transported to a far-field. Such fluid-structure-acoustics interaction (FSA) problems [1] can occur in a variety of engineering fields where noise is sought to be avoided, or sound to be designed.

The physical phenomena, namely the fluid flow, the structure, the acoustical near- and far-field, can be computed in coupled fields. For high efficiency we employ specialized solvers to simulate each of them seperately.

However, the main challenges are to match the participating solvers in terms of modeling, discretization [2] and run-time. FSA problems are computationally challenging, since turbulent scales of the fluid flow need to be resolved, CAA introduces an additional multiscale aspect, and FSI generally multiplies CFD runtime. Thus, the scalability of the participating solvers and the coupling software is of high importance. We discuss adjusting the simulations of the physical partitions in these regards and present preliminary results.

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