Aerodynamisches Institut und Lehrstuhl für Strömungslehre | RWTH AACHEN UNIVERSITY

Bachelor/Master Thesis

Multiphysics simulations with applications to aeroacoustics

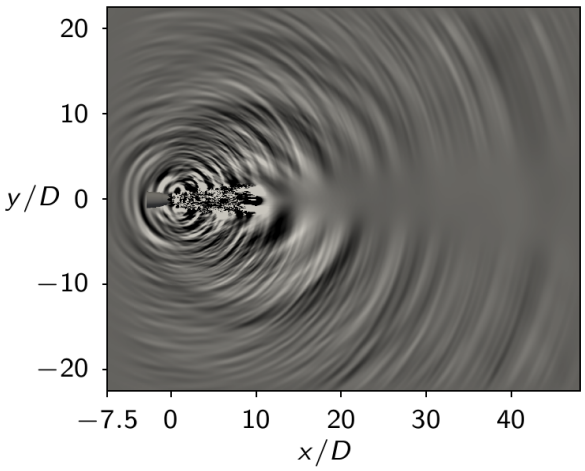
The numerical prediction of aeroacoustic noise is an important topic today, e.g., for the development of future aircraft with more strict noise emission requirements. Engine jet noise is one major issue in this regard that needs to be minimized to achieve an overall reduction of aircraft noise. For the prediction of the aeroacoustically generated noise from an engine nozzle high-fidelity numerical simulations are required to predict both the turbulent flow and the acoustic field.

At the Institute of Aerodynamics a direct-hybrid computational fluid dynamics (CFD) computational aeroacoustics (CAA) CFD-CAA approach is used for noise predictions. Both solvers are coupled in the m-AIA simulation framework, which allows a concurrent execution of CFD and CAA with an in-memory data exchange of the acoustic source terms. The mesh topology, the coupling approach and the partitioning with a dynamic load balancing scheme allow to achieve high parallel efficiency for complex simulation. Overall, the approach is suitable to perform large-scale three-dimensional turbulent aeroacoustic simulations to, e.g., study the impact of nozzle design variations on the generated noise.

Research aspects

- Efficient multiphysics simulations
- Numerical methods for aeroacoustics
- Jet noise predictions for chevron nozzles
- Large-scale simulations

If you are interested in this field of research, please let me know - usually it is possible to find a topic that suits your ideas and our needs at the same time.



Predicted acoustic pressure field in the $x-y$-plane for a jet emanating from a chevron nozzle.

You ...

- ... are interested in (computational) fluid dynamics and aeroacoustics
- ... have some fundamental programming experiences and a quick grasp for new concepts/languages
- ... are eager to learn new skills and are able to work in an independent manner

If you are interested, please contact:

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