Leibniz Universität Hannover

Institut für Turbomaschinen und Fluid-Dynamik

Studienarbeit, Masterarbeit

Investigation of two Benchmark Cases for Computational Aeroacoustics via a Hybrid LES-FWH Approach

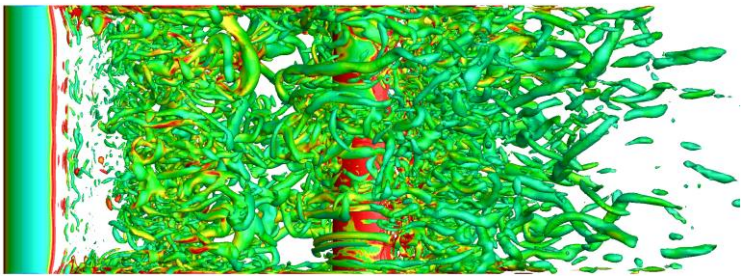

Figure 1: Flow structures around tandem cylinders visualized by iso-surfaces of vorticity-coloured Q-criterion

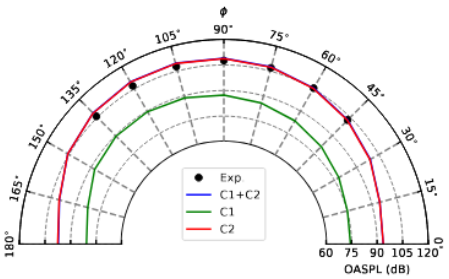

Figure 2: Farfield noise directivity OASPL

Background

The hybrid approach for aeroacoustic predictions consists of solving the Navier-Stokes equations to determine the aeroacoustic sources in the near-field, and utilizing the resulting time-accurate flow data for predicting far-field noise via an acoustic analogy. For the noise generated by turbulent flows, accurate acoustic propagation depends on the quality of the flow predictions in the near-field. In this regard, LES offers the possibility to resolve the energy-containing eddies as well as the hydrodynamic fluctuations, which are responsible for the majority of the acoustic sources. Not only resolving the eddies, but also aeroacoustics propagation requires highly accurate low-dispersive low-dissipative numerical schemes.

The aim of this project is to develop the skills necessary to use PyFR, a high-order accurate Navier-Stokes solver, along with its recently implemented Ffowcs Williams-Hawkings (FW-H) plugin for predicting noise at far observer locations in a free stream. The two benchmark cases to be simulated will be selected based on the student's status, whether it is a Studienarbeit or a Masterarbeit.

Responsibilities

- Literature research on acoustic analogies,
- Getting familiar with the CFD solver PyFR,
- Setting up the benchmark problems, running the simulations,
- Post-processing the acoustic data obtained by the FW-H acoustic analogy solver, preferably through developing a python code on our git server

Your profile

You are expected to have,

- Preferably, some Linux background and python skills
- Some understanding of CFD
- Willingness to read scientific articles

Contact

If the topic catches your interest, please get in touch with

Dr. Kenan Cengiz

cengiz@tfd.uni-hannover.de

0511/762-2529

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