Institute of Fundamentals and
Theory in Electrical Engineering

TI-Project

Slip boundary conditions for viscous acoustics

Motivation

Due to the rise of Micro-Electro-Mechanical Systems (MEMS) the characteristic length scales for acoustic problems can reach dimensions (sub µm) where classical continuum theory is not valid anymore. For a certain range modified boundary conditions can be used to account for molecular effects while still using continuum theory. This is accomplished by introducing an additional slip velocity which influences the shape of the boundary layer. Therefore, the already existing Arbitrary-Lagrangian-Eulerian (ALE)-framwork for viscous acoustics of our inhouse FEM solver openCFS should be extended to include these boundary conditions.

Research Questions

The goal of this thesis is to compare the state of the art boundary conditions for extending the applicability of continuum theory for the linearized flow equations, implement and test the most promising boundary conditions in openCFS. Finally, the new formulation should be used to simulate the operating principle of a new sound generation principle. Additionally, this work can also be extended to fit the scope of a master thesis.

Tasks

- Literature research
- Implement most promising boundary conditions in openCFS (programming language is C++)
- Test formulations

Organisation

- Language: German/English
- Start: As soon as possible
- Prerequisites: General knowledge of acoustics and vector analysis
- General FEM knowledge is advantageous but not necessary

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