Masterarbeit

3D Fluid-Structure Interaction on the example of compound absorbers

Motivation:

The reduction of noise and vibrations is an important task in engineering sciences. A possible reduction measure are porous media. Here energy is transferred into heat due to frictional effects and periodic temperature fluctuations. Compound structures consisting of homogeneous and porous layers as well as acoustic cavities can further enhance the absorption efficiency of porous media.

In order to assess the dissipation characteristics of those compound absorbers, the interaction between the single components and an external acoustic fluid has to be modeled properly.

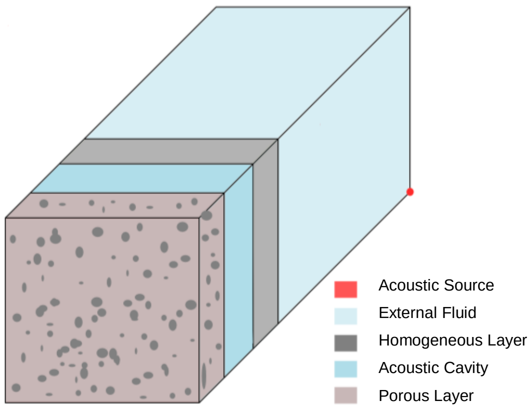

Figure 1: Exemplary structure of compound absorber

Task:

In the scope of this thesis the absorption efficiency of compound absorbers has to be assessed numerically using the Finite Element Method (FEM). Therefore, an existing Matlab implementation has to be extended.

1) Understanding of the basic theories and the existing code.
2) Extension of the existing code by 3D porous and acoustic volume elements.
3) Formulation of the 3D coupling conditions.
4) Implementation and analyzation of a calculation model for a 3D compound absorber into Matlab.

An implementation in Kratos instead of Matlab is also possible. The thesis can be written in either in English or German.

Literature:

[1] Rumpler, R.: Efficient finite element approach for structural-acoustic applications including 3D modelling of sound absorbing porous materials, Conservatoire national des arts et metiers – CNAM, Dissertation, 2012

[2] Buchschmid, M.: ITM-based FSI-models for rooms with absorptive boundaries, Technische Universität München, Dissertation, 2011

[3] Franck, A.: Finite-Elemente-Methoden, Lösungsalgorithmen und Werkzeuge für die akustische Simulationstechnik, RWTH Aachen, Dissertation, 2008

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