

BA-Thesis/TI-Project/MA-Thesis

Modelling and Simulation of Acoustic Metamaterials for Outdoor Noise Barriers

Motivation

Acoustic metamaterials are artificially created structures that are designed to have specific acoustic properties. Therewith, it is possible to design metastructures that have an acoustic band-gap transfer function by mounting mechanical resonator elements to a plate.

Research Questions

- What are the operating principles of vibro-acoustic metamaterials?
- Which influences do variations of stiffness, damping and mass have on the transfer function?

Tasks

- Create a unit cell geometry (Fig. 1 left)
- Perform the mechanic simulation of the unit cell with openCFS and evaluate simulation results
- Combine multiple unit cells to a metastructure
- Perform the coupled acoustic-mechanic simulation of the metastructure in a duct with openCFS (Fig. 1 right) and evaluate simulation results
- If MA-Thesis: Build the structure, e.g. using 3D-printing, and perform transmission loss measurements in a duct

Organisation

- Language: English (preferred), or German
- Start: immediately possible
- Entry to literature is provided

Contact/Supervisor

Florian Kraxberger, Stefan Schoder
and Manfred Kaltenbacher
kraxberger@tugraz.at

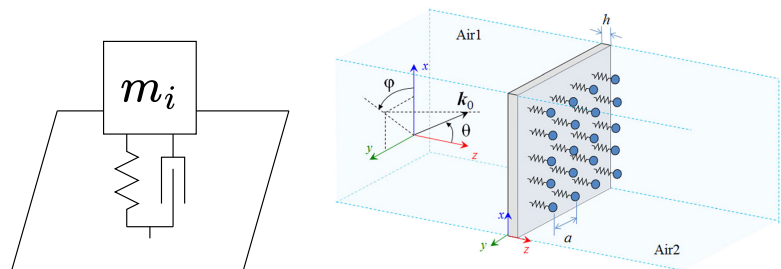


Figure 1: (left) Mechanic unit cell and (right) Acoustic metastructure in a duct