Chair for Computation in Engineering
Chair of Computational Modeling and Simulation

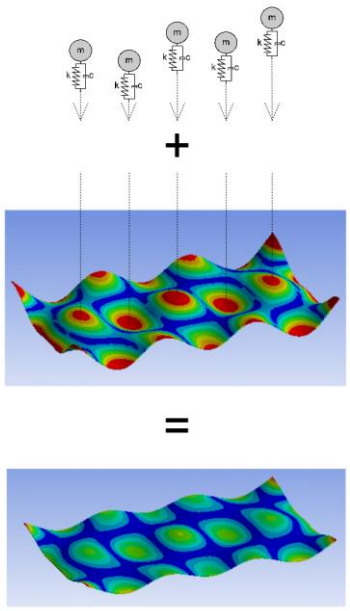
Modeling: ★★★★★
Mathematics: ★★★★★
Programming: ★★★★☆

Software Lab:

An application for the dimensioning of an Acoustic metamaterial

Setting

In the last decades, 3D-printing technology has strongly developed and now offers opportunities to manufacture new types of materials. Metamaterials are made of small periodic arrangements that together create material properties that are extraordinary. In aviation, there is a strong need for acoustic metamaterials, because the high stiffness-to-mass ratio of light-weight structures increases structure-borne noise. In this project, arrays of damped mass-spring systems and fixed masses should be used to influence the vibration characteristics of thin plates, as they are used in airplanes. Dimensioning the geometric pattern of the arrays and the parameters of each individual mass-spring system, allows the engineer to tackle the wave propagation of specific frequencies and reduces the structure-borne noise.



Task

Create an application that:

- Reads in the geometry of the plate
- Dimensions the mass-spring systems to reduce the vibrations of the plate and meet additional requirements specified by the user
- Attaches the arrays to a Finite Element model and shows the improved vibrational behavior.

Supervisors

Dr.-Ing. Martin Buchschmid, Chair of Structural Mechanics, martin.buchschmid@tum.de
Matthias Miksch, Chair of Structural Mechanics, matthias.miksch@tum.de

References

[1] C. C. Claeys, K. Vergote, P. Sas, W. Desmet, On the potential of tuned resonators to obtain low frequency vibrational stop bands in periodic panels, *Journal of Sound and Vibration*, vol. 332 pp. 1418-1436, 2013.

[2] C. C. Claeys, B. Pluymers, P. Sas, W. Desmet, Design of resonant metamaterials based acoustic enclosure, *ISMA2014 International Conferencen on Noise and Vibration Engineering*, 2014.