Professur für Mikrosensorik und -aktorik
TUM School of Computation, Information and Technology
Technische Universität München

# Master Thesis

# Modelling of next-generation MEMS microphones for hearing aids

We are looking for students who like to work in an interdisciplinary team and intend to realize their master thesis within our group at Professorship of Microsensors and Actuators embedded in the EU project Listen2Future.

**Topic**

Advances in material science have enabled the use of piezoelectric materials in MEMS microphones. In contrast to commonly used capacitive MEMS microphones, piezoelectric microphones require less energy and are, therefore, useful for mobile applications such as hearing aids. Another advantage of the piezoelectric microphone is the linear relationship between electrical voltage and force. This simplifies force-feedback control of the sensor and thus opens the possibility of increasing the sensor performance even more. Crucial for this is the design of the microphone membrane. Therefore, highly accurate models must be set up to simulate the microphone behavior.

Within this Master Thesis, you will set up a shell model of the microphone membrane to obtain a complete 3D model. Currently, a 2D axisymmetric FEM model is available, which cannot cover the full 3D behavior. A shell model could simulate additional resonance modes and promising membrane designs for force-feedback control. Simulation is done in COMSOL Multiphysics, the gold standard software to simulate the coupling of different energy domains.

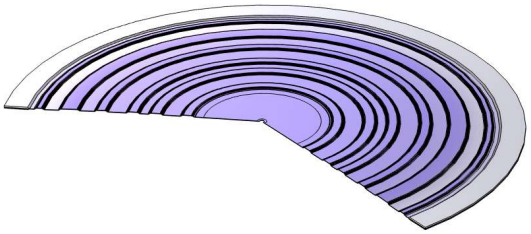
**Work packages**

- Topic familiarization and literature survey
- Familiarization with COMSOL Multiphysics
- Setting up a shell model of the piezoelectric microphone membrane
- Comparison with the existing 2D axisymmetric model
- Investigation of new membrane designs for force-feedback control
- Documentation and presentation of the results

**Requirements**

Background in one of the following fields:

- Electrical Engineering
- Mechanical Engineering
- Physics
- Materials Science
- Related fields of study



**Timetable**

The thesis can be started immediately.

**Contact**

Til Friebe, M.Sc.
Doctoral Candidate
Phone: +49 89 28923129
Email: til.friebe@tum.de

Listen2Future

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