

Simulative development of ultrasonic sensors

Project description:

Ultrasonic sensors are used for a wide range of applications. A typical area of application is, for example, the recording of acoustic emissions for structural health monitoring of safety-critical structures such as bridges or aeroplanes. Depending on the respective area of application, various properties are of particular importance for ultrasonic sensors.

The design of the sensors has a major influence on their output amplitude and linearity. Often a high linearity can only be achieved at the expense of a low output amplitude. For this reason, when selecting ultrasonic sensors for a specific application, a choice usually has to be made between particularly linear or resonant sensors with a high output amplitude. It is therefore desirable to develop a sensor design that combines both properties through successive optimisation.

With finite element simulations it is possible to transfer a sensor design into a computer model and to systematically test the properties of different adaptations and design variants. The aim of this work is to simulate and optimise the behaviour of an experimental setup, consisting of a piezoceramic with a base plate, in an FEM simulation. The transfer function of the ceramic can then be optimised on the basis of a validated simulation environment.

Scope of work:

- Measurement of the transfer function of a piezo ceramic on a metal plate
- Development of a simulation environment with COMSOL Multiphysics in which the transfer function of the piezoceramic can be simulated
- Optimisation of the transfer function of the piezo ceramic by adapting the model

Prior knowledge:

- Basic knowledge of the operation of COMSOL Multiphysics

Target group:

MSc. ET/IT Masterprojekt MSc. ET/IT Masterarbeit

Orientation:

Simulation Praxis

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