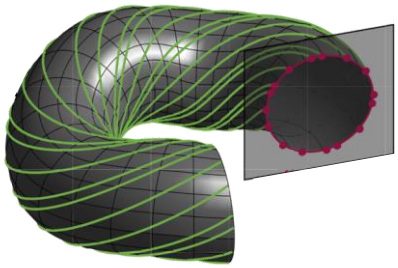
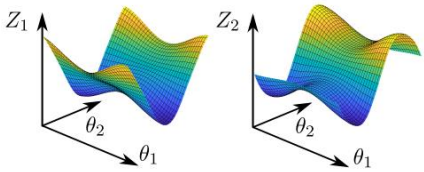
TECHNISCHE DYNAMIK

CoSTAR





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Combined semester and bachelor thesis or master thesis

Finite difference methods for the calculation of quasi-periodic oscillations

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The calculation of stationary vibrations is indispensable for many areas of modern technology: It helps in the design of electric motors, aircraft turbines, wind turbines and much more.
In addition to periodic vibrations, there are more complex vibration patterns, so-called quasi-periodic vibrations. These have a double periodicity instead of a single periodicity. These can be approximated using finite-difference methods, as they are known from fluid mechanics.
Currently, the Matlab CoSTAR (Continuation of Solution Torus Approximations) toolbox is being developed at the Department of Engineering Dynamics by the Numerics Group. It enables the calculation of periodic and quasi-periodic oscillations in simple up to complex systems with different numerical methods. The toolbox can also analyse entire solution paths (example of a solution path: magnification function of the single-mass oscillator). A first version of the toolbox is already available. Work is currently underway on the second version, which will then be published as open source code.

Working steps:

- Learning about the theory of quasi-periodicity and finite differences, as well as the CoSTAR toolbox
- Programming the approximation by a finite difference method for periodic oscillations using a simple example
- Implementation of the periodic procedure in the CoSTAR Toolbox
- Extension of the method to quasi-periodic oscillations and implementation in the CoSTAR Toolbox.

Your skill set:

- Independent and responsible way of working
- Good programming skills (ideally Matlab or Python)
- Good to very good knowledge of vibration engineering and mathematics

This is what you can look forward to:

- Expand your programming skills as an essential engineering skill
- The work is written within an open team, as well as a friendly/casual working atmosphere
- Sufficient orientation phase and excellent support with regular consultations
- Workplace at the institute or completely mobile work incl. supervision via Zoom.

Have we caught your interest? Then send an email to baeuerle@uni-kassel.de.