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## Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Montag, **20.11.2023, 12:30 Uhr**

Immerwahrstr. 1, Raum 01.025 / <https://fau.zoom.us/j/97303812645>

### Model inversion by servo-constraints for feedforward control of flexible and soft robots

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The control of robots undergoing large rigid body motion requires often a so-called two-design degree of freedom control structure. This consists of a feedforward control and a feedback control, which can be designed separately. A feedforward control is an inverse model of the multibody system model. It provides for a given desired output trajectory, e.g. the end-effector of a manipulator, the necessary control inputs and the desired trajectories of all coordinates. The later ones are used in the feedback loop as reference values.

Underactuated systems, such as flexible or soft robots have less control inputs than degrees of freedom, and model inversion is challenging. Servo-constraints have shown to be effective to establish systematically an inverse model. In this approach, the equations of motion of the multibody system are simply appended by algebraic constraint equations. These so-called servo-constraints ensure that the output follows a desired output trajectory. The arising set of differential-algebraic equations (DAEs) represents the inverse model, providing the desired control input and the trajectories of all coordinates. The inverse model may be completely algebraic or may contain stable or unstable dynamics.

The efficiency of the feedforward control is demonstrated experimentally for a flexible manipulator as well as a simple soft robot segment.

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