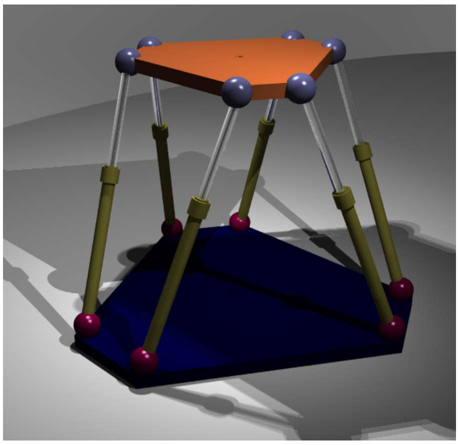
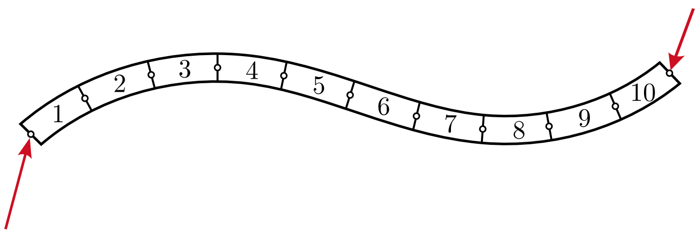
Institute of Mechanics and Fluid Dynamics
Chair of Applied Mechanics – Dynamics

Announcement: Master Thesis

Optimal Movement of an Elastic Structure with Minimal Vibrations

In positioning systems for high-precision sample positioning and alignment in measurement applications, components must be moved from an initial configuration to a specified end position and oriented. The movement of the system is realized by a small number of actuators, e. g. by six linear actuators in the exemplary depicted hexapod system. During operation, the system should be moved as quickly as possible from one rest position (initial configuration) to another rest position (final configuration). However, depending on how the actuators are controlled, vibrations of the structure (the orange carrier plate in the depicted hexapod) are also excited, and the system is not at rest in the final configuration. In order to develop a method that can be used to determine motion sequences with minimal structural vibrations in the final configuration, a planar model of a bending beam that consists of ten elements and that can perform large movements (displacements and rotations) is to be considered in this thesis. The ANCF formalism, which was especially developed for such structures, will be used for modeling. The model is to be moved from a rest position to a predefined final configuration in a predefined time interval $t \in [0, T]$ using optimal control. As part of the project, an optimality criterion is to be developed for the control system that minimizes the oscillations in the final configuration.





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