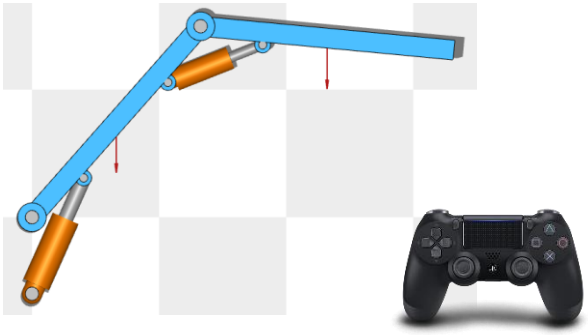
Interactive Operation of a Controlled Flexible Multibody Dynamics Model of a Hydraulically Actuated Loading Crane

Hydraulic cranes are widely used in construction, forestry, and logistics, where performance, precision, and safety are critical. Modern designs aim for lightweight components. However, lightweight designs may come at the price of higher structural vibrations, which can be problematic for the performance and precision during operation. This thesis aims to develop an interactively operable 3D flexible multibody dynamics model of a loading crane and evaluate state-of-the-art control strategies to operate hydraulically actuated loading cranes accordingly.



Your tasks will include:

- Reviewing state-of-the-art control strategies for controlling hydraulically actuated flexible components of multibody systems
- Building a flexible multibody system of a hydraulically actuated loading crane using the open-source multibody simulation code Exudyn
- Flexible components will be modelled using the floating frame of reference formulation
- Implementing state-of-the-art control strategies for controlling the crane system and comparing their performance
- Combine an external controller, e.g., PS controller, with the multibody simulation using Exudyn's interactive mode and operate the multibody model

What you'll gain:

- Deeper understanding of flexible multibody dynamics and control
- Practical skills in simulation-driven engineering and system dynamics
- Hands-on experience with modern simulation tools (e.g., Ansys, Python, Exudyn…)
- Depending on the outcome of this thesis, the possibility of writing a scientific paper

Requirements:

- Basic knowledge of multibody dynamics
- Good knowledge of control methods
- Good programming/scripting skills with Python

We encourage you to apply if you're motivated to work in flexible multibody dynamics and explore how to control flexible multibody systems!

Contact:
Dr. Stefan Holzinger
Chair for Applied Mechanics
stefan.holzinger@tum.de