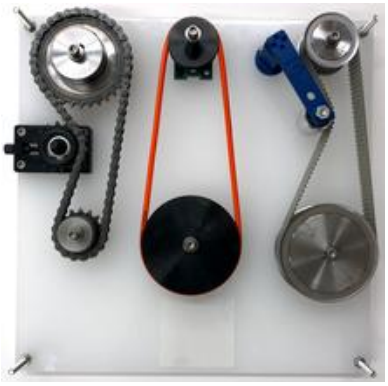
Modeling of the assembly of a NIST task board: the belt drive

project/master thesis

A major challenge in robotic manipulation is the handling of flexible objects. To validate the performance of robot systems, the National Institute of Standards and Technology (NIST) of the U.S. department of commerce have developed a standardized task board, see picture below. This task board is designed to quantify a robot system's capability for performing alignment and insertion of collars and pulleys, handling flexible parts, meshing/threading belts, actuating tensioners, and threading bolts.



https://www.nist.gov/el/intelligent-systems-division-73500/robotic-grasping-and-manipulation-assembly/assembly

In this project, the focus lies on modeling the assembly of the belt drive with the red rubber band depicted in the picture above. It is the goal of the project to develop models of different complexity and accuracy, e.g., 2D vs. 3D models, that capture the dynamics of the belt and can describe the contact interaction between the belt and the pulley. The models will be implemented and simulated with Python. After a thorough validation and comparison of the different models, strategies for the planning and control of the assembly task can be explored.

necessary requirements

- "multibody dynamics" or "computational multibody dynamics"
- good programming skills in e.g. Python or Matlab
- fluent in either English or German
- interest in combining modeling of elastic beams with computational methods

additional qualifications (not necessary)

- experience with the finite element method

contact

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