Master's thesis

Compuational workspace design tool for a compliant tendon-driven platform

University of Stuttgart

Institute for Nonlinear Mechanics

Topic Areas:	flexible multi-body dynamics, computational mechanics
Advisors:	Dr. Simon R. Eugter eugster@inm.uni-stuttgart.de
Responsible Professor:	Prof. R. I. Leine
Prerequisites/Prior Knowledge:	Dynamik mechanischer Systeme

Soft robotics is a promising research field, where structural mechanics meets robotics. Various soft robots have been built but systematic modeling for design and control purposes of soft robots remains still a topical and challenging task.
The goal of this project is to develop a computational tool for the workspace design of a compliant tendon-driven platform, see Figure 1. The design tool should include different models of the compliant part as well as the tendon actuations. The different models should be compared with experiments in which the platform's position and orientation is captured by an object tracking system.
In particular it is required to

- model the compliant part using the Constant Curvature and the Constant Strain approach,
- model the compliant part as a shear-deformable beam discretized by appropriate beam finite elements,
- implement the tendon-acutations as one-dimensional generalized force laws,
- evaluate the experiments and identify the system parameters,
- find the limits of the individual models,
- visualize the workspace, i.e., position and orientation, of the platform,
- parametrize the tendon-routings to optimize the workspace.

Multi-segement platforms as well as the dynamics of the system may also be considered.

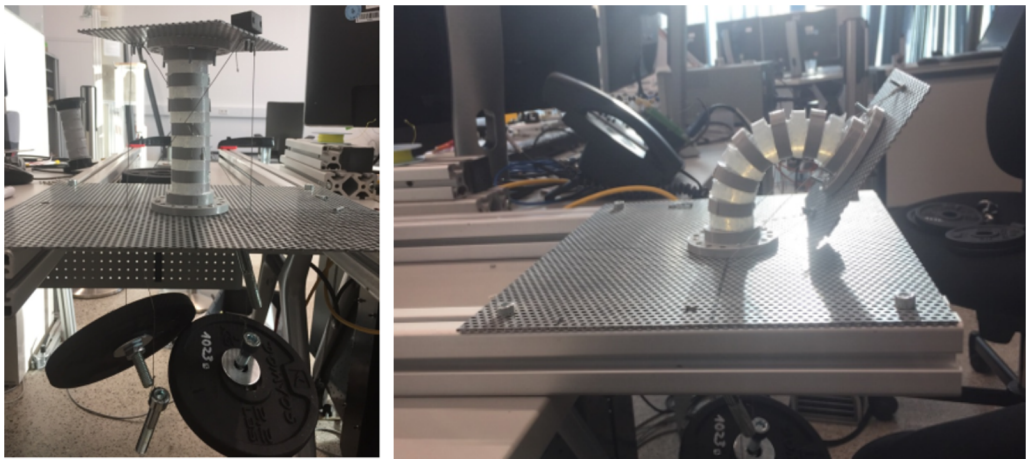

Figure 1: Compliant tendon-driven platform actuated by weights.