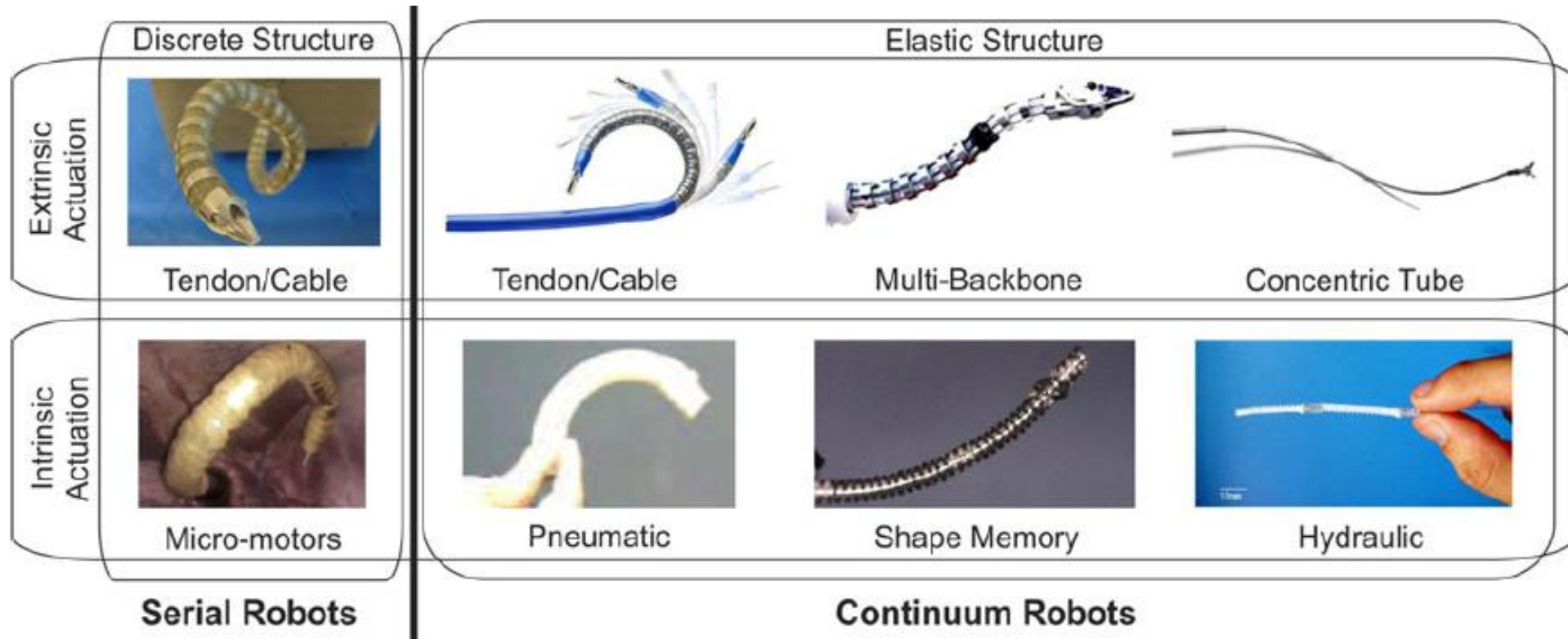


Continuum Robots for Surgical Application

Sven Fritsch

DFGT-Tagung

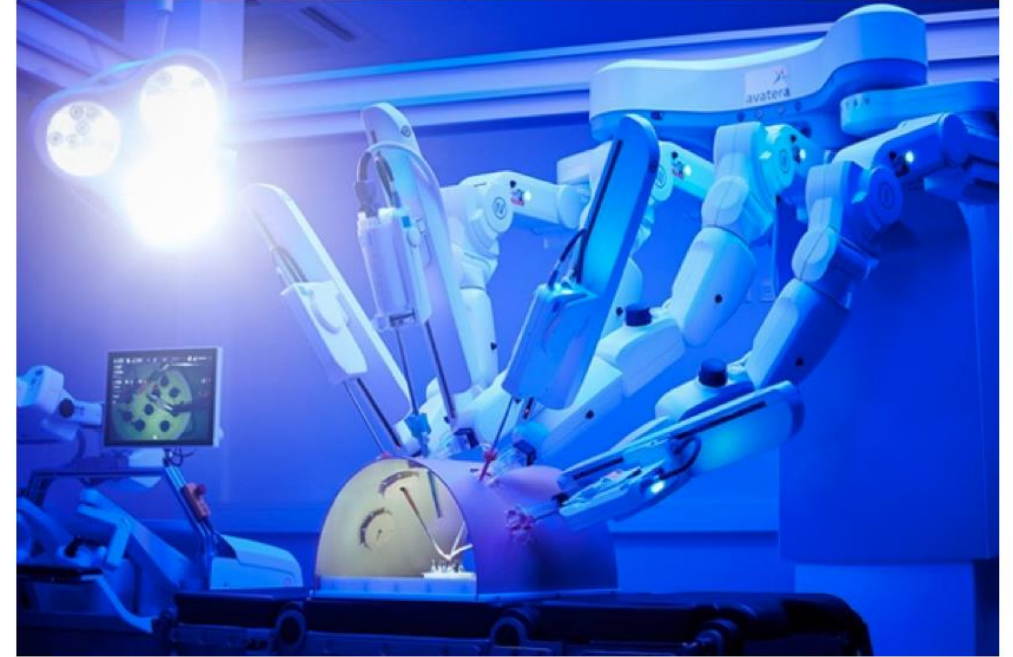


Overview of flexible robot designs categorized by their structure and method of actuation
 Jessica Burgner-Kahrs, D. Caleb Rucker, and Howie Choset. "Continuum Robots for Medical Applications: A Survey". In: *IEEE TRANSACTIONS ON ROBOTICS* 31 (2015).

Advantages of Continuum Robots



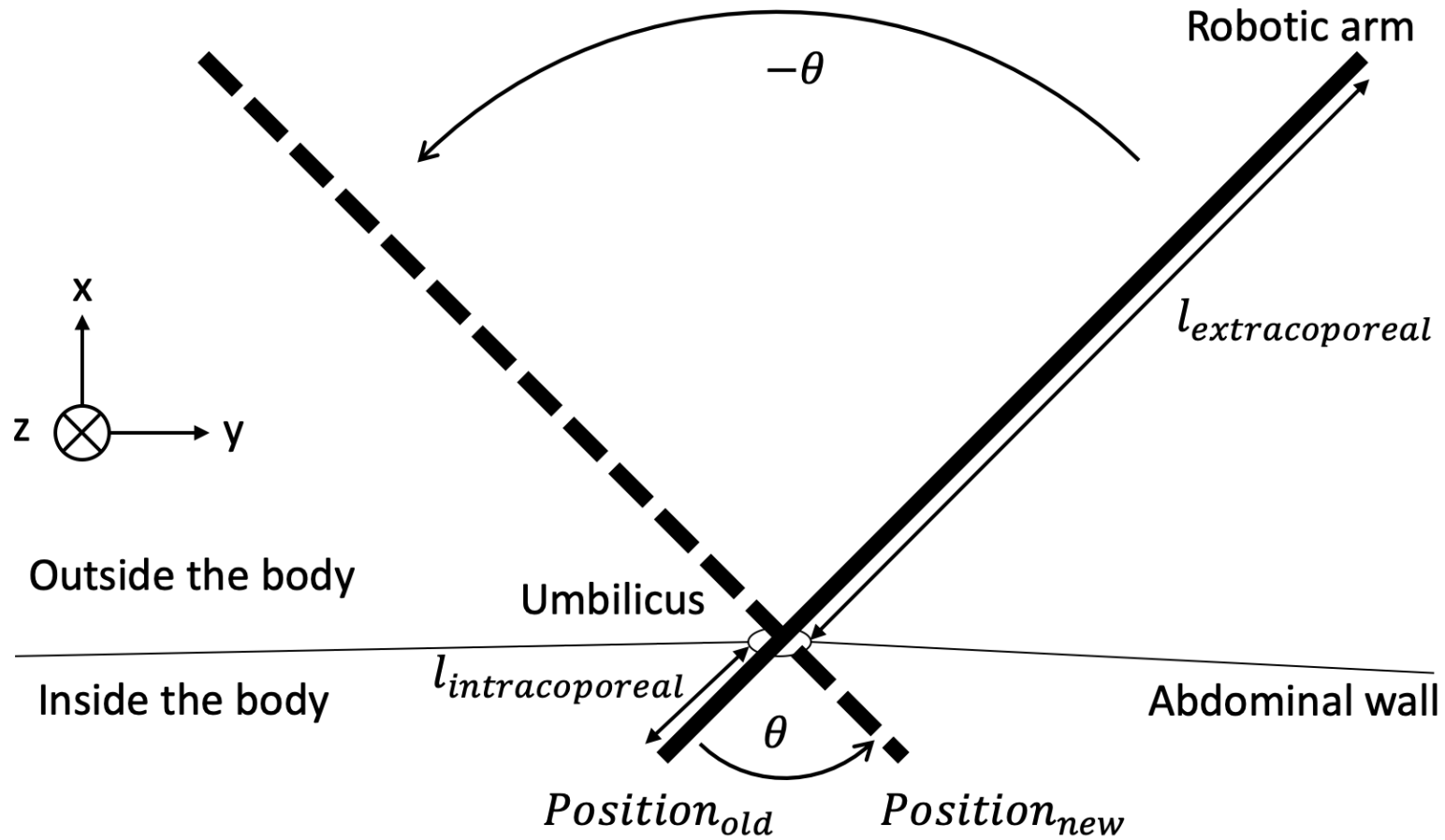
a)



b)

State-of-the-art surgical robots, a) da Vinci during Surgery, b) Avatera System

Advantages

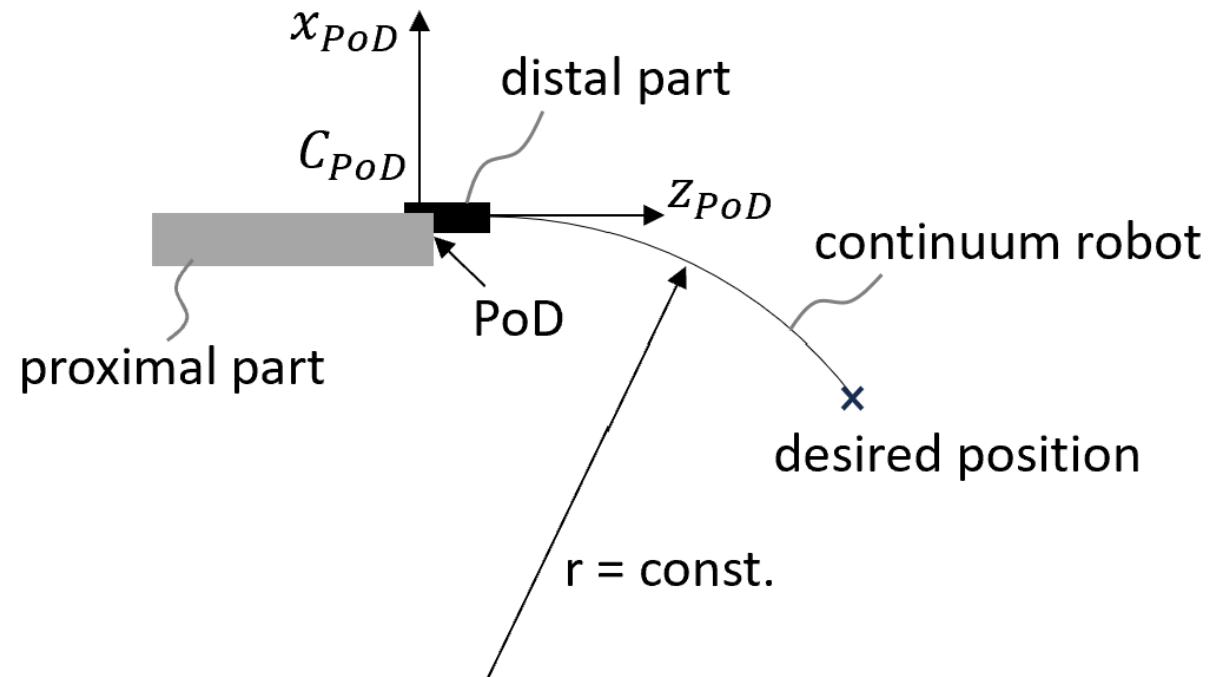


Why is no continuum robot used in surgery, yet?

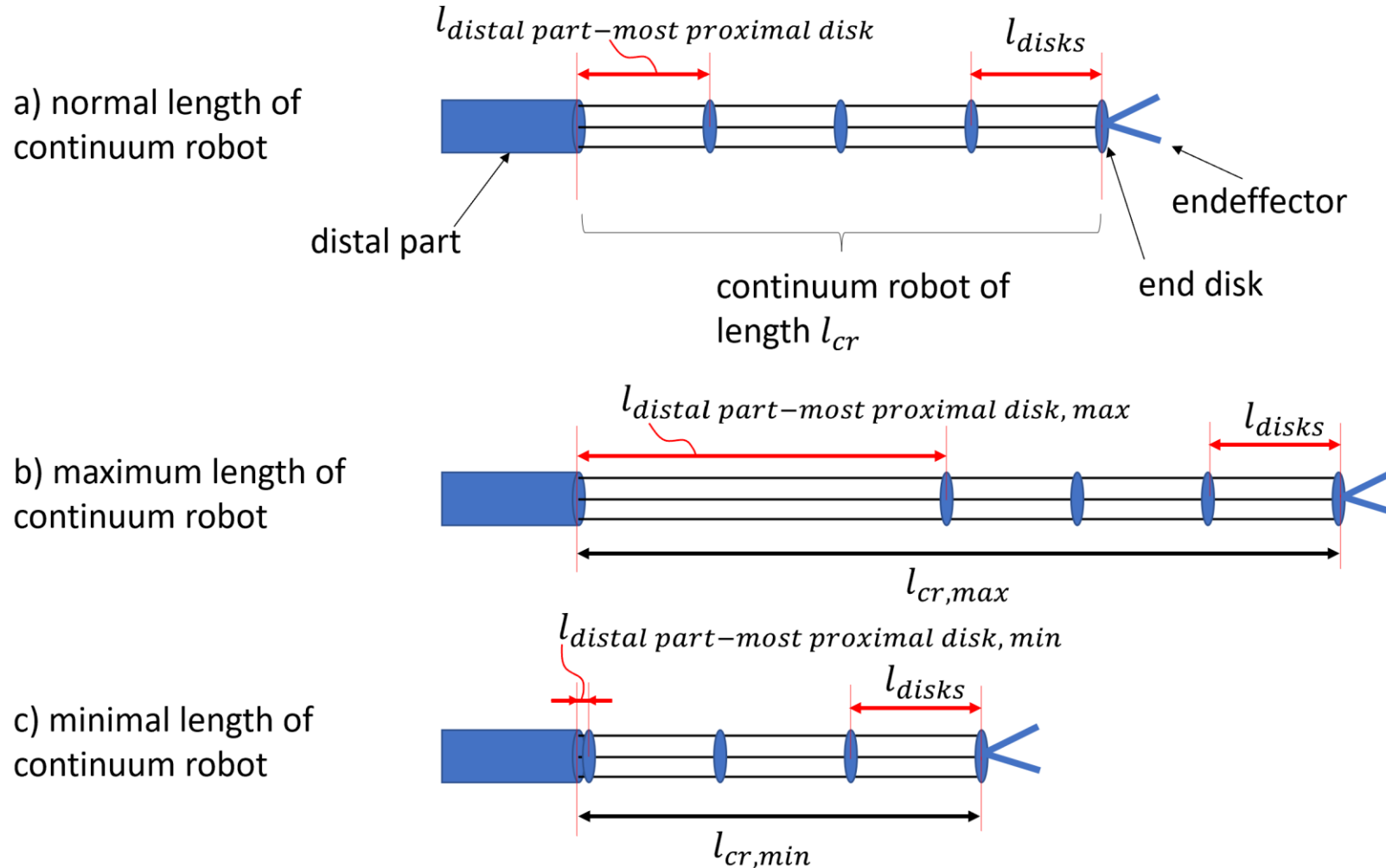
- Stiffness
- Workspace

Workspace

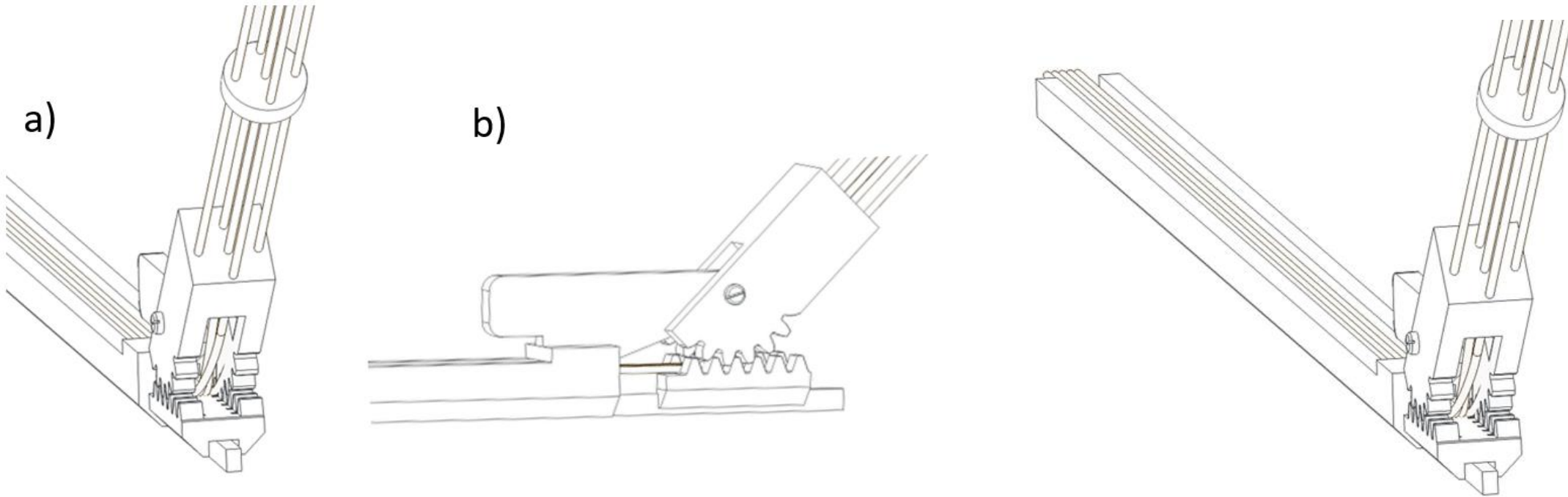
- Research in area of multi-pose workspace
-> length adjustment and deflection angle adjustment



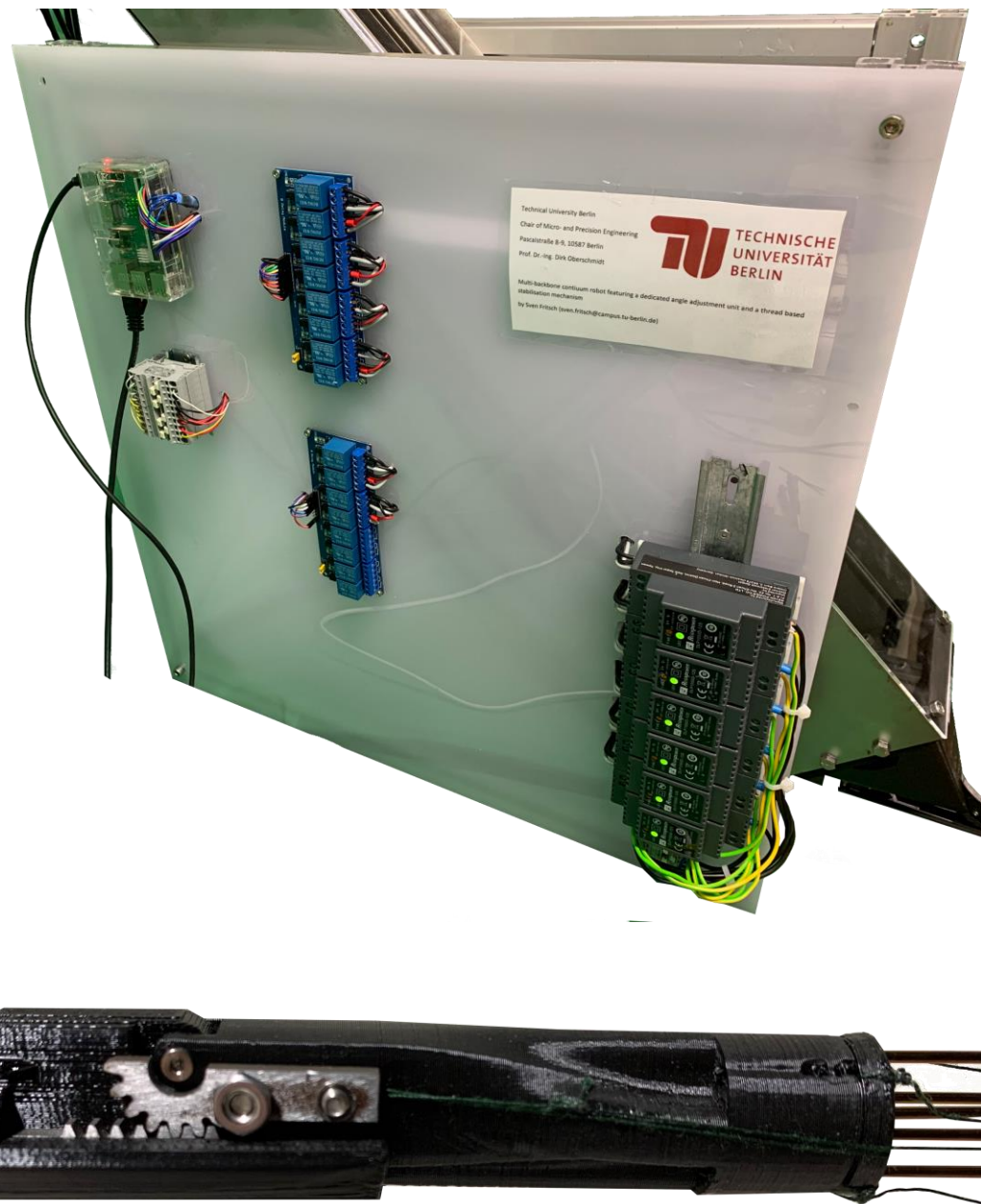
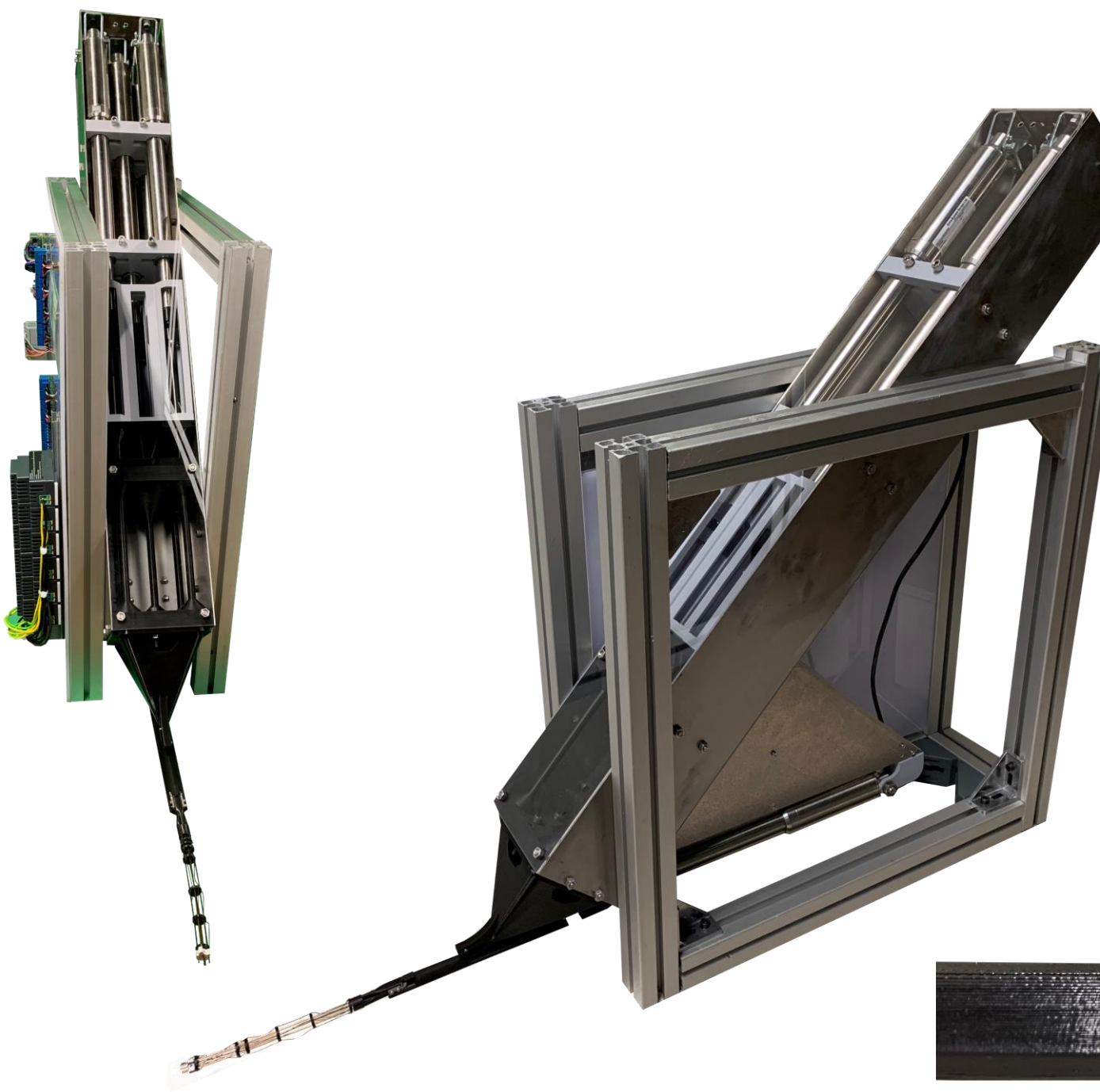
Length adjustment

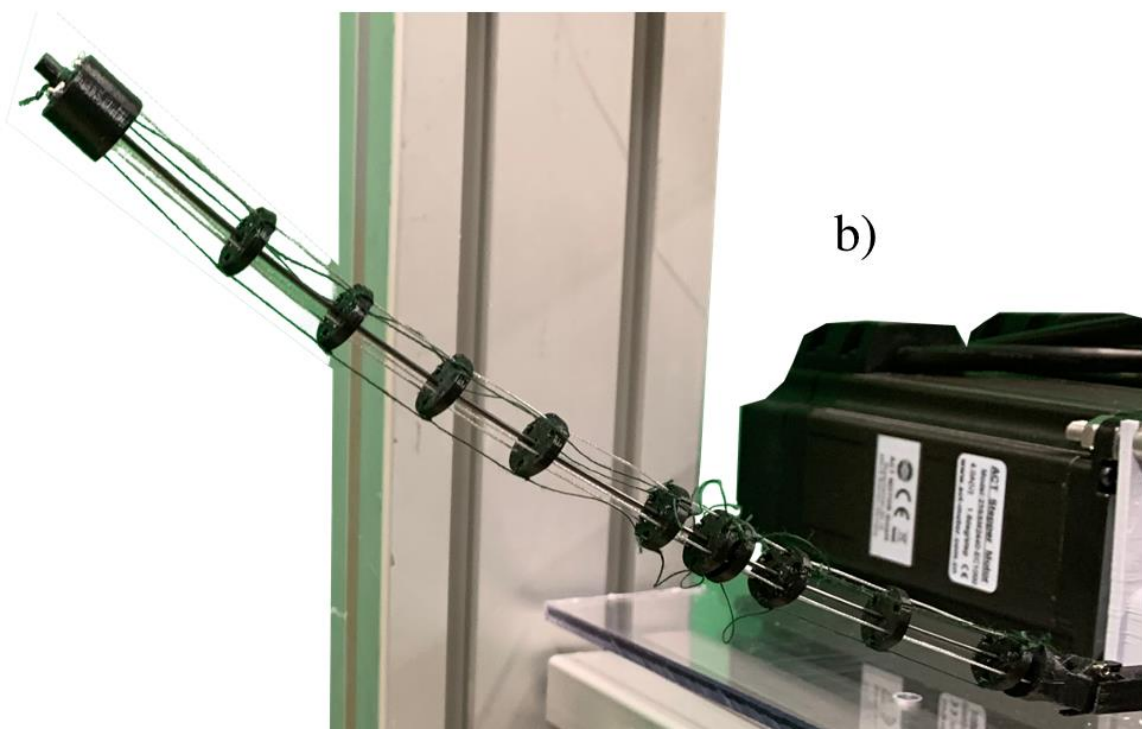
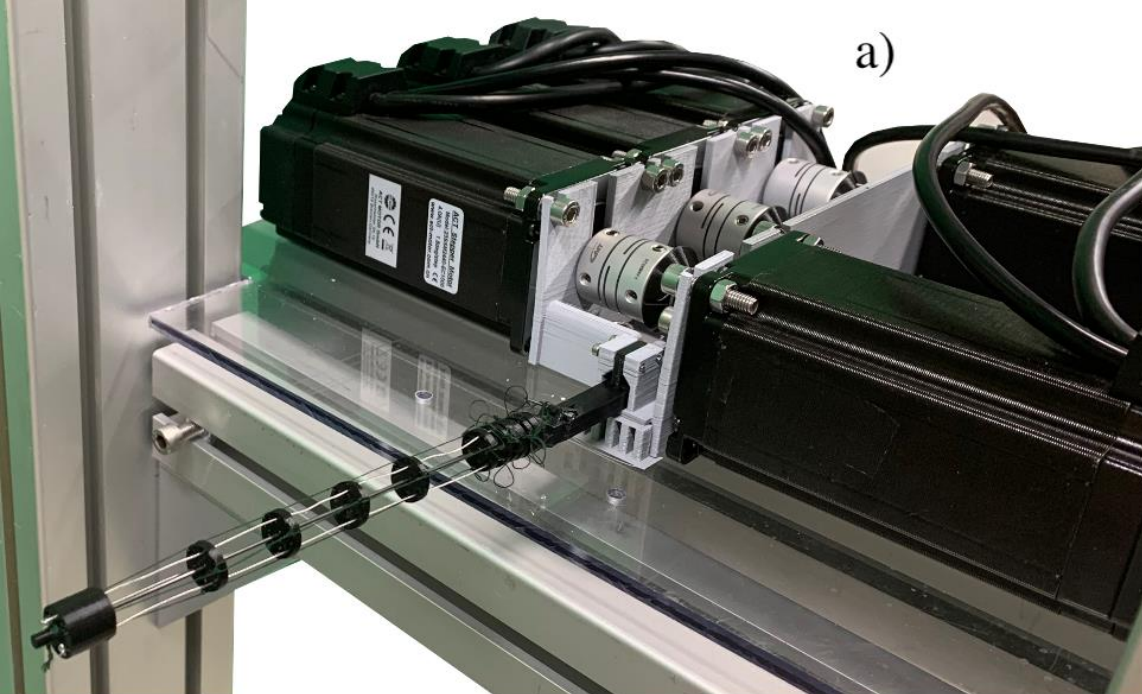


Deflection angle adjustment

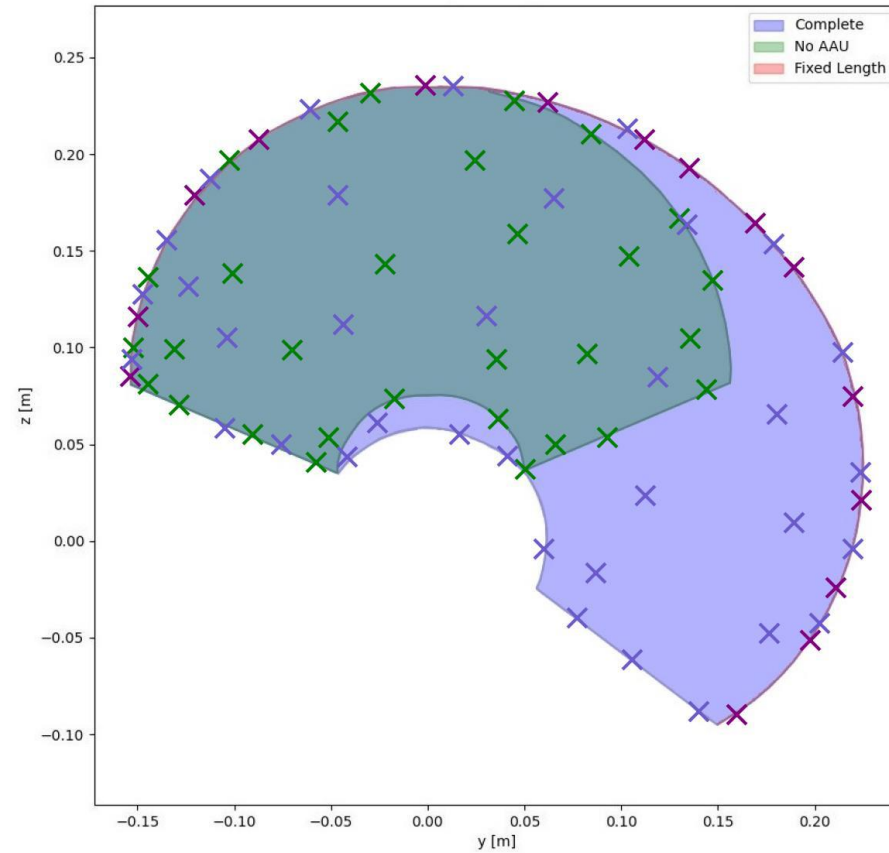
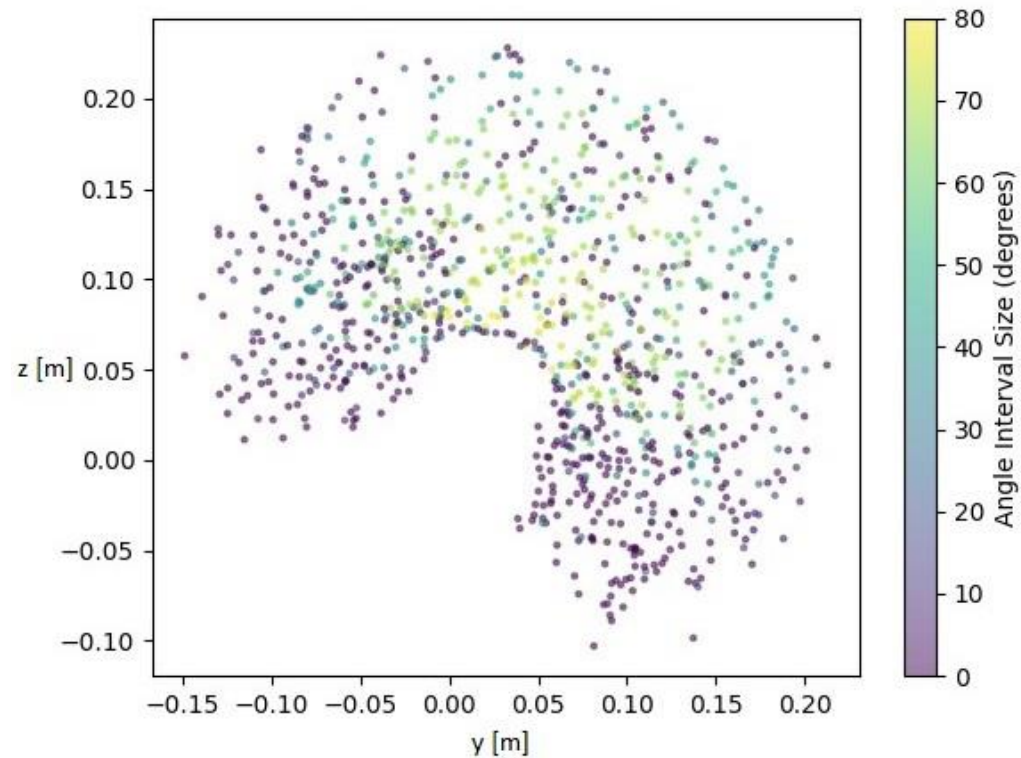


<https://register.dpma.de/DPMAreister/pat/register?AKZ=1020211288096>



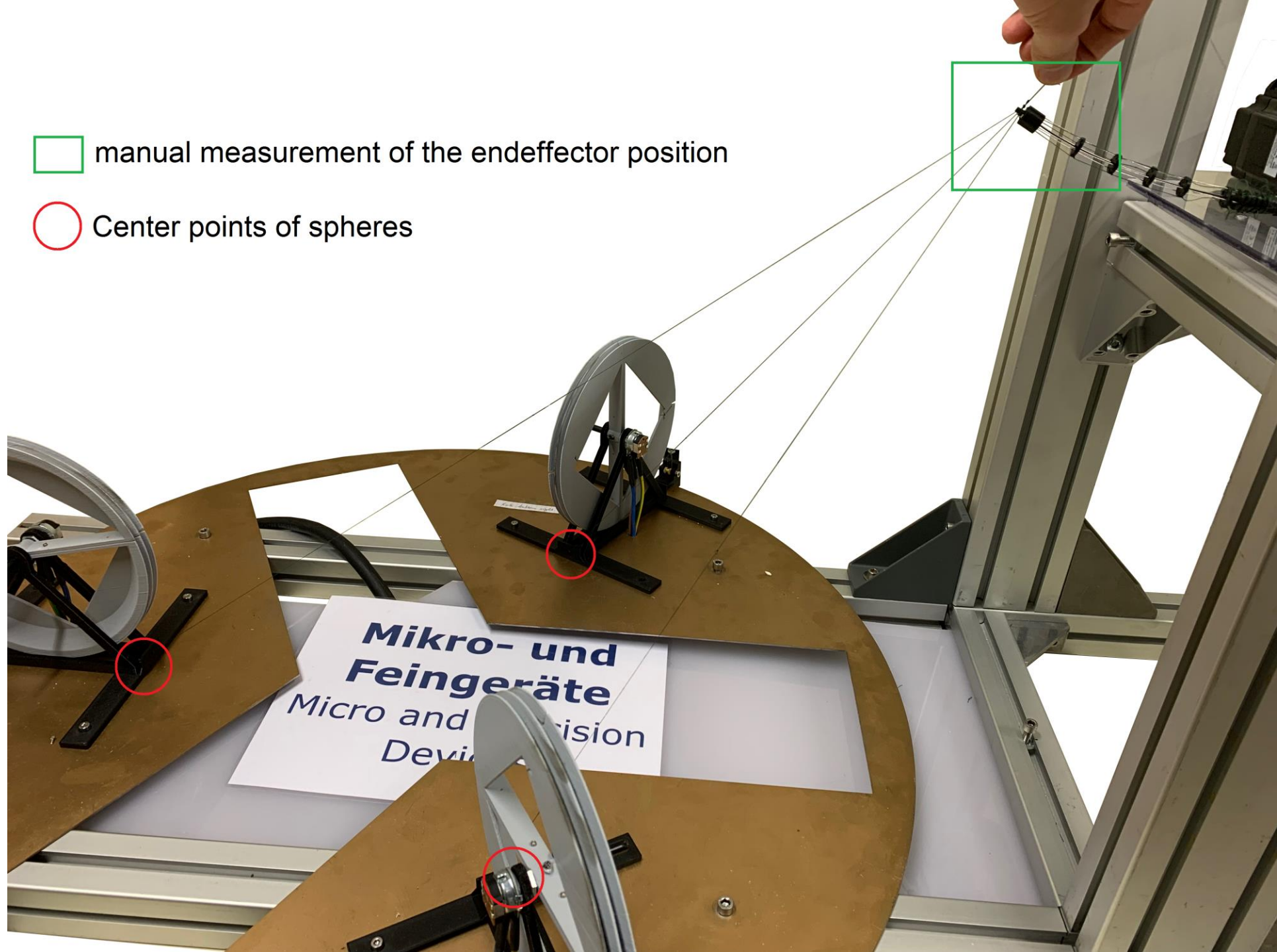


Simulation and experimental validation



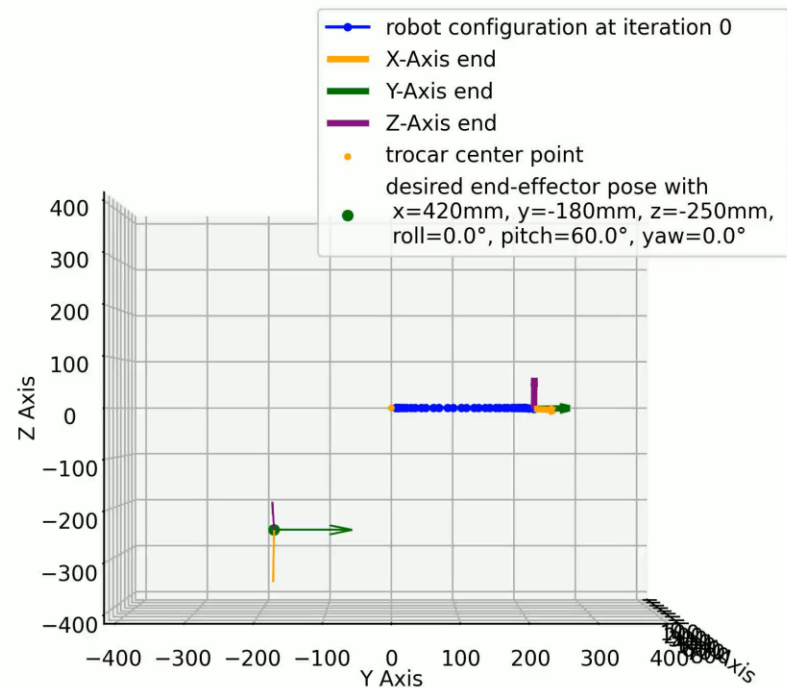
 manual measurement of the endeffector position

 Center points of spheres



Outlook

Inverse differential kinematics and euler angles for position and orientation control of a 2 segment hyper-redundant robot with 1.233 s convergence time



Inverse kinematics using non-linear minimization and angle-axis representation for position and orientation control of a 2 segment hyper-redundant robot with 1.651 s convergence time

