

University of Stuttgart

Institute for Nonlinear Mechanics

Student Assistent  
studentische Hilfskraft

Towards hyper-actuated soft robotic systems

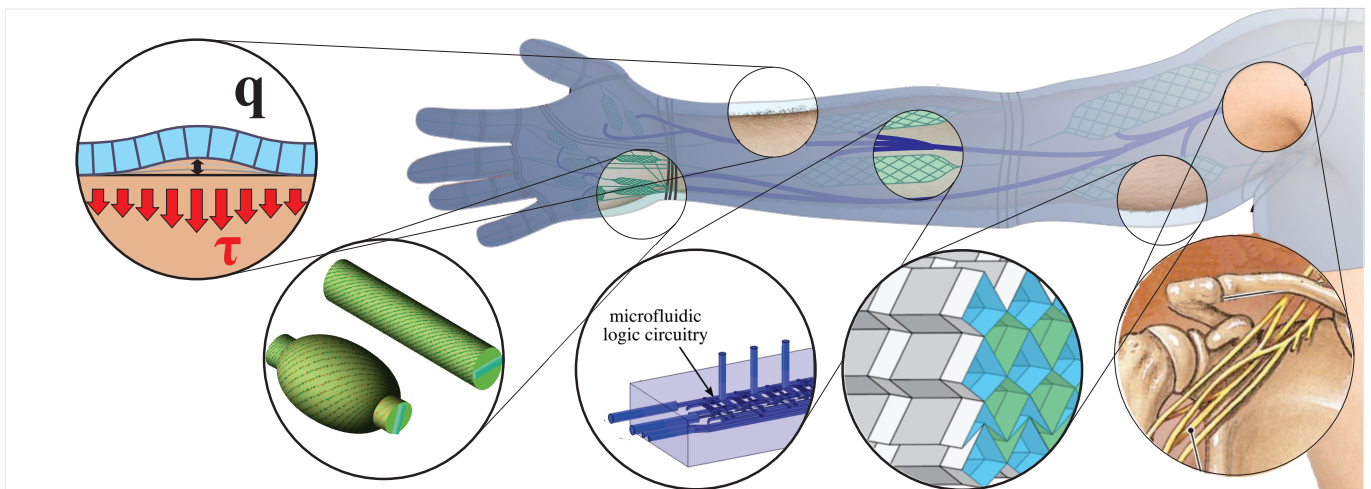
Topic Areas:	Design, Control, Mechatronics, Hardware, 3D Printing, Experimentation with Fluid Systems
Advisors:	Prof. C. David Remy david.remy@inm.uni-stuttgart.de
Responsible Professor:	Prof. C. David Remy
Prerequisites/Prior Knowledge:	Mechanical Engineering, Design, Mechatronics, Proficiency in English

We are looking to fill two long-term positions for student assistants (80h/month, 12 months duration) to help jump start a project on the topic of hyper-actuated soft robotic systems. Taking one of these positions in our international study team will be a major commitment and it should be understood that participation in this project is not a regular side job.

For this project, we envision robotic systems that are made from a cellular matrix of hundreds or thousands of soft, fluid-driven actuators. Such hyper-actuation will enable completely new paradigms of robotic control. In a sense, a robot can become a fully amorphous system that can shape-shift in its entirety to perform a certain task. Such complexity sounds futuristic, but it is enabled today by the fact that soft robotic systems can be made using additive manufacturing techniques.

To enable this breakthrough, we still need to answer a large number of research questions, that, among others, include the design and mechanical modelling of such structures, their stabilizing control, or the selection of suitable materials. Within this broad field of hyper-actuated soft robotic systems, we seek to focus our efforts on a particularly limiting issue: the question of how to route power and information to each of the actuator cells. To address this “piping problem”, we will explore approaches from the field of fluid logic. Similar to transistors in the electrical domain, it is possible to use fluid-driven valves to create logical elements and power amplifiers for fluidic systems.

In your work, you will design such fluid systems, prepare and conduct hardware experiments, and analyze the resulting data.



Sketch of a potential application