

Internship Opportunity for Women in Soft Material Robotic Systems

1. **Project Title:** Development of a motion-tracking and 6-axis force measuring system for three-dimensional DE-driven soft robotic manipulators.

Your Tasks:

- Determination of the functionalities and specifications of the system
- Conceptualization of the 3D-motion-tracking system and algorithms
- Implementation of the 3D-motion-tracking algorithm as well as the 6-axis load cell data acquisition and post-processing
- Validation of the setup
- Run experimental characterization tests in 3D of DE-based soft manipulators based on the developed setup

Required Knowledge:

- Good knowledge of MATLAB/Simulink software and basic programming skills
- Good knowledge of computer-vision systems and algorithms
- Fundamentals of Classical Mechanics
- Fundamentals of signal and image processing
- Fundamentals of electro-mechanical systems design
- Fundamentals of measurements and sensor technology
- Good knowledge of English language, both written and spoken

Prospective Start Date: January 2024

Internship Location: Saarbrücken

Supervisor: M.Sc. Julian Kunze

Department of Systems Engineering, Saarland University



2. **Project Title:** Self-sensing estimation and sensorless control of three-dimensional DE-driven soft robotic manipulators

Your Tasks:

- Learn basics of DE-based soft robotic systems
- Implement and validate simulation models for DE-based soft robotic manipulators
- Develop model-based self-sensing estimation schemes and validate them through simulation
- Implement the self-sensing schemes in experimental setups, and validate them in real-time operations
- Combine the self-sensing feedback with motion control algorithms to demonstrate sensorless motion control

Required Knowledge:

- Fundamentals of control and estimation theory
- Fundamental of electro-mechanical systems modeling and simulation
- Fundamentals of robotics
- Fundamentals of signal processing
- Good knowledge of MATLAB/Simulink software and basic programming skills
- Good knowledge of English language, both written and spoken

Prospective Start Date: January 2024

Internship Location: Saarbrücken

Supervisor: M.Sc. Giovanni Soletti
Department of Systems Engineering, Saarland University



3. **Project Title:** Tactile sensor integration for a pneumatically driven soft continuum robot

Your Tasks:

- Signal processing of sensor signals (e.g. via Arduino, Python/Matlab)
- Analysis of sensor signal regarding (e.g., sensitivity, hysteresis)
- Calibration of tactile force sensor
- Conceptual design for sensor array integration in soft pneumatic actuator
- Implementation of the concept
- Manufacturing of silicone components for sensor array and soft pneumatic actuator via casting and/or injection moulding
- Integration in existing test bench for soft pneumatic systems
- Contact experiments

Required Knowledge:

- Basic understanding of mechatronic systems and mechanical systems
- Basic programming skills

Prospective Start Date: January 2024 or later

Internship Location: Garbsen

Supervisor: M.Sc. Mats Wiese

Institute of Assembly Technology, Leibniz University Hannover

4. Project Title: Development and testing of a deep sea robotic system

Your Tasks:

- Waterproofing existing prototypes
- Improving the actuation system
- Testing methods for usability under high pressure
- Ensuring no water or pressure damage to actuation systems
- Design and manufacture using 3D printing and silicone casting

Required Knowledge:

- Enrollment in an engineering program
- CAD and experience with 3D printing would be helpful but is not a must
- Interest in the development of a robotic system

Prospective Start Date: January 2024 or later

Internship Location: Garbsen

Supervisor: M.Sc. Cora Maria Sourkounis
Institute of Assembly Technology, Leibniz University Hannover

5. **Project Title:** Contact investigation for soft robots

Your Tasks:

- Conduct experiments
- Carry out measurements on the institute's test bench
- Assist in sample preparation
- Develop new measurement methods and Evaluate measurement results
- Learn about beam models
- Explore Finite Element Models (FEM)

Required Knowledge:

- Enrollment in mechanical engineering, mechatronics, computer science or similar
- Ideally some experience in coding
- Fluent in English

Prospective Start Date: April 2024

Internship Location: Garbsen

Supervisor: M.Sc. Rebecca Berthold

Institute of Dynamics and Vibration Research, Leibniz University Hannover