Deutsches Zentrum
DLR für Luft- und Raumfahrt

Design of a Control Systems for Hybrid Continuum Joints for a Robotic Hand

Master's Thesis

In recent years, the Institute of Robotics and Mechatronics at the German Aerospace Center has been advancing the development of anthropomorphically inspired joints known as continuum joints. These joints exhibit intrinsic compliance, providing passive robustness and damping, making them ideal for safe human-machine collaboration.

The primary objective of this master's thesis is to develop, model, implement, and test a control system to enable the control of hybrid continuum joints for robotic manipulation tasks. This includes exploring iterations of the actuation system, such as direct drive mechanisms, to support the implementation and testing of advanced control strategies. The thesis will involve creating mathematical models of the control system, evaluating various control approaches — such as position control, force control, and impedance control — and tailoring them to leverage the capabilities of the advanced actuation systems. The ultimate goal is to optimize the integration of actuation and control for enhanced robotic performance.

Fig. 1: DLR David

Prerequisites:

- Very good knowledge in the area of control engineering (e.g. from the lectures System Theory in Mechatronics or Modern Control 1, 2).
- Good knowledge in the field of engineering mechanics (for derivation of differential equations)
- Experience with MATLAB/Simulink

Tasks:

- Interdisciplinary cooperation with groups at the institute
- Extension and commissioning of an existing test rig
- Development and integration of control approaches
- Integration of own, creative ideas

The work is carried out at the German Aerospace Center in Oberpfaffenhofen.

Start: at the earliest possible date.
Contact: oliver.neumann@dlr.de

Please attach a brief motivation, curriculum vitae and a transcript of records.

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