Deutsches Zentrum
DLR für Luft- und Raumfahrt

Modeling and Control for Flexible Shafts and Tendon-Driven Actuation in Robotic Joint Design

Master's Thesis

The use of flexible shafts and tendon-driven actuation systems has gained significant attention in the development of robotic joints due to their lightweight, compact design and ability to replicate human-like motion. These systems enable precise and compliant actuation, making them ideal for applications in soft robotics, prosthetics, and humanoid robots. However, the inherent flexibility of the shafts and tendons introduces complexities in dynamic behavior, such as nonlinearities, time delays, and vibrations, which pose challenges for accurate modeling and robust control.

This thesis aims to explore the dynamics of flex-shaft and tendon-driven robotic joints, focusing on the development of modeling techniques and control strategies. By addressing these challenges, the research seeks to enhance the performance, efficiency, and reliability of robotic systems, contributing to the advancement of bio-inspired and versatile robotic actuation mechanisms.

Fig. 1: DLR David

Prerequisites:

- Very good knowledge in the area of Control Engineering
- Good knowledge in the field of Engineering Mechanics
- Experience with MATLAB/Simulink
- Experience with ROS2

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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