



## Starten Sie Ihre Mission beim DLR.

Das DLR ist das Forschungszentrum für Luft- und Raumfahrt sowie die Raumfahrtagentur der Bundesrepublik Deutschland. Rund 8.000 Mitarbeiterinnen und Mitarbeiter forschen gemeinsam an einer einzigartigen Vielfalt von Themen in Luftfahrt, Raumfahrt, Energie, Verkehr und Sicherheit. Ihre Missionen reichen von der Grundlagenforschung bis hin zur Entwicklung von innovativen Anwendungen und Produkten von morgen. Wenn auch Sie sich für die Welt der Spitzenforschung in einem inspirierenden, wertschätzenden Umfeld begeistern, starten Sie Ihre Mission bei uns.

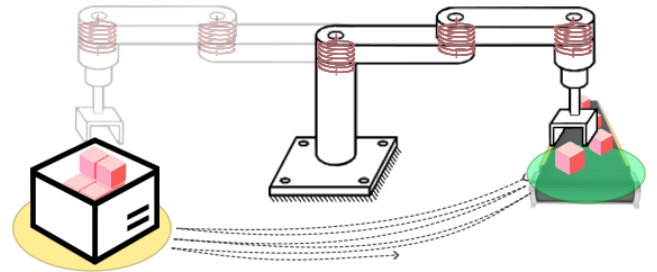
Für unser Institut für **Robotik und Mechatronik** in **Oberpfaffenhofen** suchen wir eine/n

## Student\*in für eine Master's Thesis

### Ultra-efficient Resonance-driven SCARA Robot

#### Background:

In industrial pick-and-place applications, a robotic manipulator moves objects from one place to another with high speed (see Fig. 1). For instance, objects arrive at a conveyor belt (green area), and a robotic manipulator picks them up and places them into a box (yellow area). Because speed of execution is a main factor in industry, the need for strong actuators, heavy robots, high energy consumption, loud machines, and vibrations in the environment.



#### Your mission:

Instead of understanding robots as pure rigid body machines, we propose to generate the pick-and-place trajectories as oscillatory motions of elastic machines operating in resonance. Repetitive motions generated by mechanical resonance are theoretically self-sustaining and operate without energy input. In this work you will study the concept of such new generation of highly energy-efficient SCARA-like pick-and-place robots that follow this design principle. The tasks involve co-designing the robot to optimize its mechanical properties (stiffness, kinematics, dynamics) and the motion control strategy. After evaluating and optimizing the design in simulation, the concept shall be realized in a single link (possibly two-link) hardware testbed and experimentally evaluated.

#### Your Qualification:

- Strong background in robotics, mechanical design and control
- Hands-on experience in mechatronics or robotics
- A strong interest in multidisciplinary work, combining aspects of dynamics and mechanical design

#### Your Start:

The thesis will be conducted at the Institute of Robotics and Mechatronics in Oberpfaffenhofen. Envisioned starting date is May 2025. We give preference to severely disabled applicants if they are professionally suitable.



Deutsches Zentrum  
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