TU Braunschweig, Institut für Robotik und Prozessinformatik (IRP)
Mühlenpfordtstraße 23, 38106 Braunschweig

Hände und Greifen / Robot Grasping and Computational Kinematics

2021 Winter

Organizer	Prof. Dr. Jochen Steil
Lecturer	Dr. Bertold Bongardt
Exercises	S. Tittel, B. Bongardt
Format	2 SWS (L) + 2 SWS (E)
Times / Rooms	Mon, 13:15 – 14:45 (L) + Wed, 11:30 – 13:00 (E)
Rooms	PK 3.3 (L) + PK 3.3 (E)
Module / Credit points	INF-ROB-38 / 5

Goals

Based on the courses 'Robotics 1: Technical and Mathematical Foundations' and 'Robotics 2: Modeling, Analysis, and Control' in the previous semesters, we continue the study of analytical mechanics in this 'Robotics 3' course. We consider the mathematical problems associated to the crucial task of *robot grasping* and study selected topics of the field of *computational kinematics*. The course is a specialized masters teaching module offered by the IRP. It introduces 'advanced tools' that help to solve real-world mechanical problems.

Audience

Students of Computer Science and STEM (Science, Technology, Engineering and Mathematics)

Literature

Relevant reading material will be announced in the lecture

Overview

Block	Monday	Topic
01	2021-10-25	Hands, Grippers, Manipulation
02	2021-11-01	Line Geometry
03	2021-11-08	Screw Theory
04	2021-11-15	Displacements and their Matrix Representations
05	2021-11-22	Dual Quaternions and Projective Coordinates
06	2021-11-29	Tools for Closed Loop Systems
07	2021-12-06	Modeling Contact and Grasps
08	2021-12-13	The Grasping Problems
09	2021-12-20	Analysis and Synthesis of Grasps
10	2022-01-10	Evaluation and Optimization of Grasps
11	2022-01-17	Satisfaction and Optimization: MLIs and SDPs
12	2022-01-24	Sheth–Uicker Parametrization
13	2022-01-31	On Analytical Kinematics Computations
14	2022-02-07	Conclusions