

# Cognition, Control and Learning for Everyday Manipulation Tasks in Human Environments

## Abstract

In recent years we have seen tremendous advances in the mechatronic, sensing and computational infrastructure of robots, enabling them to act faster, stronger and more accurately than humans do. Yet, when it comes to accomplishing manipulation tasks in everyday settings, robots often do not even reach the sophistication and performance of young children. This is partly due to humans having developed their brains into computational and control devices that facilitate knowledge-informed decision making, perspective taking, envisioning activities and their consequences, and predictive control. Brains orchestrate these learning and reasoning mechanisms in order to produce flexible, adaptive, and reliable behaviour in real-time.

Household chores are an activity domain where the superiority of the cognitive mechanisms in the brain and their role in competent activity control is particularly evident.

In this talk, I will give an overview of the Intelligent Autonomous Systems group's ongoing research in the excellence cluster "Cognition for Technical Systems", in which we investigate --- in an interdisciplinary endeavour --- cognitive mechanisms that are to enable autonomous robots to produce flexible, reliable and high-performance behavior for everyday manipulation activities. The talk will step through the "cognitive perception-action loop" for robot control focusing on the acquisition and use of environment models for housework as a running example.

## Curriculum Vitae



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Michael Beetz is a professor for Computer Science at the Department of Informatics of the Technische Universität München and heads the Intelligent Autonomous Systems group. He is also vice coordinator of the German national cluster of excellence COTESYS (Cognition for Technical Systems) where he is also co-coordinator of the research area "Knowledge and Learning".

Michael Beetz received his diploma degree in Computer Science with distinction from the University of Kaiserslautern. He received his MSc, MPhil, and PhD degrees from Yale University in 1993, 1994, and 1996 and his Venia Legendi from the University of Bonn in 2000. Michael Beetz was a member of the steering committee of the European network of excellence in AI planning (PLANET) and coordinating the research area "robot planning". He was also principal investigator of a number of research projects in the area of AI-based robot control. His research interests include plan-based control of robotic agents, knowledge processing and representation for robots, integrated robot learning, and cognitive perception.