

# Design and Control of a Humanoid Robot Arm

Lehrstuhl für Echtzeitsysteme und Robotik - Lehrstuhl für Produktentwicklung  
und Leichtbau Kollaboration



Semesterarbeit / Masterarbeit

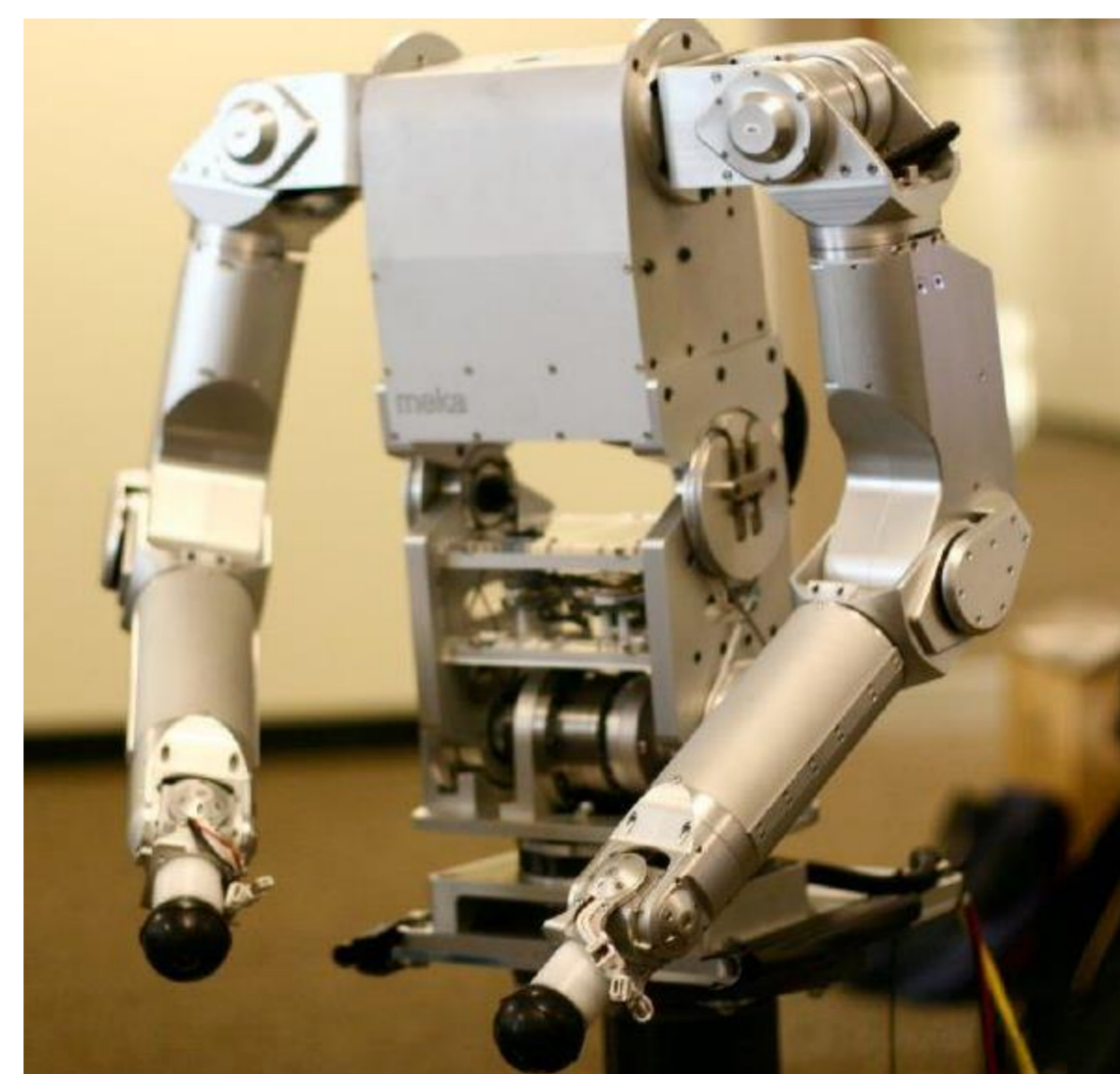
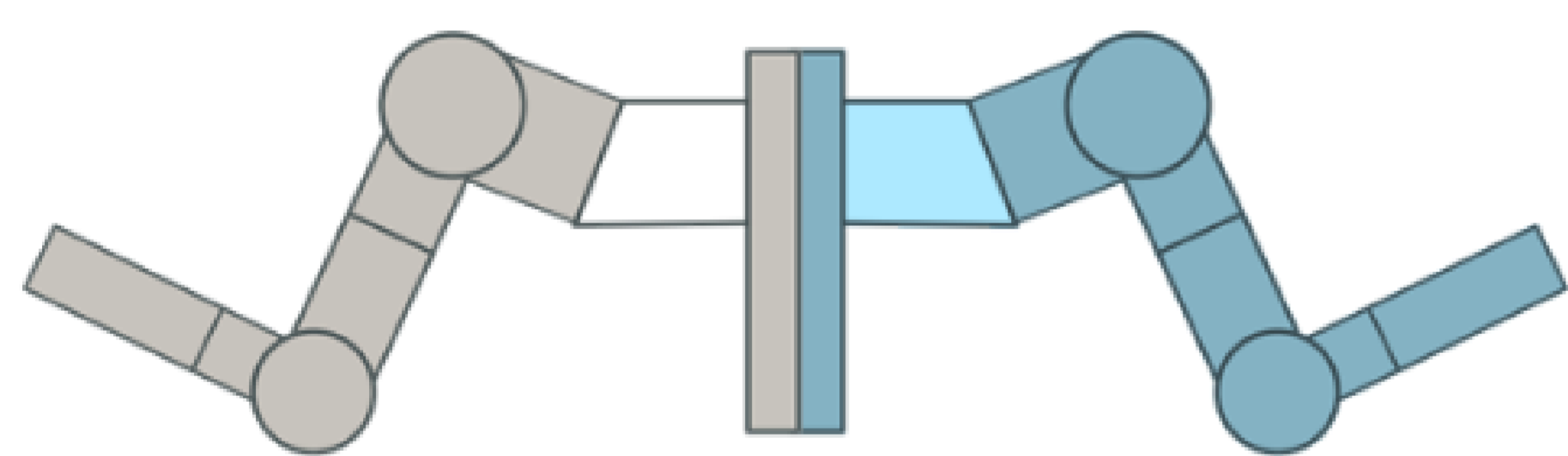
## Background:

There are two fundamentally different models for building intelligent machines. Using the first strategy (Top-down), you decide what capabilities you want your robot to exhibit based on higher level user requirements, that 'builds in' all those abilities from the outset. The second strategy (Bottom-up), has many simple (even 'blind') mechanisms/programs that are integrated into one machine. As these many simple devices begin to work in concert, they can produce behavior that is remarkably complex, even 'intelligent'. Many of the modern robotic systems have been intuitively designed based on a bottom-up approach. The objective of the DIVA project is to design a robotic system that is purely 'top-down' in its development and compare it to an intuitively designed, bottom-up equivalent.

## Description:

The objective is modeling and control of a humanoid robot arm. These include:

- Software architectures and middleware for robot programming
- Tools and best practices for software integration and concurrent development
- Components orchestration using finite state machines & behavior trees
- Optimization, robot kinematics and dynamics for whole body control



*Figure 1. DIVA Project. A humanoid robotic arm focusing on the design exploration of the Top-Down Approach and the design intuitive Bottom-Up approach. (Right): The MEKA arm as an approximation of the realized product.*

## Required skills:

- C, C++, Python
- Background in control theory and dynamical systems
- Knowledge on middleware like ROS and YARP is a plus
- Knowledge on Electronics and PCB design is a plus

## Perks:

- Prototyping allowance
- Work with a fun, energetic team
- Play with new technology
- Hands-on, iterative product development

## Contact:

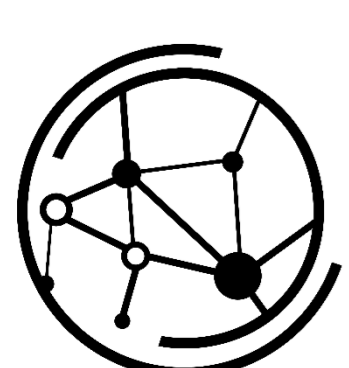
**Dr. Anand Suresh**

Phone: +49 (89) 289 - 15143

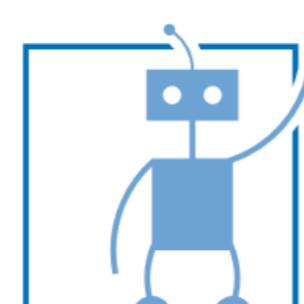
Fax: +49 (89) 289 - 15144

Room: [5506.02.634](https://www.tum.de/en/5506.02.634)

[anand.suresh@tum.de](mailto:anand.suresh@tum.de)



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