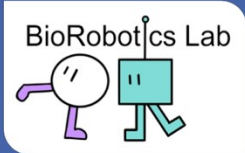


Optimization and Biomechanics for Human Centred Robotics

KIT BioRobotics Lab



Prof. Dr. Katja Mombaur

Endowed Chair by Hector Foundation II
Institute for Anthropomatics and Robotics (IAR)



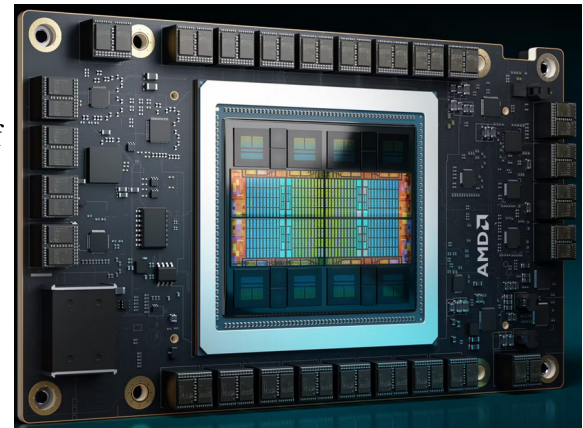
Bachelor's or Master's Thesis Topic:
High-Performance Numerical & Computational Technology for Robot Control

Supervisor: Jonas Große Sundrup (jonas.grosse-sundrup@kit.edu)

Background

Numerical and computational methods, from Numerical Optimal Control approaches to Reinforcement Learning, are a core pillar of modern robotics research. To facilitate efficient real-time control of modern robots in challenging environments, we not only need efficient methods, but also efficient execution.

In this project we are looking at how different approaches can be leveraged on modern hardware, including parallelization and offloading to modern accelerator hardware like GPUs or the groundbreaking AMD Instinct or nVidia Grace Hopper platforms, which are, in similar, but less powerful versions, already available on current robotic platforms in the form of for example nVidia Jetson.

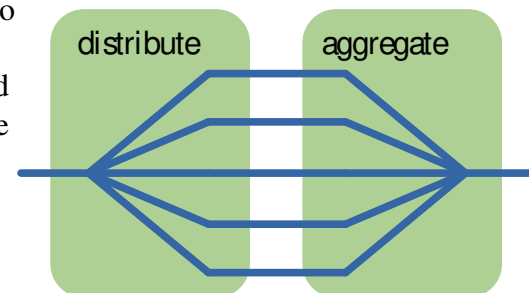
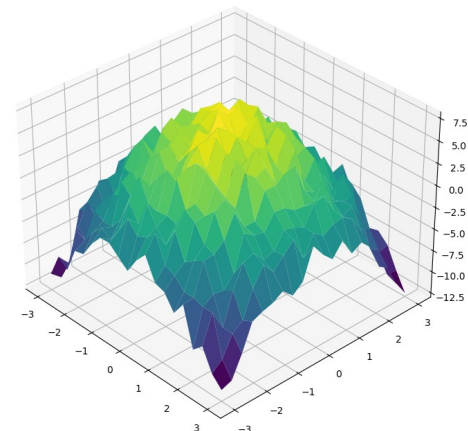


Possible Thesis Scopes

This topic opens up the possibility for different kinds of theses. Possible topics include:

- Evaluating and augmenting existing algorithms for modern high performance computing architectures, including GPU computing, dynamic handover of CPU and GPU computing, etc. and their use for robotic applications
- Evaluating different technologies, for example in hardware or in algorithmic architecture, in terms of their performance impact on numerical and computational robotic control approaches, particularly
- Evaluating ways of pushing modern accelerator technologies to their limits to achieve maximum control throughput.

This is an active research field and the student will be directly involved in bleeding edge research questions in our group, consequentially more questions than the ones described might be available at any point in time. Students are also explicitly encouraged to develop their own solution approaches and propose technology choices in accordance with their specific topic and the overall research goal.



Required knowledge

- Programming experience
- topic-dependent, you are encouraged to inquire within