Karlsruher Institut für Technologie

INNOVATIONSCAMPUS MOBILITÄT DER ZUKUNFT

Institut für Fördertechnik und Logistiksysteme

Bachelor's / Master's Thesis (m/w/d)
Estimating Object Weight and Center of Mass Using Tactile Fingertip Sensors in a Shadow Hand

Problem formulation

Accurately estimating objects' weight and center of mass (CoM) is critical for robotic manipulation, especially in complex and dynamic environments. While force-torque sensors mounted on the robot flange are traditionally used for this purpose, they may not provide the granularity needed for delicate tasks. Tactile fingertip sensors in robotic hands, such as the Shadow Hand, offer a potential alternative, but their accuracy and reliability in estimating weight and CoM require thorough investigation and comparison.

Task definition

This thesis will explore the use of tactile fingertip sensors in the Shadow Hand to estimate the weight and center of mass of objects. The research will involve developing algorithms to process tactile data and comparing the accuracy of these estimations with those obtained from a force-torque sensor mounted on the robot flange. The study will include experimental validation, focusing on the precision, reliability, and applicability of tactile sensors in various manipulation tasks, and provide insights into the advantages and limitations of each approach.

You shall offer

- Solid knowledge base and experience in deep learning and robotics.
- Coding skills in Python and C++.
- Experience with ROS

We will offer

- The most state-of-the-art technologies in deep learning and computer vision.
- Working in a lab with a Germany-wide unique Shadow Teleoperation System
- Tight support from supervisors, including a workshop on scientific writing.

Research area:
AI & Robotics

Focus:
☒ Experimental
☒ Theoretical
☒ Practical
☐ Simulation
☐ Construction (CAD)

Study program:
☒ Maschinenbau
☒ Mechatronik
☒ Elektrotechnik
☒ Informatik
☐ Informationswirtschaft
☐ Wirtschaftsingenieurwesen

Begin: From now on

If you are interested, please send us an e-mail with your **curriculum vitae** and a current **transcript of records**.

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Please note that your data will be treated in accordance with the applicable data protection regulations as part of the application process.