TECHNISCHE UNIVERSITÄT MÜNCHEN
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F O R S C H U N G S P R A X I S

# Reinforcement Learning for Robotic Grasping of Flexible Materials

Problem description:

The ability of robots to grasp and manipulate flexible materials, such as cloth and nets, is crucial for advancing automation in various fields, including household chores, healthcare, mariculture, and industrial applications. Traditional robotic grasping techniques primarily focus on rigid objects, where the dynamics are more predictable. However, flexible materials introduce complex deformation behaviors that challenge conventional control and planning algorithms. This thesis aims to explore robust grasping policies for flexible materials using reinforcement learning (RL), leveraging deep learning techniques to handle the high-dimensional state and action spaces inherent in these tasks.

Work schedule:

- Literature research
- Develop a Simulation Environment: Determine or create a suitable simulation environment that accurately models the physical properties of flexible materials, enabling the training and evaluation of RL algorithms.
- Design RL Algorithms: Adapt and develop RL algorithms tailored for grasping tasks involving flexible materials, focusing on policy learning that can generalize across different shapes, sizes, and types of materials.
- Performance Metrics and Benchmarking: Establish performance metrics and benchmarks for evaluating the effectiveness of RL-based grasping policies, considering factors such as grasp success rate, material deformation, and computational efficiency.

Bibliography:

[1] Matas, J., James, S., Davison, A. J. (2018). Sim-to-Real Reinforcement Learning for Deformable Object Manipulation. Conference on Robot Learning (CoRL).
[2] Seita, D., Tao, M., Laskey, M., Wei, J., and Goldberg, K. (2018). Deep Transfer Learning of Pick Points on Fabric for Robot Bed-Making. arXiv preprint arXiv:1809.09810.

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