Grasp Adaptation for Robotic Manipulation

Description

In this project, the student is tasked to implement a robotic system that allows sim2real policy adaptation of grasps of objects in a heap. Closing the gap between simulation and reality would require data-efficient and scalable training in simulation and fast adaptation in a real scenario [1].

In this project, we will mainly follow a similar approach that has been studied in [3] where they use a simple meta-learning technique that pre-trains a joint policy on a very large real dataset. They use a base reinforcement learning algorithm (RL), called QT-Opt [4] to learn a joint policy across generated real scenarios. This approach is simply not data-efficient where it requires a massive amount of real data in order to enable transferring well across tasks. We will use a technique called Domain Randomization to generated a large set of simulated scenarios [3]. Both training on simulated data and adaptation on real data will be handled by QT-Opt.

Tasks

- Re-implementation: Implement an agnostic paralleled interface for domain randomization that will be used for different meta-learning or domain adaptation methods. This task will be based on the existing distributed and asynchronous QT-Opt implementation in the lab. We will build a distributed robotic simulation [2].
- Improvements: Propose improvements to achieve a more scalable and computationally efficient implementation.
- Benchmarking: The approach will be evaluated against the existing methods on different simulation adaptation scenarios.

References


