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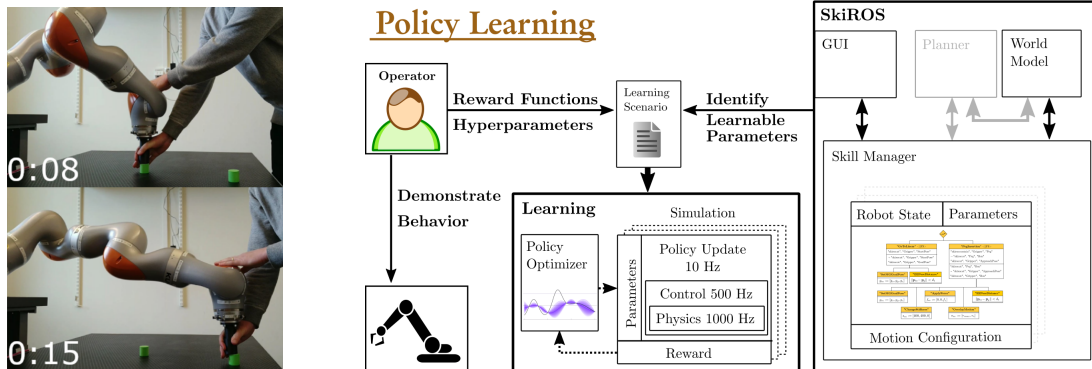Matthias Mayr & Faseeh Ahmad
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Master Project: Learning Imitation of Demonstrated Behaviors with RL-methods using a Robot Arm

Kinesthetic teaching is a well-known method for operators to teach robots a behavior. It is particularly useful when the behavior is difficult to describe in code and often easier to perform by operators.

However, it is not always straight forward to reproduce the taught behaviors. Especially when running modern compliant control, accuracy reduced since e.g. joint friction plays a role. Furthermore, there are many interesting challenges such as encoding the demonstrated behavior and generating a behavior robust. One example for this is a taught peg insertion: The demonstration will be a perfect insertion, whereas this most likely fails when just rerunning the same trajectory. Behaviors such as a parameterized "search" need to added to actually successfully execute it. The research question of this thesis is if reinforcement learning methods can be used to learn a robust behavior that resembles the demonstrated sequence.

Your Tasks

At first you search and discuss related work in the field and get familiar with the skill-based system SkiROS [1] as well as a recent RL-framework. You will design a framework for both demonstrating behaviors as well as learning them. Such a structure should be easily reconfigureable since we learn and execute frequently changing tasks. The approach would be evaluated on a set of learning problems in an industrial setting.

Requirements

- Independent, diligent and structured way of working

- Knowledge in Python

- (Optional) Courses that covered AI or RL methods and robotics

- (Optional) Experience with Linux & ROS

Start Date

- Now or later

What we offer

- State-of-the-art Research

- Option to publish the results

- Regular supervision

- Freedom to explore interesting topics

- Freedom to schedule your time

Key Words

- Robotics

- Reinforcement Learning

- Kinesthetic Teaching

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[1] https://github.com/RVMI/skiros2

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