Elmar Rückert
TU Graz, Arbeitsgruppe von Wolfgang Maas

Title:
Movement Primitives with intrinsic probabilistic planning

Abstract:
A common approach to represent complex movements like walking or balancing is to use a parametrized policy representation in the form of movement primitives. Currently used approaches for movement primitives parametrize the shape of the trajectory either directly or indirectly, e.g. via dynamical systems. In these existing cases, the movement generation for a primitive with given parameters is a computationally non-simple, non-planning process. For complex movements this implies a large number of parameters which usually complicates learning and limits generalization of desired movement skills. In this work we propose to use probabilistic planning as intrinsic part of the movement generation of a primitive in order to get a more compact movement representation.
Instead of a parametrization of a trajectory, the parameters of the primitive now define abstract desired goals or features of the movement.
This is done by modulating an intrinsic cost function used by the intrinsic planning algorithm that generates the movement. The approach mixes model-based and model-free Reinforcement Learning: in addition to learning the primitive parameters based on Reinforcement, we exploit the data also to approximate a dynamic system model used by planning. As we will show, this can be efficiently done simultaneously. Our experiments show that the compact movement representation of our approach facilitates learning and improves the quality of the learned policy.