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

for

Huang Bo

Mat.-Nr. , field of study

Deep-Dynamic Movement Primitives learning using convolutional neural networks.

Problem description:

Dynamic Movement Primitive (DMP) provides a way for encoding motion data [1]. DMP model consists of two dynamical systems with one way parameterized connection such that one system drives the other (acting as a clock). Dynamical system can either form point attractor or limit cycles which make them suitable for imitating single-stroke movements or rhythmic tasks and provide robustness against perturbation. The approach relies on reshaping the attractor landscape by using non-linear regression (forcing terms) for imitating demonstrated movement.

The forcing terms of a DMP can be modeled with the radial basis functions [1] or any other suitable function approximator [2]. Recently deep learning approaches using the Convolutional Neural Networks (CNN) have provided promising results in robotics applications [3]. This work will focus in replacing the forcing terms of a DMP by a CNN. This in turn can provide more informative input to a DMP, by directly processing camera images with a CNN.

Work schedule:

- Experimenting and training different CNN architectures on data acquired from the KUKA LWR.

Bibliography:

- [1] Ijspeert, Auke Jan, Jun Nakanishi, and Stefan Schaal. Learning attractor landscapes for learning motor primitives. No. BIOROB-CONF-2002-004. 2002.
- [2] Affan Pervez, Dongheui Lee. "Learning Task Parameterized Dynamic Movement Primitives using mixture of GMMs"
- [3] Levine, Sergey, et al. "Learning Hand-Eye Coordination for Robotic Grasping with Deep Learning and Large-Scale Data Collection." arXiv preprint arXiv:1603.02199 (2016).

Supervisor: M.Sc. Affan Pervez

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(D. Lee)
Univ.-Professor