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F O R S C H U N G S P R A X I S
for
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Model-based Reinforcement Learning for Variable Stiffness Actuators

Problem description:

A novel technological trend in robotics focuses on the development of actuators able to change their stiffness with dedicated mechanisms, the so-called variable stiffness actuators (VSA) [1]. As human muscles, VSA are able to safely (compliantly) interact with unknown environments and to generate explosive motions.

In this Forschungspraxis work the student has to implement an algorithm, based on reinforcement learning, to learn the optimal policies for VSA in highly dynamic tasks. Fast convergence towards an optimal solution will be guaranteed by adopting a model-based reinforcement learning approach, namely the Probabilistic Inference for Learning Control (PILCO) [2]. The implemented approach will be tested in simulation on a chain of VSA in hammering and jumping tasks.

Work schedule:

- Learning algorithm implementation in Matlab/Simulink
- Experimental evaluation in hammering and jumping tasks

Bibliography:

[1] M. G. Catalano, G. Grioli, M. Garabini, F. Bonomo, M. Mancini, N. G. Tsagarakis, A. and Bicchi. VSA - CubeBot. A modular variable stiffness platform for multi degrees of freedom systems, in *International Conference on Robotics and Automation*, 2011.

[2] M. P. Deisenroth and C. E. Rasmussen. PILCO: A Model-based and Data-Efficient Approach to Policy Search, in *International Conference on Machine Learning*, 2011.

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