Robust Reinforcement Learning (RL)/Adaptive Dynamic Programming (ADP) for Continuous Systems

TECHNISCHE UNIVERSITÄT DARMSTADT

Seminar Project (2-4 students, Homeoffice)

RL has been successfully applied to discrete-time systems or Markov Decision Processes (MDPs). Nevertheless, it has been challenging to generalize such results to the controller design of physical systems.

One reason is the state space of a physical control system is generally continuous and unbounded, and the states are continuous in time. Moreover, the stability properties and constraint satisfaction have to be carefully taken into account.

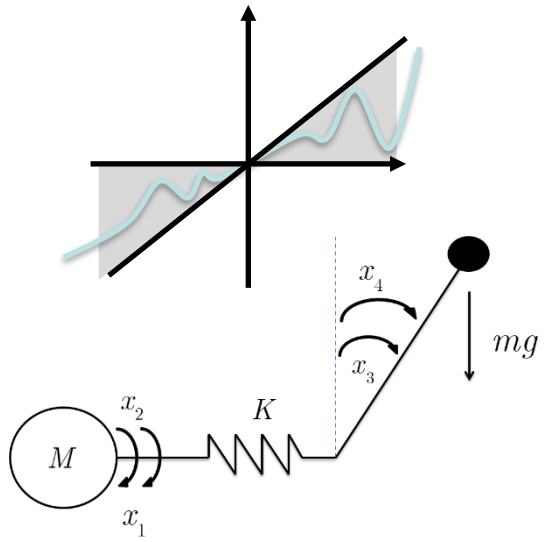
In this project, the students will do research on the robust ADP presented in [1]. The focus is on linear systems with nonlinear uncertainty.

The tasks for the students (working as a group) are:

- Understand the framework
- Conduct a simulation/numerical example in Matlab to illustrate the approach

The suggested system for simulation can be a flexible link robot arm in [2]. However, the students can propose the system that they want to work with.

The advising will be preferably done in English. If you have any questions, feel free to contact us.



[1] Y. Jiang and Z. -P. Jiang, "Robust Adaptive Dynamic Programming and Feedback Stabilization of Nonlinear Systems," in IEEE Transactions on Neural Networks and Learning Systems, vol. 25, no. 5, pp. 882-893, May 2014.
[2] A. Howell and J. K. Hedrick, "Nonlinear observer design via convex optimization," Proceedings of the 2002 American Control Conference (IEEE Cat. No.CH37301), 2002, pp. 2088-2093 vol.3.

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CCPS Control and Cyber-Physical Systems