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## A D V A N C E D   S E M I N A R

### Trajectory Tracking of learned Dynamics

#### Problem description:

Effective trajectory tracking is an essential skill for modern robots and has many applications in industrial production lines or service duties. It is also very interesting from the general control engineering perspective. Tracking denotes the problem of choosing an input of a system such that its output follows a desired reference value which generally varies in time [3].

This reference value is often given as a time encoded function, the reference trajectory. But depending on the application, desired trajectories can also be generated from dynamical systems. This is commonly known as the servo problem and well understood in the control community. New challenges arise if the task is to follow trajectories which are learned from observations [2]. As learning usually leads to a stochastic description of the desired dynamics, we are interested in how the stochastic modelling affects the servo/tracking problem. A specific focus is set on Model Predictive Control (MPC) and optimal control approaches to tracking [1].

The goal of this Advanced Seminar is to perform a literature research to identify different classes of problem settings, discuss the properties and evaluate the available solutions for the tracking/servo problem based on learned trajectories.

- Review fundamental concepts of the tracking/servo problem from classical control
- Identify and discuss different settings for trajectory tracking of learned trajectories
- Summarize state of the art and identify open challenges for tracking of stochastic dynamics

#### Literatur

- [1] James Blake Rawlings and David Q. Mayne. *Model predictive control : theory and design*. Madison, Wis. Nob Hill Pub. cop., 2009.
- [2] Stefan Schaal, Jan Peters, Jun Nakanishi, and Auke Ijspeert. Learning movement primitives. In *Robotics Research. The Eleventh International Symposium*, pages 561–572. Springer, 2005.
- [3] Bruno Siciliano and Oussama Khatib. *Springer handbook of robotics*. Springer Science & Business Media, 2008.

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