Learning and Adaptive Control

Dates and Time

01-10-2025; 13:45-16:00 (WH) – Wednesday!

13-10-2025; 13:45-16:00 (WH)

27-10-2025; 13:45-16:00 (WH)

03-11-2025; 13:45-16:00 (HK)

10-11-2025; 13:45-16:00 (HK)

17-11-2025; 13:45-16:00 (HK)

24-11-2025; 13:45-16:00 (JD)

01-12-2025; 13:45-16:00 (JD)

Course Location

Cursus- en Vergadercentrum Domstad

Koningsbergerstraat 9 3531 AJ Utrecht

ECTS

6 ECTS if the homework assignments are completed successfully.
1,5 ECTS for auditing the course.

Lecturers

Prof. dr. ir. Wouter B. J. Hakvoort, University of Twente
Dr. Hakan Köroğlu, University of Twente
Dr. Janset Daşdemir, University of Twente

Objective

This course presents selected material on learning and adaptive control. It is divided into three parts organized as follows: Part I – Lectures 1-3; Part II: Lectures 4-6; Part III: Lectures 7-8. In the first part, the lectures will be on disturbance observers, iterative learning control and adaptive feedforward control respectively. In the second part, the first lecture will be on online parameter estimation in continuous time including robustness modifications as well. This will be followed by direct model reference adaptive control of continuous-time systems based on state and output feedback. The third part of the lectures will focus on adaptive control of nonlinear robotic systems modeled by Euler-Lagrange dynamics. Topics include full-state and output-feedback control under parametric uncertainty, with an emphasis on DCAL-based structures and filter-based adaptive estimation techniques.

Contents

8.1 Linear Filter-Based Adaptive Output Feedback Control

8.2 Nonlinear Filter-Based Adaptive Output Feedback Control

Course materials

Lecture slides and recommended reading material will be made available on the DISC course platform.

Prerequisites

A basic graduate course on systems and control (with contents including state-space and transfer function models, discrete-time control, controllability/observability, stability analysis in the frequency domain, Lyapunov stability theory) is a prerequisite. A recap/self-study of basic results from calculus and functional analysis will be needed (and will be requested beforehand in due time) as well. MATLAB/SIMULINK will be used to do the homework assignments.

Homework Assignments

There will be eight homework assignments (i.e. one assignment per lecture), which will be distributed via the course platform. Assignments will be graded on a scale from 1 to 10 (with 1 given as the base grade for any submission). The final grade for the course will be an average of the grades for the homework assignments.