EL2700 Model Predictive Control 7.5 credits

Modell-prediktiv reglering

Course syllabus for EL2700 valid from Autumn 16

This is a translation of the Swedish, legally binding, course syllabus.

Grading scale: A, B, C, D, E, FX, F
Education cycle: Second cycle
Main field of study: Electrical Engineering

Intended learning outcomes

After the course, you should be able to

- analyze properties of discrete-time linear systems in state-space form
- compute optimal open-loop controls for state transfer using linear and quadratic programming
- use dynamic programming to design state estimators and linear controllers that minimize a quadratic cost criterion in the states and controls (LQG-optimal controllers)
- understand the receding-horizon idea and how MPC extends LQG-optimal control to deal with state and control constraints
- design MPC controllers for engeinering systems, making effective use of its tuning parameters to meet closed-loop performance targets
- have a basic understanding of stability properties of MPC controllers
- know how MPC can be implemented as either an nonlinear control law or using on-line optimization

Course main content

Properties of discrete-time linear systems in state-space form; optimal state transfer by linear and quadratic programming; design of linear-quadratic optimal controllers using dynamic programming; model predictive control and the receding horizon principle; dealing with state and control constraints; design and tuning of model predictive controllers and receding-horizon estimators; output feedback MPC; reference-following MPC; stability analysis of MPC controllers; implementation as explicit nonlinear feedback law or by real-time optimization

Disposition

Lectures, Exercises, Computer exercises, Laboratory works. Homeworks

Language of instruction

Language of instruction is specified in the course offering information in the course and programme directory.

Eligibility

Automatic Control, Basic Course, or permission by the coordinator.

Literature

J. B. Rawlings and D. Q. Mayne, Model Predictive Control: Theory and Practice, Nob Hill Publishing, 2015.

Examination

- LAB1 - Lab 1, 1.5 credits, grading scale: P, F
- LAB2 - Lab 2, 1.5 credits, grading scale: P, F
- LAB3 - Lab 3, 1.5 credits, grading scale: P, F
- TEN1 - Exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Requirements for final grade

LAB1 1.5p

LAB2 1.5p

LAB3 1.5p

TEN1 3p