

February 21, 2023

Special course introduction (Final call)

Course title Introduction to Adaptive and Optimal Control
Lecturer Kazuhisa ITO, Visiting Professor (Shibaura Institute of Technology, Tokyo, Japan)
Course content This course provides some basic knowledge and tools for designing discrete time adaptive control system and/or optimal control system. These control strategies are effective for stabilization, regulation, or tracking control for real systems. For easy comprehension, mathematical and system control preliminaries such as signal norm, linear control theory, system stability and so on are reviewed in first several lectures. Preparations will be required for every lecture.

Course hours Full online lectures, 2 hrs. on Thursday 14,30 (see also below)
Zoom Meeting ID: 980 7107 7754, Passcode: AOC or access to



Language English

Class schedule

- 1st March 2, Preliminaries of mathematical tools 1: norm, useful inequalities, Lagrange multiplier
- 2nd March 9, Preliminaries of mathematical tools 2: matrix inversion lemma, positive definite matrix
- 3rd March 16, Stability theorem: definitions, Lyapunov stability, asymptotic stability
- 4th March 23, Adaptive estimation 1: system description, projection algorithm, stability proof
- 5th March 30, Adaptive estimation 2: least-square algorithm, stability proof
- 6th April 6, Adaptive estimation 3: least-square algorithm, stability proof (cont'd)
- 7th April 13, Key technical lemma: boundedness and convergence
- 8th April 20, One-step-ahead adaptive control for SISO system 1: derivation of adaptive controller
- 9th May 11, One-step-ahead adaptive control for SISO system 2: stability of adaptive controller with projection algorithms
- 10th May 18, Model predictive control: concept and evaluation function, prediction horizon
- 11th May 25, Model predictive control: basic solution, multiple coincidence point case
- 12th June 1, Model predictive control: introduction of control horizon and solution
- 13th June 8, Application examples: Artificial muscle control, Greenhouse environment control

CAD MATLAB/Simulink

Textbook Original textbook can be downloaded from



References - G. C. Goodwin and K. S. Sin, Adaptive Filtering Prediction and Control, Dover Books on Electrical Engineering, 2009
- J. M. Maciejowski, Predictive control with constraints, Prentice Hall, 2002

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