Introduction

Big picture
Syllabus
Requirements

Big picture

ME 233 talks about advanced and practical control theories, including but not limited to:

- dynamic programming
- optimal estimation (Kalman Filter) and stochastic control
- SISO and MIMO feedback design principles
- digital control: implementation and design
- feedforward design techniques: preview control, zero phase error tracking, etc
- feedback design techniques: LQG/LTR, internal model principle, repetitive control, disturbance observer
- system identification
- adaptive control
- ...

Teaching staff and class notes

- instructor:
  - Xu Chen, 2013 UC Berkeley Ph.D., maxchen@berkeley.edu
  - office hour: Tu Thur 1pm-2:30pm at 5112 Etcheverry Hall
- teaching assistant:
  - Changliu Liu, changliuliu@berkeley.edu
  - office hour: TBA
- class notes:
  - ME233 Class Notes by M. Tomizuka (Parts I and II); Both can be purchased at Copy Central, 48 Shattuck Square, Berkeley

Requirements and evaluations

- website (case sensitive):
  - www.me.berkeley.edu/ME233/sp14
  - bcourses.berkeley.edu
- prerequisites: ME C 232 or its equivalence
- lectures: Tu Thur 8-9:30am, 3113 Etcheverry Hall
- discussions: Fri. 10-11am, 1165 Etcheverry Hall
- homework (20%)
- two in-class midterms (20% each): Mar. 6, 2014 and Apr. 15, 2014; one-page handwritten summary sheets allowed
- one final exam (40%): May 15 2014 (Th), 7 pm -10 pm; open notes

Prerequisites (ME 232 table of contents)

- Laplace and Z transformations
- Models and Modeling of linear dynamical systems: transfer functions, state space models
- Solutions of linear state equations

- Stability: poles, eigenvalues, Lyapunov stability
- Controllability and observability
- State and output feedbacks, pole assignment via state feedback
- State estimation and observer, observer state feedback control
- Linear Quadratic (LQ) Optimal Control, LQR properties, Riccati equation

Remark

ME233 will be webcasted:

- Berkeley's YouTube channel (http://www.youtube.com/ucberkeley)
- iTunes U (http://itunes.berkeley.edu/)
- webcast.berkeley (http://webcast.berkeley.edu)

links will be posted on course website when available

References (also on course website)

- Probability
  - Bertsekas, Introduction to Probability, Athena Scientific
  - Yates and Goodman, Probability and Stochastic Processes, second edition, Willey
- Linear Quadratic Optimal Control
  - Anderson and Moore, Optimal Control: Linear Quadratic Methods, Dover Books on Engineering (paperback), 2007. A PDF can be downloaded from: http://users.rsise.anu.edu.au/%7Ejohn/papers/index.html
  - Lewis and Syrmos, Vassilis L., Optimal Control, Wiley-IEEE, 1995
  - Bryson and Ho, Applied Optimal Control: Optimization, Estimation, and Control, Wiley
- Stochastic Control Theory and Optimal Filtering
  - Brown and Hwang, Introduction to Random Signals and Applied Kalman Filtering, Third Edition, Willey
  - Lewis and Xie and Popa, Optimal and Robust Estimation, Second Edition CRC
  - Grewal and Andrews, Kalman Filter, Theory and Practice, Prentice Hall
  - Anderson, and Moore, Optimal Filtering, Dover Books on Engineering (paperback), New York, 2005. A PDF can be downloaded from: http://users.rsise.anu.edu.au/%7Ejohn/papers/index.html
  - Astrom, Introduction to Stochastic Control Theory, Dover Books on Engineering (paperback), New York, 2006
- Adaptive Control
  - Astrom and Wittenmark, Adaptive Control, Addison Wesley, 2nd Ed., 1995
  - Goodwin and Sin, Adaptive Filtering Prediction and Control, Prentice Hall, 1984
  - Krstic, Kanellakopoulos, and Kokotovic, Nonlinear and Adaptive Control Design, Willey