
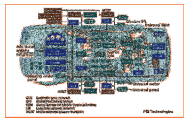
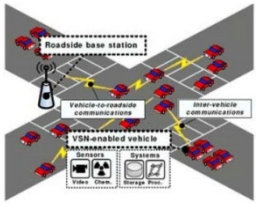


CSC8260:
Wireless Networking and Cyber-Physical Systems

Hongwei Zhang

http://www.cs.wayne.edu/~hzhang

Objectives of the course

Build up your background in wireless cyber-physical systems (WCPS)

- Wireless networking
- Real-time systems and networking
- Wireless networked control

- Basic scientific methodology: control, optimization, etc
- Applications of WCPS in next-generation transportation, power grid, and healthcare systems

Topics to cover

- CPS applications
  - smart energy grid, transportation system, healthcare, etc.
- Fundamentals of wireless communication
  - wireless channel, signal propagation, modulation, link models, etc.
- Fundamentals of control systems

Topics (contd.)

- Wireless networking in a local region: MAC
- Large scale wireless networking: routing, transport
- Real-time wireless networking: real-time MAC, routing, and transport in wireless settings
- Predictable wireless networking in an uncertain world: wireless system and environmental dynamics, jamming, etc.
- Wireless networked control

Textbooks

- Strongly recommended
  - **[R0]** Anurag Kumar, D. Manjunath, Joy Kuri, *Wireless Networking*, Morgan Kaufmann, 2008. ISBN: 978-0-12-374254-4
- Recommended
  - **[R1]** Anurag Kumar, D. Manjunath, Joy Kuri, *Communication Networking: An Analytical Approach*, Morgan Kaufmann, 2004. ISBN: 0124287514
  - **[R2]** Jane Liu, *Real-Time Systems*, 2nd edition, Prentice Hall, 2000
  - [**R3**] C. Siva Ram Murthy and G. Manimaran, *Resource Management in Real-Time Systems and Networks*, MIT Press, 2001
  - **[R4]** Thomas G. Robertazzi, *Computer Networks and Systems: Queueing Theory and Performance Evaluation* (3rd edition), Springer. (ISBN: 0387950370)
  - **[R5]** Ravindra K. Ahuja, Thomas L. Magnanti, James B. Orlin, *Network Flows: Theory, Algorithms, and Applications*, Prentice Hall, 1993.
  - **[R6]** Joseph L. Hellerstein, Yixin Diao, Sujay Parekh, Dawn M. Tilbury, *Feedback Control of Computing Systems*, Wiley-IEEE Press, 2004. (ISBN: 978-0-471-26637-2)
  - **[R7]** Sheldon M. Ross, *Introduction to Probability Models*, 9th edition, Academic Press, 2006. (ISBN: 9780125980623)
  - **[R8]** Robert G. Gallager, *Discrete Stochastic Processes*, Kluwer Academic Publishers, 1996. (ISBN: 0792395832)
  - **[R9]** Mohamed G. Gouda, *Elements of Network Protocol Design* (1st edition), John Wiley & Sons. (ISBN: 0471197440)

Logistics

- Class timings
  - MW 3:00pm-4:20pm
- Office hours
  - MW 4:30pm-5:30pm in *Suite 14101.3, Maccabees Building*, or by appointment
- Teaching Assistant
  - TBA

Logistics (contd.)

- Prerequisites
  - Basic knowledge of computer networks (e.g., materials covered in CSC6290 or equivalent), elementary probability theory, statistics, and mathematical logic
  - Or consent of instructor
- Course website
  - http://www.cs.wayne.edu/~hzhang/courses/8260/8260.html

Logistics (contd.)

- Grading
  - Class participation: 20%
  - Paper presentation: 35%
  - Project: 45%
- Letter grades will be assigned based on performance ***relative*** to other students; A tentative grading scale:

  A: 93-100
  A-: 90-92
  B+: 85-89
  B: 80-84
  B-: 75-79
  C+: 70-74
  C: 65-69
  C-: 60-64
  F: 0-60

Project

- Solve one research issue in
  - *Wireless, real-time, embedded networking* technologies and applications in cyber-physical systems
    - vehicles: V2V, V2I, sensing and control, infotainment, etc.
    - power-grid: alternative energy microgrid, hybrid power grid, etc.
    - industrial control: feedback control, machine health monitoring, etc.
    - healthcare: assisted living, etc.
    - Others
    - Can focus on issues such as *MAC, interference management and control, routing, transport control, networked control, wireless sensing enabled decision making*

Project (contd.)

- Rules
  - Students are allowed to form groups in doing projects, but the number of students per group should be no more than 2
- Deliverables
  - Written project report (in the form of a research report)
  - In-class presentation
- Timeline
  - Select the topic and form your project group by 01/31/2012
  - Detailed project report outline & list of references are due on 02/29/2012
  - Submit slides for your presentation at least one day before your presentation (date to be decided)
  - Submit your project report electronically by midnight 04/28/2012

Policies

- Frequently check out the course website for updated information
- Actively participate in open discussion on research issues
- Read assigned research articles, if any, before coming to class
- Project required
- Other WSU polices

How to succeed in this course?

- Attend/follow lectures, read books & papers
- Work on project
- Ask questions!!!

Questions?

Student questionnaire

- Name (optional): E-mail (optional):
- Major: Degree/Expected Year:
- Mathematics courses (e.g., elementary probability theory, statistics, and mathematical logic) taken:
- Computer Networking courses taken:
- What do you expect to learn from this course? How do you think this course should be taught?
- How might this course contribute to your career objectives?