Advanced Wireless Networking

Course Information

Hung-Yun Hsieh
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Registration Information

- Course information
  - Title: Advanced Wireless Networking (高等無線網路)
  - Code number: 942EU0390
  - Credit: 3 points
  - Time: Wednesday 2:20pm ~ 5:20pm
  - Place: Room 101, EE-II Building
- Instructor
  - Prof. Hung-Yun Hsieh <hyhsieh@cc.ee.ntu.edu.tw>
  - Office: Room 409, EE-II Building
  - Office hours: By appointment

Advanced Wireless Networking

- Goal and scope
  - This course is designed for students with wireless networks background who plan to pursue research on selected topics in wireless networking
  - It investigates fundamental theories and state-of-the-art techniques for solving various important problems in wireless networks
    - ☞ The emerging area of embedded, networked sensors
      - Data-centric communication
      - In-network processing
      - Localization
      - Time synchronization
      - Fault tolerance
    - ☞ Not necessarily limited to sensor networks

Not an Introductory Course

- Wireless sensor networks
  - Highly cross-disciplinary in nature
    - Diverse sensing & actuation technologies (e.g. audio, mechanical, optical, and biological)
    - Versatile applications (e.g. scientific, industrial, medical, military, commercial)
    - ☞ Circuit design, control, signal processing, communications, operating systems, …
  - This course is not designed to prepare you with basics and overviews of sensor technologies and their applications for advanced topics in related disciplines
    - Hopefully the college will offer such a class in the near future

Intended Audience

- Networking issues in wireless sensor networks
  - ☞ Much of the recent greatest excitement about sensors comes from the idea of using large numbers of them that can communicate with each other and form ad hoc networks
- Prerequisites
  - Wireless ad hoc networks
    - In particular, knowledge in MAC and multi-hop routing protocols, and fundamental properties of connectivity and capacity for multi-hop wireless networks
  - ☞ Have a good command of network simulators (NS-2)
  - ☞ Have a good command of English (reading, writing, listening, and speaking)

Course Materials

- No textbooks
  - Selected articles from IEEE/ACM journals, magazines, and conference proceedings
  - Selected chapters from books in wireless sensor networks
- References
  - H. Karl and A. Willig, Protocols and Architectures for Wireless Sensor Networks, Wiley & Sons, 2005
  - C. Raghavendra, K. Sivalingam and T. Znati (eds), Wireless Sensor Networks, Springer, 2005
  - B. Krishnamachari, Networking Wireless Sensors, Cambridge University Press, 2005

Grading

- Grading criterion
  - Class participation (20%)
  - Homework and paper reviews (40%)
  - Term project (40%)
- ☞ No midterm or final exams of any kind
  - The good thing: no more students' nightmare to burn the midnight oil and cram yourself with details that you are not interested in
    - ☞ You can focus on the topics that interest you most and work on it as your term project
  - The bad thing (if you will): you don't assume the role of a conventional "student"

Collaborative Learning

- Learn as you teach
  - You will be disappointed if you expect someone to teach you everything that is to learn about this course
  - You choose the topic you are interested in, research on it, and teach us
    - A preliminary list of references will be supplied
    - Read these papers and search for additional materials if necessary
    - Prepare for the teaching materials (e.g. slides) and meet me before presentation
    - Teach us what you have learned
    - Critique the literature, present and defend your opinions
  - ☞ No experts on all areas here: we are all learning!

More on Literature Review

- Presentation
  - Each topic is allocated two weeks of time
    - First week: fundamental concepts and solutions
    - Second week: state-of-the-art technology and in-depth investigation
  - ☞ Better interaction with the audience
- Discussion forum
  - Each topic has a discussion forum where the presenters play the key role in initiating discussions, and answering questions
  - ☞ Post the review report after the presentation
- ☞ Active class participation required

Homework

- Beyond literature review
  - Hands-on exercises using simulations
  - Tools that will be used
    - Generic network simulator – NS-2
    - Mote simulator (emulator) – TOSSIM
- TOSSIM: TinyOS mote simulator
  - TinyOS is an event based, open-source operating environment designed for use with embedded networked sensors
    - ☞ Supported hardware: Mica, Mica2, MicaZ, Telos, iMote, …
  - TOSSIM uses real application code for simulation (in particular for large-scale simulation)
- ☞ Can be extended to build your term project

Term Project

- Requirements
  - Related to the course topics
  - Interesting issues
  - Sufficient depth
- Project types
  - Protocol design and evaluation
  - Performance analysis
  - Network simulation
  - Testbed demonstration
  - ☞ Any work that has the quality of international conference papers is good for the project
- ☞ More details as we go along

Go Online

- Web page

  http://cc.ee.ntu.edu.tw/~hyhsieh/teaching/networking06s
  - Announcement
  - Access course materials
  - Upload submissions (slides and reports)
    - Paper review
    - Homework
    - Project
- Discussion forum

  http://tonic.ee.ntu.edu.tw/forum
  - Register first

Course Administration

- An English course
  - All formal submissions and oral presentations need to be in English
  - Use English for classroom interactions whenever possible
    - ☞ Language shouldn't be the reason that hold you back from speaking
- Teamwork
  - A group of two
- Class attendance
- Honest code