EEL 6788 - Advanced topics in wireless networks
Focus on urban sensing

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Welcome to EEL 6788 - Advanced topics in wireless networks

- This class is a vehicle for students to immerse themselves into current research topics in wireless networks.
- To clarify a misunderstanding caused by the EEL prefix: this is not an electrical engineering class. Our perspective is computer science computer engineering: software, networking protocols, some hardware. We are not interested in antennas, signal processing etc.
  - EE majors are, of course welcome to the class.
- Every year, we choose a different topic. Previously we had:
  - Ad hoc networks
  - Sensor networks
  - Sensor networks from an agent perspective
This year’s topic: urban sensing

- How to use the ubiquitous personal devices
  - best example being smartphones
  - ... but also cameras, watches, personal health monitors etc.
- to **sense** our environment
- **collect, validate, integrate** and **secure** the data
- and **deliver** it to interested customers, either centralized or distributed.

- Also known as **participatory sensing, urban computing** etc.
Example 1: real time distributed environment monitoring

- monitor the level of allergens in areas around the city
- use the cell phone’s sensor to sense the data
- distribute the information
  - to centralized locations where a map is created
  - peer to peer to people who are interested

Challenges

- How do we know that people are interested?
- What is the motivation in sending?
  - Free-rider problem
Example 2: citizen science

- setting up a study which monitors some environmental value important to the community
  - e.g. noise, pollution, vibration caused by trucks, water quality
- real world studies are very expensive
- use cellphones to record data, send it to a central location

Challenges

- Do we trust the data?
  - Can we prevent malicious users to distort the values?
  - What about recording errors?
  - The issue of motivation
Example 3: price arbitrage

- prices of products show a variation across stores
- stores rely on the fact that comparison shopping is expensive
  - time
  - fuel cost
  - attention span
- use peer-to-peer networks to record / take a picture of prices
- distribute it to interested parties.

Challenges

- Motivation, free-riders, trust
- Conflict of interest: do I want to share the deal I found?
  - Idea: prospect of mutual benefit
Who is interested in urban sensing?

- Industry
  - Microsoft
  - Nokia
- Academia
  - UCLA
  - Dartmouth
  - MIT
- Startup companies
About the instructor

- Damla Turgut
- http://www.eecs.ucf.edu/~turgut
- HEC-317, turgut@eecs.ucf.edu (preferred), phone: (407) 823-6171
- Class time: MW 9am-10:15am
- Office hours: MW 3pm-6pm
- Research interests:
  - wireless networks (sensor, ad hoc, etc.)
  - mobile computing
  - embodied agents
Class organization

- It is a **research class**. Goal is to collectively explore an interesting new domain.
- Strong emphasis on student participation.
- The culminating experience (and determining factor of the grade) is the **project**
  - real world smart-phone application (Android, iPhone, WebOS etc)
  - real world PC-simulated smart-phone application (eg. Android emulator)
  - netbook apps
  - simulation of urban sensing scenarios (YAES etc.)
  - surveys
- Projects with programming components can be 1-2 persons, survey projects are 1 person only.
- Objective: projects as scientific papers.
Class deliverables and grading

- Presentation (20%)
- Project (60%)
- Homeworks (20%)

Standard 90/80/70/60 scale will be used for final grades.
However, the instructor may use +/- grading for the final grades.
Research a topic in urban sensing and present it in class in a 20 min presentation.

- The goal is to be able to cover more material than if I would have to lecture.
- The goal of the presentation is to teach us.

It is usually centered around a single application. I would expect it to be a bit more than summarizing a paper: you need to read the background of the persons, the circumstances etc.

Example: CenceMe from Dartmouth. Yes there is a paper which describes the Nokia N900 version. But there is also a later iPod application, it might be that there is a small company as well etc.

I will put up a series of suggested topics, you can come with your own.

Send me the presentation in Powerpoint, OpenOffice or PDF ahead of time such that I can put it on the webpage.
Real world application using a smartphone platform (Android, iPhone etc.)
–//– with smartphone emulated on a PC (eg. Android emulator)
–//– simulated on a PC (eg. YAES ...)
Netbook apps (preferable using peer-to-peer wireless)
Surveys

Programming projects 1-2 person, surveys 1 person only.
You can get away without programming, but you then you need to read a lot.
Check the website for the exact deliverables of a project.

They are structured such that you can send the project to a conference / journal.

... and I think you should

... consider it as an exercise in a research project
Homeworks: reading assignment

- Two or three reading assignments on papers relevant to the topic.
- Deliverable: 500 word summaries on the papers.
Timeline (tentative)

- **January 31:** Decide on the project, assemble the teams.
  - Make sure you have a half page description about the specification of the project: what tools are you going to use, what functionality do you expect to work at the end of the project.

- **February 28 - March 2:** Half time report of the projects (no class presentations)
  - Some code should be working... Ideal report: we have done most of the functionality, but we need some debugging.
  - The final report is already started, with the already accomplished
  - Show me your progress: come to the office hours and demo it, show it over skype, send me a video, etc.

- **March 2:** Homework 1 due (presentations 1/26 - 2/28)

- **April 11:** Homework 2 due (presentations 3/2 - 4/6)

- **April 13-25:** in-class presentations of the projects
  - Focus on demo

- **April 27:** final reports due

- **April 30:** Homework 3 due (all the project presentation writeups due)
The first preference would be to actually come to the class for your presentation and present your project.

But you can record your presentation and we will play them in class:

- Using the Powerpoint record presentation mode.
- Video tape it.
- Use the Tegrity recording feature.
- ... I am open to other technological approaches, e.g. video conferencing.

★ A challenge is that it needs to retain an accessible Tegrity record.