CSE 510
Projects

Richard Anderson
Ken Fishkin
(with Alan Borning, David Mizell, Joe McCarthy)

Project Charge

- The lectures have been broad samplers of various topics in HCI. Your project should pick one of those topics, or a part of it, and explore it in depth.

Project goals

- Do something interesting tied to the course
- Reinforce concepts and get a taste for HCI research
- Investigate something you are pondering for your thesis
- Stepping stone to IRS internship

Mechanics

- One or two person projects
- Project proposals due Jan 29
  - Roughly one page via email to RA & KF
  - Feedback by 2/3
- Mid quarter check point
  - Proposal should indicate what will be done by 2/21
- Projects due March 14

What is an HCI Project?

- User study
  - Work process (requirements)
  - Technology evaluation
- Implementation
  - System enhancement
  - Exploratory development
- Literature
  - Synthesize multiple papers (term paper)

Deliverables

- User studies and implementation
  - Spend most of your time on research
  - But we need to be able to evaluate the work
    - Short write up + poster style presentation
- Literature
  - Paper (10-20 pages)

Project opportunities

- Projects should tie into the class in some way
  - But we are flexible
- You may leverage other work
  - Expectation of new work identifiable as being for CSE 510
- We have some ideas
  - But they are not to be constraining

UrbanSim:
Using Models in Urban Planning

- Integrated land use and transportation models can provide an important tool for exploring policy alternatives and possible urban futures
- What if …?
  - We built a new freeway or rail line?
  - We changed zoning or established an urban growth boundary?
  - We changed the tax structure?
- Analogy: SimCity, but with requirements for realism

Project: Streetscape Study

- Keith Grochow and Zoran Popovic are working on producing street-level animations of urban environments, including buildings, pedestrians, and moving vehicles
- Animation is driven by the simulation results
- Research questions:
  - What is the appropriate degree of realism?
  - Use in mediation?
  - Role of sound?
  - Can people get accurate information from such visualizations?

Project: Visualizing Model Operation

- Most component models use multinomial logit form

$$P(i) = \frac{e^{V_i}}{\sum_j e^{V_j}}$$

- Develop an interface to help visualize the operation of a model
- Possible audiences:
  - Expert users
  - Students in a grad class in Urban Planning
  - Members of advocacy groups and other stakeholders (particular attention to issues of credibility of the model important here)

Project: Visualizing Choices

- Related to "Visualizing Model Operation" project
- Develop a visualization and explanation tool based on depicting the decisions faced by different archetypal residents of the region.
- Test how well people can use this tool to understand the choices available to citizens, and how the available choices are affected by different scenarios

Project: Negotiation and Mediation Tools

- Develop a prototype interface for using UrbanSim mediation about land use and transportation disputes
  - On a hand-held device?
- Possible capabilities:
  - Let people select and classify values that are important to them
  - Let people select indicators that show how well different scenarios support those values
  - System could also highlight areas of agreement and areas in dispute

Schindler's lift

- Develop and evaluate visualizations of elevator state for use by service engineers
- Chris Mason of Schindler R&D is working in Seattle and is very interested in UW ties (see cse490ra)

Tablet PC

- Pen based computing has been around for a long time
  - With notable failures
- Tablet PC might be different
  - 800 pound gorilla
  - Technological advances in hardware and software

What is the Tablet PC

- Tablet computer meeting a certain spec
- Runs Windows XP Tablet OS
- Active digitizer
- Support for Ink, Handwriting recognition, Gestures

Programming the Tablet PC

- We have a small number of tablets available
- Development work can be done on a desktop machine (W2k, XP) with tablet SDK
- Develop in C# using VS .NET
  - C# development should not pose difficulties if you have Java experience
  - Windows/VS .NET development has startup costs

TPC Projects

- Study value of active digitizer
  - We have an older Fujitsu tablet that can be used for comparison
- Study stylus based game play
  - Free cell / spider are great with a pen!
  - Form factor consistent with recreational uses
  - Evaluate control mechanism for different classes of games

EdTech / Tablet Projects

- Student note taking with tablet PC
- Study instructor use of handwriting across different presentation technologies
- Background study / prototype / design for educational applications
  - Grading
  - Scratch paper
- Handwriting recognition for lecture capture of ink

Educational technology

- Study classroom feedback system for practice talk scenario
- Study classroom feedback system for lecture review scenario
- Investigation the use of zooming on an electronic whiteboard in class
- Background study of instructor writing in class

Project: be Vannevar Bush

- You are the head of DARPA. Write a Bush-style manifesto. What changes do you foresee? What needs will they create? What solutions will they allow? *Justify* your changes

Project: Fumbling Engelbart

- If Engelbart's demo was so compelling, why did it take so long to succeed? Investigate the post-1968 years and analyze why Engelbart's vision didn't take hold sooner.

Project: Realizing Memex

- What was hard to do in the memex homework assignment? How could the web be improved to make that easier? Add such an enhancement to a web browser, and test it.

Project: is information design universal?

- Tufte says: "The principles of information design are universal - like mathematics - and are not tied to unique features of a particular language or culture"
- Conduct user studies to test this hypothesis

Project: Tufte is wrong

- What do you think Tufte got wrong? Pick a rule of his, argue against it, and then justify your argument by experiment.

Project: Tufte-lyzer

- Write a "Tufte-alyzer", that takes a Powerpoint presentation and detects "hall of shame" situations. Extra credit: suggest corrections.

Project: graph-o-matic

- CNBC and Yahoo must constantly dynamically create stock graphs. The aspect ratio is (largely) a given. How do they determine the Y axis (scale and offset)? How did they determine colors and fonts? What *should* they use?
- Write a system which takes a stock symbol and a time period, and creates the graph. Evaluate your graphs vs. those of Yahoo.

Project: visualizing uncertainty

- Tukey's box-plot shows uncertainty for a 1D quantity in a plot.
- How would you show uncertainty for an n-d quantity in a visualization?
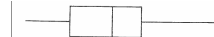
Project: query-by-example

- One reason queries are so complicated is because they work in "SQL space". Could they be more readily described in "tuple space"? What if the "operands" are tuples in the database, and the queries become "find more like these", "compare ones like this to ones like those", etc. Create such a system.

Project: using Amazon

- Amazon.com has made a subset of its database available for Web programming (http://associates.amazon.com/exec/panama/associates/ntg/browse/-/567632) . both the elements, and the connections between them, are available and of interest. Explore visualization techniques which show both elements and connections, using the Amazon data.

Project: Visualizing trends

- Viz. techniques focus on showing how the data is *now*. Sometimes, what is also (or even mainly!) of interest is showing *trends* in the data and its interconnections over time. Explore visualization techniques that focus on deltas in connections over time (possible IRS project).

Project: focus in graph viz.

- When changing focus in a DAG visualization, some techniques work better on large graphs, some on small one. Perhaps a third technique exists that does well for both. Find it.

Project: improving Yee

- Extend the Yee technique to work on very large graphs (as they suggest)
- Extend it to show temporal changes – right now, only done if watching animation.

Project: Viz for the blind

- Explore ways to present a scatterplot, Tukey bars, a hyperbolic tree, or any of the other visualization techniques we've discussed in this class that are not:
  - Bar chart, pie graph, line graph

Project: calm computing @ Sieg

- Turn the big display on the wall of Sieg into a "calm computing" display. What data will you show? How? How will you evaluate it?

Community Display

- Develop a tangible interface (using phicons or other augmented physical devices) to help people manipulate the items on the screen of the projected community display on the 2nd floor of Sieg
- Use sensing technology to detect which people are near the community display (or at the very least how many), and alter the content accordingly.

Handheld RF Readers

- These are becoming a reality. Build on the Want et al. paper on RF technology, and think about how their scenarios could be extended using handheld readers. Then develop a system showing this in action, and evaluate it.
  - KF can help in obtaining a reader for project use

Project: TUI for the blind

- The TUI emphasis on physicality emphasizes touch and gesture. This seems like it might be a good match for UI for the blind. Investigate a TUI interface tailored for the blind.

Project: BodyNet

- Wearable networks lend themselves to an army of specialized input widgets. Create another soldier in this army. In particular, create an input widget that could be used one-handed, in either a purse or pocket, to enter 4-digit PINs.

Project: MusicFX

- MusicFX is a collaborative system that alters the music in a fitness center automatically to the preferences of those currently using the center.
- What are the key features that made MusicFX successful? Are there other types of content and/or context that might provide fertile ground for system that enables inhabitants to influence aspects of their environment? If so, what are they?
- Choose one particular scenario and describe it in more detail. Then either implement it or conduct user investigation to evaluate it.

Project: Media Spaces

- Media spaces are environments augmented with media to support collaborative information and knowledge sharing.
- Although some experimental media spaces were maintained for long periods of time, none are still in operation. How do you explain this? Are there any media spaces currently in use in any professions (that is, in real work contexts, rather than in research contexts)? What features of the technology, work and/or relationships do you think are most crucial to the long-term success of a media space?
- This is a literature project

Project: Virtual Meditation

- VM#1 was an exploration into computer-supported cooperative theater. Two participants were photographed at the outset, and wore galvanic skin response and heart rate sensors during the performance. The only "response" of the performance was to alter visual effects on the screen, though the images of the faces of the two chosen participants were morphed to portray different [scripted] emotions. What other kinds of sensing might beneficially be added to a CSCT performance, and how might the performance "respond" in interesting ways to this (or existing) sensing?
- This can either be a literature project, an evaluation project, or an implementation project.

Project: Lovegety's

- Lovegety's are devices that broadcast your interests, and direct you to other nearby Lovegety owners with compatible interests.
- Lovegety's were very simple and very popular (at least for a time (and place)). If you could design your own Lovegety -- i.e., a personal device to reveal something about yourself in certain contexts to other such devices -- what kinds of features would it have? For example, what kinds of personal content would you want to reveal, what kinds of personal content would you like to know about others, and what kinds of constraints would you place on revelation contexts?
- This is an evaluation project.

AR system registration and calibration

- An A.R. system must quickly establish the coordinate mappings between
  - A) the real world coordinate system, and
  - B) the tracker coordinate system, and
  - C) the eye-worn display.
- This is the "registration problem" for A.R., determining and correcting the error in these mappings is the "callibration problem"
- The challenge is to find a fast, but reasonably accurate way to register and calibrate the AR system in the real environment, using few or no tools other than the AR system itself.
- Assignment: write a survey paper summarizing the published research on AR system registration/calibration. Try to characterize how closely the registration/calibration technique used is linked to the type of 6DOF tracker being used.

Project: AR Tracking

- Most current AR systems track the user's head position and orientation using a 6DOF tracking system which utilizes markers or beacons placed either on objects or the user, and a sensor which detects their position. For many AR researchers, the ideal 6DOF tracking system would entail a miniature video camera on the user's head, and an image processing capability sufficient to compute the user's head position and orientation relative to the actual (unmarked) surroundings.
- Assignment: write a survey paper summarizing the published research on image-processing-based 6DOF tracking. Describe what the technical difficulties are, and estimate the image processing "horsepower" needed for real time tracking.

For next time

- Mynatt Elizabeth and Gerhard Weber. "Nonvisual Presentation of Graphical User Interfaces: Contrasting Two Approaches," CHI `94. http://citeseer.nj.nec.com/mynatt94nonvisual.html
- Wai Yu, Kenneth Cheung, and Stephen Brewster. "Automatic Online Haptic Graph Construction".In Proceedings of Eurohaptics 2002 (Edinburgh, UK), Edinburgh University. http://www.dcs.gla.ac.uk/~lorna/MultiVis/Publications/Eurohaptics2002_graphconstruction.pdf