Interactive System Design: Identifying the problem and designing the solution

- Design is as much about communication as it is about creativity.

Upcoming Reading Assignments:
- Thur 4/27/00 - N&L 5
- Tues 5/2/00 - N&L 6&7

Creativity in Design
- Engineering is about creativity and innovation.
- Engineering methodologies ease the laborious aspects of design.
  + Analyzing performance
  - Hardware benchmarks, objective usability goals
  + Testing for safety and ease of use
  - Automobile crash tests
  - Integrating components
  - Tracking down obscure design knowledge.
  - These are the skills of a good usability engineer

Innovation requires broader range of tools and methods
- Las casas colgadas en la ciudad de Cuenca.
- For studying unfamiliar application domains and problems and making sense of what you find
- For describing novel solutions to design problems
- For testing new designs, even when the use is not clear
- Researching to fill a gap in available engineering knowledge
- When to use one method versus another

The creative engineering design process
- Analyze and Synthesize
  - Gain an understanding of the problem.
  - Address the problem with the appropriate available methods.
- Why do we talk about the process so much?
  - These are no longer textbook homework assignments.
  - To slow you down and make you think about the problem

Design activities that contribute to the basic iterative design cycle of analysis and synthesis
- How are these similar to the loop you already know so well:
  - Design/re-design
  - Program
  - Test
  - Debug

Defining the Problem
- You need a clear problem statement
  - To communicate your goals
  - To track your progress towards your original goal
  - To solve the right problem

The components of a problem statement
- The human activity that the system will support
- The users
- The levels of support (usability) that the system will provide
- The basic form of the solution
- There should be a causal link from a situation of concern to the problem statement.
- Each component evolves into a major area of design work.

**Elaborating a One-Sentence Design Statement**

**The human activity and the users**
- Collect data using user studies: interviews, observational studies (verbal protocol or dialogue), or questionnaires.
- Analyze the data to build user and task models.
- For an educational piece of software, who are your users?

**Level of support**
- Identify the critical aspects of system performance. There will always be trade-offs.
- Establish detailed, complex, objective criteria of evaluation.

**Form of the solution**
- Ultimately, this will be your entire design specification.

**The Activity (or Goal) to Be Supported**
- Let’s hear the proposed activities.
- Goal-oriented activities are broken down into tasks.

**A task:**
- A specific individual piece of work
- Something you could tell your personal assistant and it would get done.
  - For example: “Fetch me a cup of coffee.”
- Can be broken down into subtasks or steps
  - Goal-oriented behavior tends to be hierarchical.
  - Added twist: People choose the methods they use to accomplish a task.

**Example Task**
- Read the paper co-authored by Alistair Sutcliffe that will be discussed in the HCI meeting today.
- Find about an hour of time.
- Get a cup of coffee.
- Get the paper.
- Read the paper.
  - Figure out the number of pages.
  - Read the title and abstract.
  - Flip through all the pages reading the headings and looking at the pictures.
  - Read the first sentence of every paragraph.
  - ...

**In-class activity**
- Think about the activity of “Getting through the day today.”
- Identify a task that you will accomplish today and break it down into one level of subtasks.
- Remember: A task is a specific individual piece of work, something that you could hand off to your personal assistant.

**The User**
- General human performance capabilities
  - Discussed somewhat in Chapter 3, we’ll read it later
- The target user will usually also have uniquely-definable characteristics.
- What are the characteristics of:
  - An Internet-user?
  - A UofO student?
  - A UofO faculty?
  - A first-grader in a Brooklyn public school?

**Level of Support:**

**Usability Factors**
- It’s more than just “quick, easy”
  - Speed of performance
- Incidence of errors
- Ability to recover from errors
- Ease of learning: how much to learn and how long it takes
- Retention of learned skills
+ User’s ability to customize the system to suit their way of working or the situation of use
- Screen colors in a word processor
+ Ease with which people can re-organize their activities supported by the system
- Tektronix order-entry system
- User satisfaction

+ Usability targets
- Not all are quantifiable.
- There will probably be some correlation between quantifiable factors (i.e. time and errors) and non-quantifiable factors (i.e. user annoyance).
- My dream: A standardized EPA miles-per-gallon usability rating on all shrink wrapped software, a rating that incorporates a spectrum of usability factors.

+ The form of the solution
+ Hardware platform and OS
- Dictated to you in this class.
- But the problems you identify might easily be better solved with others.
- And sometimes a computer is not needed at all.
+ The User Interface
- Don’t try to design a complete solution on the spot.
- Don’t just start drawing screenshots.
- Identify different potential forms.

+ Next topics
+ What follows after problem definition?
- Design (Ch.4)
+ A critical component of the design process:
- User Studies (Ch.5)