CS5340
Human-Computer Interaction

February 7, 2013

Today's Class

- Administrivia
- T3 Overview
- Ethnography Assignment
- Establishing Requirements (continued)
- Design (part 1)
- Paper Presentations: Design Skills

Administrivia

Assignments

- I3 now due 2/28 (week later)
- T1 returned soon
  - **All** statements need to be supported
    - "Physical activity is hard for people to achieve" → need to cite a source.
    - Be careful, avoid generalizations, "People want to know more about their health" – what people? How do you know this?
- See note on Piazza about presentation expectations
- Reminder to explicitly reference textbook + research paper readings, class discussions

T3

Requirements Identification & Design Ideation

- Builds on T2
  - Read teammates' assignments
  - Be sure to relate this assignment to T2!
- Stakeholder analysis
  - primary, secondary, tertiary, facilitating
  - if multiple classes, identify each

T3

Requirements Identification & Design Ideation

- Task analysis
  - 6 tasks, based on ethnographic work
    - goal, preconditions, subtasks, and exceptions
    - Hierarchical decomposition (diagram)
  - Answer
    - Where is the task performed?
    - How often is the task performed?
    - What are its time or resource constraints?
    - How is the task learned?
    - What can go wrong? (errors, exceptions)
    - Who else is involved in the task?
    - Domain-specific questions

T3

Requirements Identification & Design Ideation

- Requirements
  - Functional (6)
  - Non-functional (6)
- Brainstorm 3 design concepts
  - Must go beyond initial ideas
  - Each concept must be very different from the others: think outside of the box
  - "Creating a diverse set of ideas helps people understand the space of designs and their relative merits" Dow et al. ToCHI 2010

T3

Requirements Identification & Design Ideation

- Brainstorm 3 design concepts
  - Describe
    - How addresses your problem
    - How addresses your requirements
    - Innovation (how different from currently available systems)
    - Interaction metaphor
    - Potential unintended consequences (3)
- Storyboard
  - For each concept
  - High level

Ethnography

- What did you learn?

Establishing Requirements

Design Requirements

- Developed from a sound understanding of users' needs
  - Justified and related back to the data collected
- Statement about an intended product that specifies
  - What it should do (functional)
  - Constraints on system (non-functional)
- Clear, specific, unambiguous
  - To identify when they've been addressed

Establishing Requirements

- How does this happen?
  - Socio-technical modeling
  - Task Analysis
  - Contextual inquiry
  - Participatory design

Socio-Technical Models

- Reaction to technological determinism
  - Bi-directional influence of people + machines
- Technical + human + social + organizational
- Describe impact of the introduction of a technology into an organization
- Detailed requirements for successful deployment
  - Interviews, observations, document analysis, etc.

Socio-Technical Modeling

- Examine
  - Problem being addressed
  - Stakeholders
  - Workgroups
  - Changes that will be supported
  - Proposed technology (and how it will fit in org)
  - External constraints/influences
  - Performance measures

Socio-Technical Modeling

- CUSTOM
  - Focus on stakeholders
  - Initial stage of design
- OSTA
  - Focus on tasks
- Soft systems methodology
  - Independent of technology
  - focus on rich picture of context
- Uses interviews, observations, focus groups, document analysis, etc.

Establishing Requirements

- How does this happen?
  - Socio-technical modeling
  - Task Analysis
  - Contextual inquiry
  - Participatory design

Task Analysis

- Method of analyzing what people do
- Knowing how people accomplish tasks currently
  - Helps us identify
    - problems, limitations, successes
    - Design opportunities (functional requirements)
    - Contextual factors (non-functional requirements)

Task Analysis

- Not just limited to the computer interface
  - Broader context too
- Focus on observable behavior
  - As opposed to internal mental state
    - GOMS and other cognitive approaches get at this
- Help you
  - Clarify what you know
  - Organize what you know
  - Understand transitions/danger points
  - Fill in gaps

Task Analysis

- Method of analyzing what people do
  - the tasks involved — Task Decomposition
  - What they need to know to do those tasks — Knowledge-based Techniques
  - The artifacts (objects) they use do accomplish those tasks — Entity-Relation based analysis

Hierarchical Task Analysis

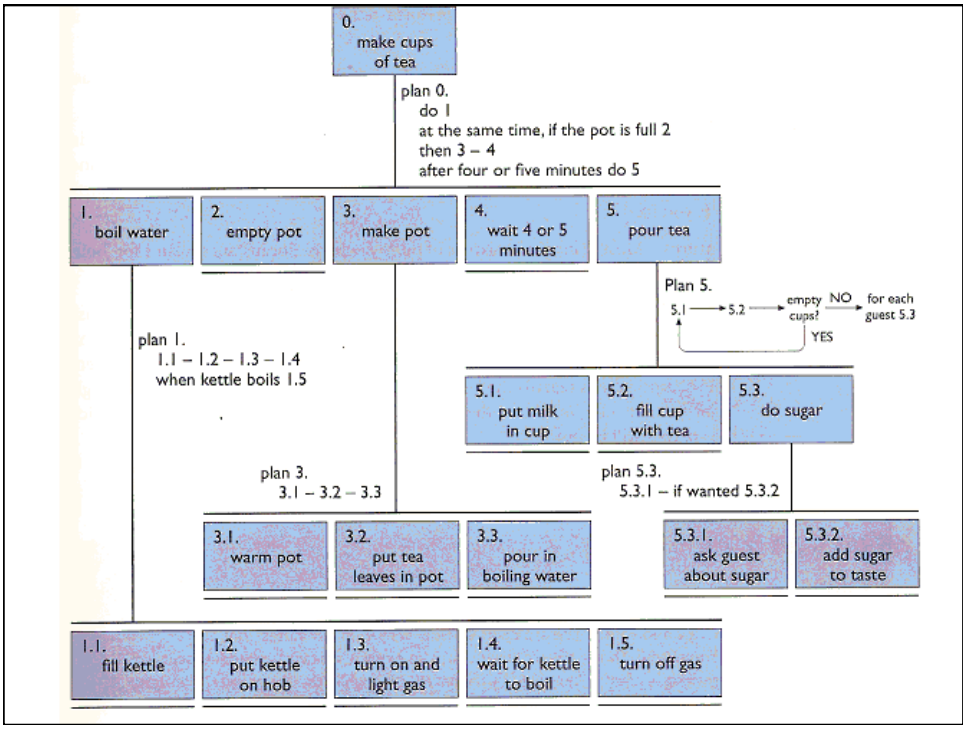
- Form of task decomposition
- Hierarchy of tasks & subtasks

  +

- Plans
  - Express partial ordering on subtasks (possible parallelism)
  - Conditions on subtasks
  - Temporal constraints on subtasks **(wait)**
  - Cycles

Hierarchical Task Analysis

- Iterative
  - Refinement of subtasks, plans
- Stopping rules
  - P x C rule
    - Probability of making a mistake in task X cost of mistake < threshold
    - Simple, non-costly tasks = don't expand
  - Complex motor responses (e.g., mouse movement)
    - No longer productive, accurate, useful
  - Internal decision making required
    - HTA based on *observable* behaviors
    - Use a cognitive modeling approach instead



Hierarchical Task Analysis

- Practically speaking
  - Task = Goal (what are you trying to do)
  - Top-level = problem you're solving
  - Decompose into subtasks/subgoals
  - For each task
    - Preconditions (other tasks, information)
    - Decompose if nontrivial – "How do you do it?"
    - Exceptions
  - Plan

Task Analysis

- Sources of Data
  - Document analysis
  - Observation (naturalistic, lab)
  - Interviews
  - Sorting tasks
- How can it help with design?
  - establishing requirements
    - Determine which tasks should be supported in new design
    - Help the client clarify what the important features are
    - Determine tasks to automate, unsupported tasks
  - Designing menus

Task Analysis

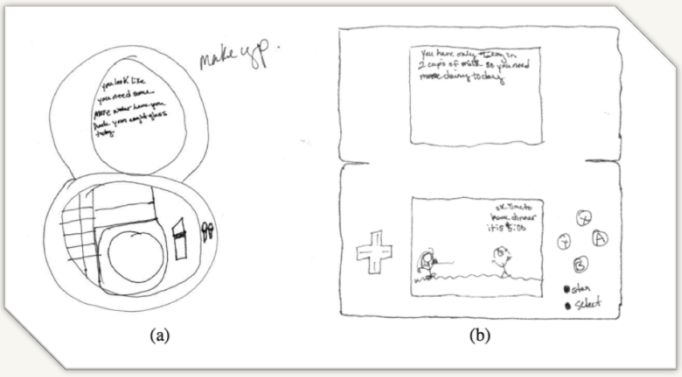
- Other information about tasks that may be useful
  - Where is the task performed?
  - How often is the task performed?
  - What are its time or resource constraints?
  - How is the task learned?
  - What can go wrong? (errors, exceptions)
  - Who else is involved in the task?
- (answer these questions in T3)

Establishing Requirements

- How does this happen?
  - Socio-technical modeling
  - Task Analysis
  - Contextual inquiry
  - Participatory design

Participatory Design

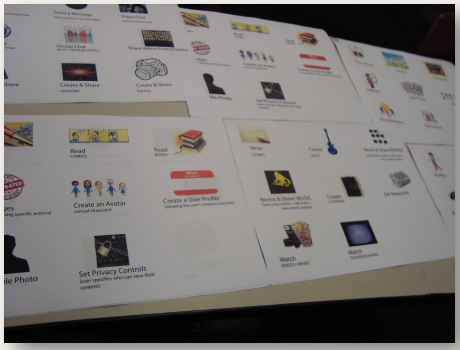
- Include users throughout design process
- Not just as a data source, but design collaborator
- Help define & refine requirements, iteratively
  - Brainstorming
  - Storyboarding
  - Pencil and Paper Exercises (paper prototyping)

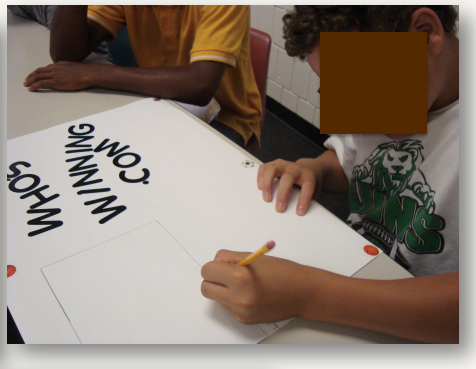


objects that can detect if the user needs something

(a) an augmented makeup compact reminding the user to drink water and
(b) an augmented gaming system reminding the user to drink milk.

"Bridging the Information Gap: Collaborative Technology Design with Low-Income At-Risk Families to Engender Healthy Behaviors," Siek *et al*. OZCHI'09

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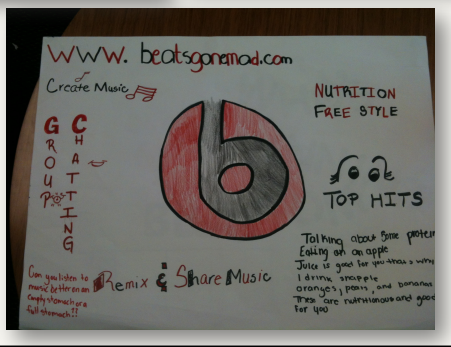
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Design

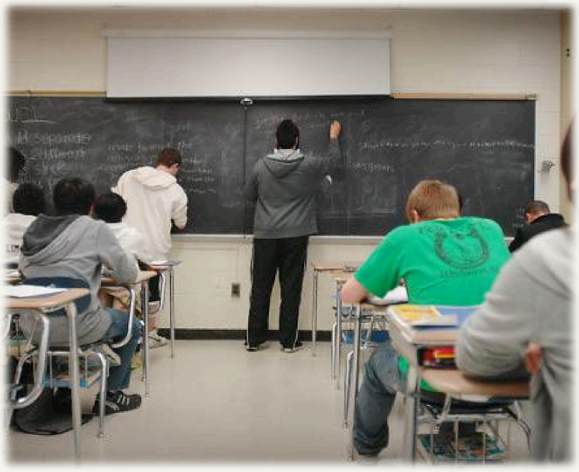
What is Design?

- Achieving goals within constraints
  - Goals
    - who is it for, why do they want it
  - Constraints
    - Materials, platforms, environments
  - Trade-offs
- *Interaction* Design
  - Not simply interface

Requirements Gathering

Design *Interventions*

(not artifacts)



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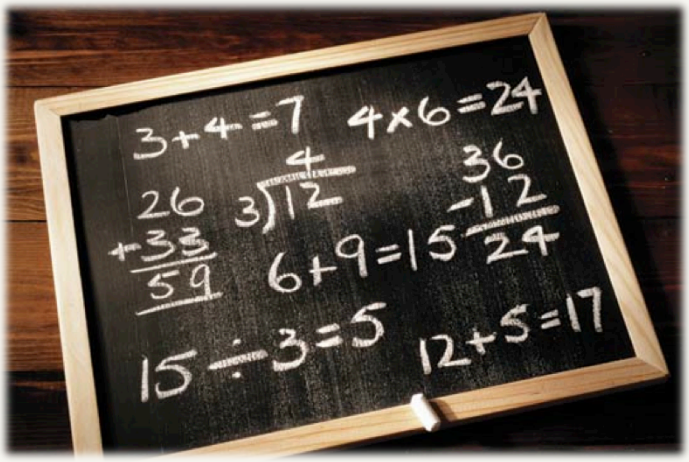

Design *Interventions*

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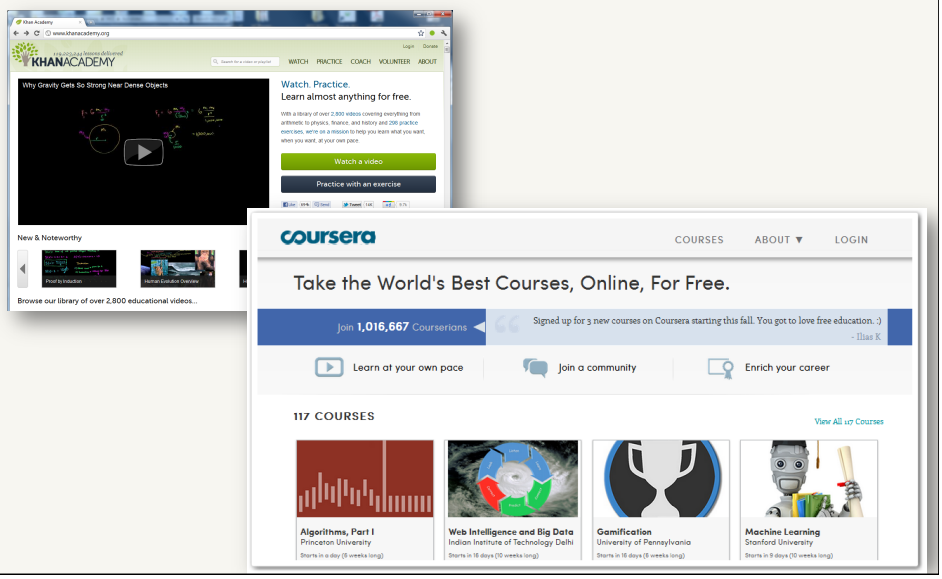


Golden Rule of Design

- Understand your materials
  - Computers
    - Software, hardware, networks, etc.
  - People ("Know your users")
    - Who are they?
      - Probably not like you!
    - Talk to them, watch them
      - how things *really*--vs. should--happen
      - Ethnography, Task & socio-organizational modeling, etc.
    - Look at the artifacts (objects) they use
  - Use your imagination…

Scenarios & Personas

- "**Force you** to think about the design in detail and notice potential problems before they happen"
- Rooted in real data
- Can be reused throughout the design process
- Also help
  - Communicate ideas
  - Validate other models (e.g., task)
    - Does your formulation hold up?
  - Express dynamics
    - System *behavior* (vs. just appearance)

Personas

- Description of an 'example' user
  - Not necessarily a real person
- Use as surrogate user
  - What would "Ralph" think
- Details matter
  - Realism helps in creation and use
- Develop several
  - Represent different user types/roles
- **Based on studies of actual users**

Scenarios

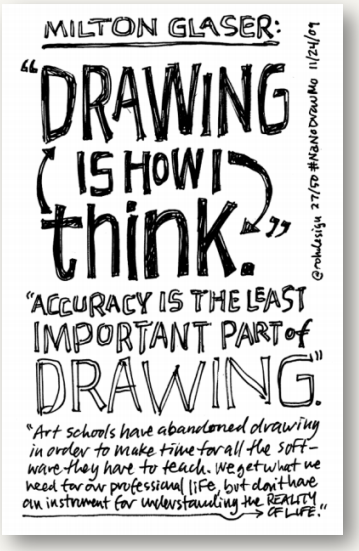
- What will users want to do?
- Step-by-step walkthrough
  - What can they see (screenshots, storyboards)
  - What do they do (keyboard, mouse etc.)
  - What are they thinking (mental models)?
- Use and reuse throughout design
- (But be careful ... Only show one path)

Storyboarding

- Illustrate interaction with a system
- Participant-driven

  or

- Designer-driven
  - Help visualize scenarios
  - Support transition from conceptual to interface design
  - Allow us to make mistakes early (cheaper, quicker)



Storyboarding

- Hand-drawn (or digital)
  - Hand-drawn recommended (and what you'll do for assignments)
  - Because with a computer…
    - Stop thinking conceptually, start thinking pragmatically
      - Constraints of the software tool
      - Details (fonts, colors) vs. broader concepts (goals, tasks)

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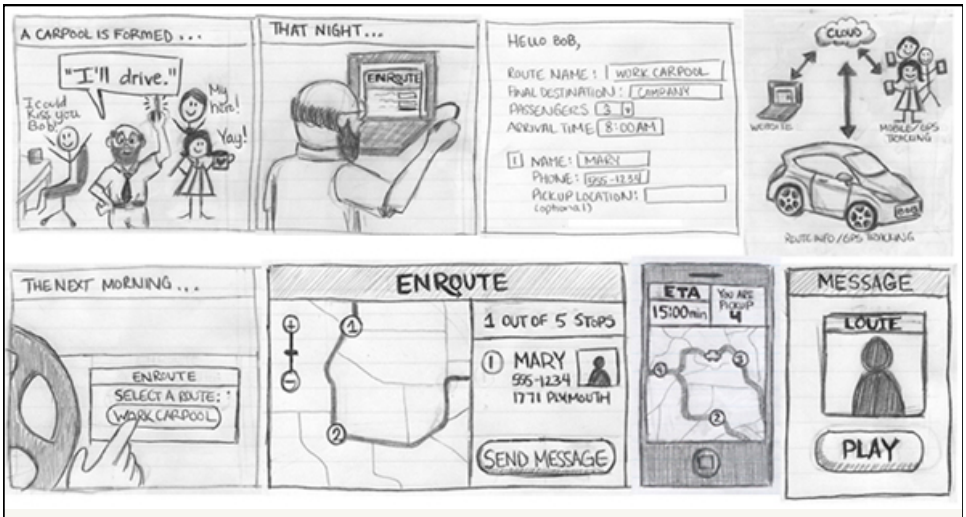


Notice how the storyboard tells a story.

It is not just screenshots .... Context important.

Storyboarding

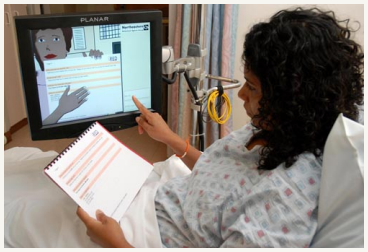
- Screens
  - Not the detailed interface yet!
  - General layout, navigational elements, core concepts
- Scenes
  - High level tasks
  - Focus on a couple primary use cases
  - Personas in action

Storyboarding

- Can be attractive, but not works of art
  - Quick!
  - Pencil & paper
- Tips
  - Long paper
  - 1 square/scene
  - Number each scene
  - (short!) text description for each scene (caption)

Interaction Metaphors

- Interaction with system is designed to reflect something from the real world that the user is already familiar with
- Suggest how you might use something
  - Mental models
  - Suggest a *style* of interaction



Interaction Metaphors

- data as **files** (in folders or directories)
- deleting a file as throwing it in the **trash**
- programming as building **objects**
- Adobe Flash content played back on a **stage**
- applications as **agents**

Interaction Metaphors

- can be mixed
  - e.g., windows and desktops
- can be misleading
  - e.g., putting a disk in the trash
- some things don't seem to have any obvious metaphor
- one metaphor is better than another if…
  - it leads to more correct predictions about a system's behavior.

To Do For Next Week

- DFAB Ch 8
- TohidiETAL06 on Piazza (GUI architectures & tools)
- Optional: Swing events & layout managers. (Or GUI doc in language of choice)
- T3 due – on team website (by 6pm)
- Presentations
  - Stephen Flaherty
  - Junlei Wang
  - Desmond Yeung

Paper Presentations

- Dow et al, *Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-Efficacy*, ToCHI 2010 | `**Sukhdeep Saini**
- Davidoff et al., *Rapidly Exploring Application Design through Speed Dating*, UbiComp 2007 | **Yang Huang**
- Brandt, *Designing Exploratory Design Games: A Framework for Participation in Participatory Design?*, PDC'2006 | **Miriam Zisook**