Human-Computer Interaction
CS5340 – Round 4

Homework I3: Update

- Now due next week

- Still advise you to find a spot on your own
  - Any senior center would qualify

- Cambridge Senior Center plan

Homework I3: Ethnography

- You have been hired to use computer interface technology to improve the lives of older adults.

- Use concepts from Ethnography reading to identify problems where HCI might make an impact
  - Find a location
    - Pick a location from Stephen's list, OR
    - Propose a location to Stephen where older adults spend significant time
  - You may have to travel to a different part of the city!
  - Schedule a time
    - No more than two students at a location at one time!
    - You must observe for a **2.5 hour chunk of time**
    - This is NOT an assignment you do in pairs. Do NOT go with a friend
    - Be sure to "check in" with someone (e.g., receptionist, instructor) to avoid looking suspicious
    - Zeeshan will coordinate for the locations Stephen identified

Homework I3: Ethnography

- Assess the situation. Find your optimal location.
  - A place where there are multiple older adults (eating area, class, workspace, etc.)
  - A place where you will not be in the way
- Observe. Identify problems HCI might solve.
- Interview. Try to interview at least one person (and optimally 2-3), but
  - You must ask them if OK (say you're doing a class project)
  - You need to be VERY cognizant of the impression you make
  - Do not ask them to volunteer medical information
  - Read body language carefully
  - Do not hold someone hostage
  - Thank them for their generousity

Prior homework updates

- Zeeshan sending week1 grades

- Comment on notes
  - From now on...
    - Cutting and pasting -> hand written

Team Project Guidelines

- Your project MUST
  - Have a substantial UI
  - Be interactive
  - Work robustly
  - Contribute to health or health research
  - Solve a real-world problem
  - Be targeted for and tested with older adults

Why?

Team Project Guidelines

- Your project SHOULD
  - Be creative
  - Be original
  - Be non-obvious
  - Have a "wow" factor

  - Allow you, at the end of this course, to leapfrog your peers with an amazing demo!
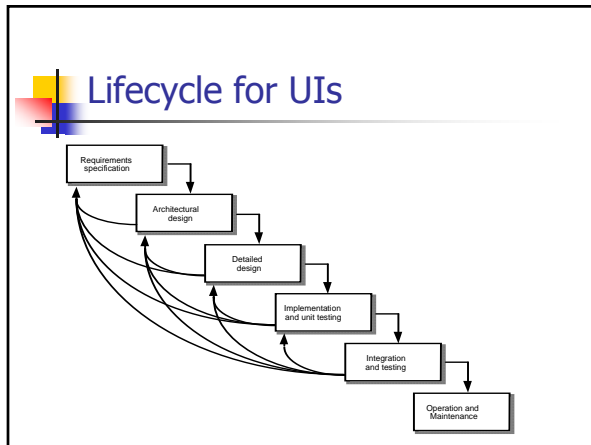   *Why?*

Team Project Constraints

- Team: 3-4 members, ideally multi-disciplinary
- Focus: Health Application for (or used by) older adult users
- Context: Senior center, home, etc.
- Platform: Your choosing
- Input/output/sensing: Your choosing

Team status?

Requirements Analysis

- What does the system/interface need to do?

- Who is the user?
- What does the user need to do?

Lifecycle for UIs

- Requirements specification
- Architectural design
- Detailed design
- Implementation and unit testing
- Integration and testing
- Operation and Maintenance

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Not just the interface

- Organizational issues (CSCW)
  - Who is impacted "outside" of the system?
  - Workflow

- Example: Meeting room notification system

Not just the interface

- Organizational issues (CSCW)
  - Power structures
- Example: Virtual work
  - Presence (increases perceived worth)
  - Informal interaction
  - Exercise authority
  - Existing social and org structures (asymmetry)
  - Management by objectives

Scenario-Based Design
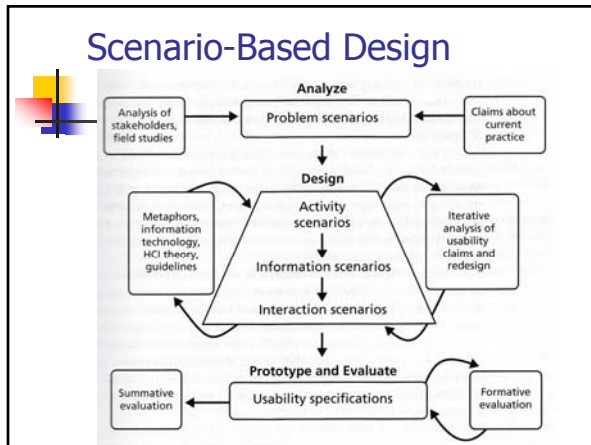
Stakeholders

- Not just users, but anyone affected
- People often have conflicting goals
- Symmetry (benefits ≠those who work)
- Free rider problem
  - Visibility
  - Social pressure
- Critical mass
  - Web 2.0 challenge

Classes of Stakeholders

- Primary
  - End users
- Secondary
  - Receive output or provide input
- Tertiary
  - Directly affected by success or failure
- Facilitating
  - Involved with design, development, maintenance

Example: EMR

Classes of Stakeholders

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Example: Course Reg

T2-1 User Analysis

- Practically speaking (for the homework)
  - Age, gender, ethnicity
  - Education
  - Physical abilities
  - General computer experience
  - Skills (typing? Reading?)
  - Domain experience
  - Application experience
  - Work environment and other social context
  - Relationships and communication patterns
- Identify major kinds/classes of users
- By interview, observation & questionnaire

Socio-technical modeling

- Work systems are composed of both people and technology
- Documents the impact of a specific technology into an organization
- Done via interviews, focus groups, observation

Key elements to capture

- Problem (hopefully a real one)
- Stakeholders
- Workgroups (informal, formal)
- Changes supported
- Technology within organization
- External constraints and performance measures

Socio-technical Modeling

- CUSTOM
  - Focus on stakeholders
- OSTA
  - Focus on tasks
- Soft systems methodology
  - Independent of technology

CUSTOM

- Stages
  1. Describe organizational context
  2. ID & describe stakeholders (current & proposed)
  3. ID & describe workgroups (current & proposed)
  4. ID & describe task-object pairs (current & proposed)
  5. ID stakeholder needs (proposed – current)
  6. Consolidate stakeholder requirements
- *Focus on stakeholder perspectives*
- *cf. OSTA – focus on tasks*

Open System Task Analysis (OSTA)

- Focus on aspects of system framed in terms of tasks
  - User's goals
  - Task inputs
  - External environment
  - Transformation processes
  - Social system
  - Technical system
  - Performance satisfaction
 - New technical system

SSM – Soft Systems Modeling

- Understanding situation & problem
  - Independent of technology
- Helps designer understand broader context

Socio-technical modeling
Soft Systems Modeling "rich picture" example
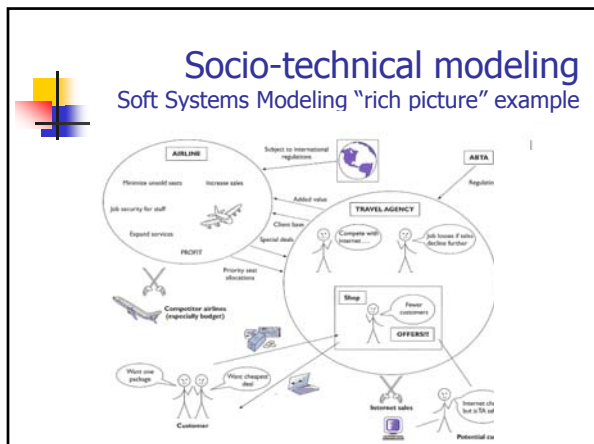
What's the answer?

- There is no right/wrong answer
- *SSM useful if it aids designer's understanding of the problem and design of the solution*

- True of many of the techniques in HCI!

Participatory Design

- Include users throughout design process
  - Brainstorming
  - Storyboarding
  - Pencil and Paper Exercises (paper prototyping)
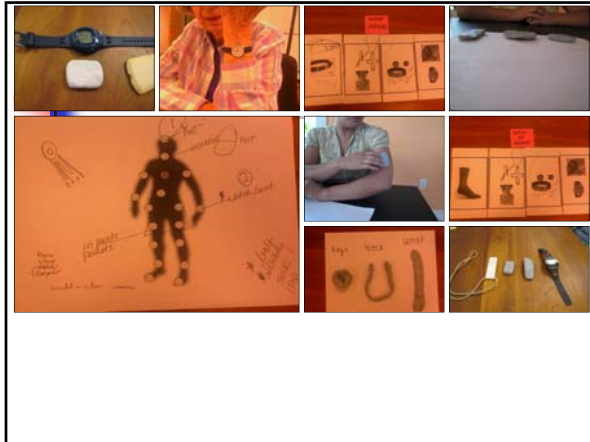
PICTIV

- Paper prototyping +
- Video

- Example:
  http://www.youtube.com/watch?v=CHj6qcD6tIQ

Participatory Design

- e.g. ETHICS
  - Process of development = managing change
  - Design groups include representative stakeholders – make all design decision.
  - Explicit list of questions to answer

Participatory Design

- ETHICS
  - Make the case for change
  - Identify system boundaries
  - Describe the existing system
  - Define key objectives
  - Define key tasks
  - Define key information needs
  - Diagnose efficiency needs
  - Diagnose job satisfaction needs
  - Analyze likely future changes
  - Specify and prioritize objectives based on efficiency
- Concerns: expense and time

Contextual Inquiry

- cf ethnography
  - More focused (assumes technology)
  - More brief (usually one or a few interviews)
  - Focuses on interview (vs. observation)
  - Uses specific techniques & models
    - Sequence
    - Physical
    - etc.
  - But, done in the workplace (in context)

Why is contextual inquiry important?

- You better know the constraints on behavior!

- Example: communication and plausible deniability

Task Analysis

- Analysis of how people do their jobs

- Task decomposition
- Knowledge-based techniques
  - Objects, tasks, and knowledge
- Entity-relation-based analysis
  - Actors and objects and relationships

Task Analysis

- Clarify what you know
- Organize what you know
- Understand transitions/danger points
- Fill in gaps

Hierarchical Task Analysis

- Hierarchy of tasks & subtasks
  +
- Plans
  - Express partial ordering on subtasks (possible parallelism)
  - Options on subtasks
  - Conditions on subtasks
  - Temporal constraints on subtasks **(wait)**
  - Cycles

Knowledge-Based Analysis

- Goal: understand knowledge needed to perform a task
- Taxonomies
  - Ask the expert
  - Card sorting
  - Use for objects & tasks
  - Usually many different ways to do
    - Addressed by task descriptive hierarchy (AND/OR/XOR)

Entity-Relationship Analysis

- Objects
  - Concrete, Actors (roles), Composites
  - Attributes
- Actions
  - Agent, Patient (changes state), Instrument
- Events
  - Performing of an action, spontaneous
- Relationships
  - Object-object, Action-patient, Action-instrument
- Describe sequencing

T2-2 Task Analysis

- Practically speaking (for the homework)
  - Hierarchical task decomposition
    - Task = Goal (what, not how)
    - Top-level = problem you're solving
    - Decompose into subtasks/subgoals
  - For each task
    - Goal – "Why do you do this?"
    - Preconditions (other tasks, information)
    - Decompose if nontrivial – "How do you do it?"
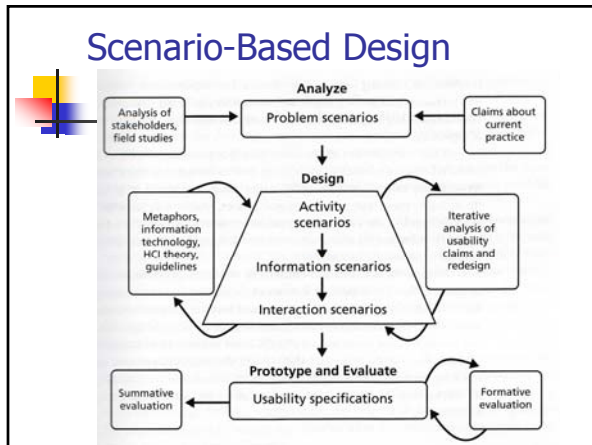
T2-2 Task Analysis

- 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?

Exercise

- Do a task analysis for "brushing teeth"

Scenario-Based Design

Scenario-Based Design

Example Problem Scenario

Sally Harris is a high school sophmore who has been researching black holes for the past 3 months…

She is a bit worried about the space and materials provided to everyone… This year she has explored some new methods-for example, an Authorware simulation that illustrates her theory of black hole formation. …

As she studies her simulation, Sally thinks of a way to turn the lack of computer support into a "feature": She will create a sequence of visualizations that can be flipped like a deck of cards to show the animation. …

Problem Scenarios

- Narratives of activities in the current situation (prior to technology introduction) that reflect needs and opportunities for redesign.

- Tells a story of a current practice.

- Carefully constructed to reveal aspects of the stakeholders & activities that have implications for design. (*fictional!)*

Essential Elements of a Scenario

- Setting – situational details that motivate goals, actions, reactions
- Actors
- Task goals-
- Plans – Converting goal to behavior
- Evaluation – Interpreting situation
- Actions – observable behavior
- Events -

Essential Elements of a Scenario – Registrar system

- Setting – situational details that motivate goals, actions, reactions
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- Events -

T2-3 Problem Scenarios

- Invent hypothetical stakeholders

- Write about 3 tasks
- Be as concrete as possible to show actors' motives

T2 - Team Project

- Perform User Analysis & Task Analysis

- Write up
  - Description of users / user classes
  - Task Analysis
    - Six or more tasks, including goal, preconditions, subtasks, and exceptions
  - Problem Scenarios
    - For 3 most important tasks

Basic GUI

AWT vs. Swing

- AWT used "heavy weight" components
  - Uses native widget & processes
- Swing uses "light weight" components
  - 1997, 1.1.5
  - Uses native window for top-level frame, but Swing provides its own windowing system within the frame
    - Even draws its own menus
  - Thus,
    - Can have "pluggable look-and-feel"
    - Can be deployed on any device (with req'd libs)
    - Many more (non-native) widgets
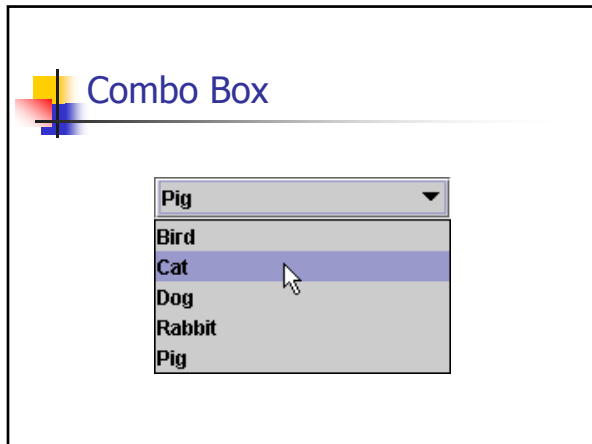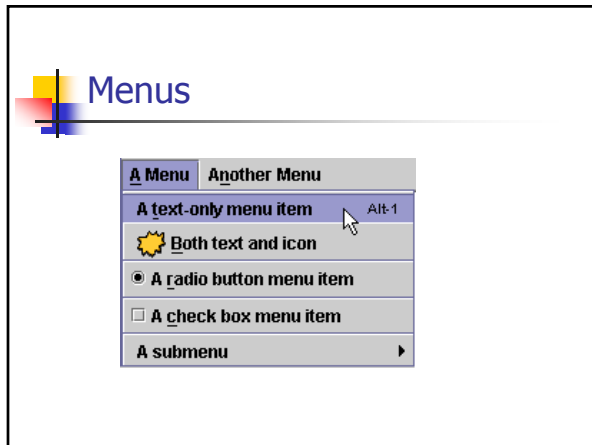
Pluggable Look-and-Feel

Java

GTK+

Windows

Mac

Buttons

Combo Box

Pig	▼
Bird	
Cat	
Dog	
Rabbit	
Pig	

Menus

A Menu Another Menu

A text-only menu item	Alt-1
⭐ Both text and icon	
◉ A radio button menu item	
☐ A check box menu item	
A submenu	▶

Text Field

Years: 30

Labels

Tool tips

Embedded Panels

Advanced

First Name	Last Name	Favorite Food
Jeff	Dinkins	
Ewan	Dinkins	
Amy	Fowler	
Hania	Gajewska	
David	Geary	

Music
- Classical
  - Beethoven
  - Brahms
  - Mozart
- Jazz
- Rock

One Two Three

Blah blah

Frames Per Second
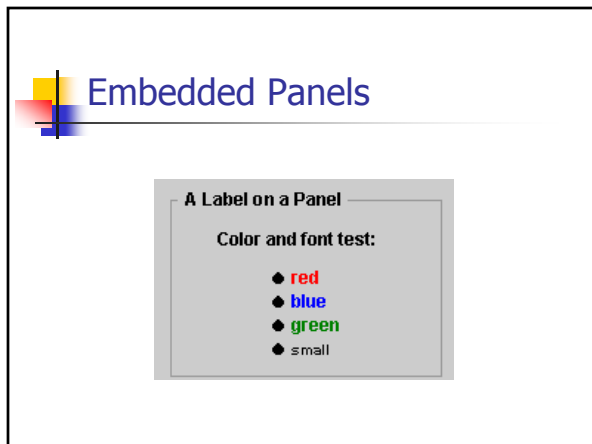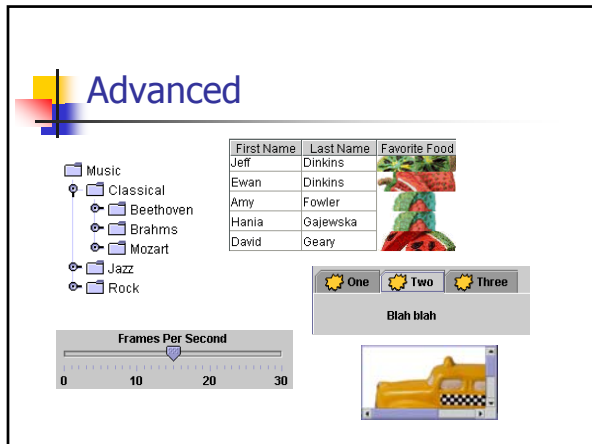
0   10   20   30

Team Homework – Create a Restaurant Ordering App

- Two Labels, one with an icon.
- Two Buttons, one with an icon.
- One ButtonGroup with at least 3 RadioButton options (with toggling between buttons functional).
- Two CheckBoxes.
- One ComboBox with at least two items.
- One TextField
- One Panel with a titled border enclosing at least one other component.
- One tool tip on one component.
- One Menu with at least two options.

Possible Implications of Aging for Interface Designers

Hawthorn

Methodological Issues

- Studies of age as independent variable
  - Cross-sectional vs.
  - Longitudinal
  - *Flynn effect (Fig 2. Hawthorne)*
- Decline is non-linear

Vision & Aging

- Issues
  - Progressive impairment very common
  - Peripheral stimuli must be stronger
  - Slower processing
  - Wide variability
    - 10% of 80 yr olds are legally blind
    - 10% of 80 yr olds have 20/20 vision
- HCI impacts
  - Need to assist in maintaining focus & attention
  - Text: avoid colors, use large standard fonts, left justified
  - Use simple, relevant graphics
  - Keep screen objects together that must be compared

Speech/Hearing & Aging

- Issues
  - Hearing declines with age
    - 20% 45-54 => 75% 75-79
  - Particular problems with high frequencies
  - Difficulty with background noise
  - Speak less fluently
- HCI impacts
  - Need to use lower frequency alert sounds
  - Use lower frequency human speech for output
  - TTS may be less understandable
  - ASR less reliable

Psychomotor ability & Aging

- Issues
  - Longer response times for some tasks
  - Less control of fine movement & force
- HCI Impacts
  - Problems with mouse
    - Require less speed, larger targets

Attention & Aging

- Issues
  - Problems maintaining attention over long periods of time.
  - Ability to attend to relevant info in the face of distractors declines.
  - Possible decline in ability to divide attention.
- HCI impacts
  - Minimize distractions

Memory & Learning

- Issues
  - Slight decline in working memory
  - Some decline in episodic & procedural, but not semantic, memory
  - Recognition intact, but recall suffers
  - Decline on spatial memory tasks
- HCI impacts
  - Reduce working memory demands
  - Recognition vs. recall
  - Avoid command line languages
  - Learning new software may take significantly longer and require more practice

Intelligence

- Issues
  - Some decline
  - Individuals decline differently (verbal, reasoning, spatial, numeric, etc)
  - Crystallized vs. Fluid Intelligence
- HCI impacts
  - Reduce complexity
  - Minimize change

Cursor exercise

Next Week

- Read and take notes
  - Design I (Dix Ch 5, Dix Ch 7)
  - GUI architectures and tools (Dix Ch 8)
  - Research papers for Interface Design Tools & Toolkits (Week 5) (4 papers)
- Continue learning widgets for team's programming language

- I3: Ethnography!
- I4: Design exercise
- T2: Task Analysis and Basic GUI

Research Papers:
Health Interfaces; Older adults

- Choe et al., Opportunities for Computing Technologies to Support Healthy Sleep Behaviors, CHI 2011 (Presenter: Ghanshyam Bhatt)

- Purpura et al., Fit4Life: The Design of a Persuasive Technology Promoting Healthy Behavior and Ideal Weight, CHI 2011 (Presenter: Xueming Wu

- Keyani et al., DanceAlong: Supporting Positive Social Exchange and Exercise for the Elderly Through Dance, CHI 2005 (Presenter: Milesh Nima)

- Chu Yew Yee et al., Investigating Narrative in Mobile Games for Seniors, CHI 2010 (Discuss)