



## Human-Computer Interaction CS5340 – HCI – Round 2

Prof. Stephen Intille

<http://bit.ly/neu-hci-spring-12>

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## Overview for Today

- Brief Review of Lecture 1 essentials
- Brainstorming exercise
- Review of Homework
- UI Development Process
- Human Factors
- Homework Preview
- Research Paper Presentations

(Break half way)

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## Overview of Course

<http://bit.ly/neu-hci-spring-12>

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## Administrivia

- Stephen
  - 450 WVH, [s.intille@neu.edu](mailto:s.intille@neu.edu)
  - Office hours
    - Most likely Wed early morning (being scheduled)
    - After class
    - Send email
- Facilitator/Grader - Zeeshan Sayyed
  - [sayyed.z@husky.neu.edu](mailto:sayyed.z@husky.neu.edu)
- Class discussion/questions: Piazza  
<http://piazza.com/northeastern/spring2012/cs5340>  
(Send all questions not specific to your work here)

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## Overview of Course



- Texts
  - Required:
    - Dix, et al, *Human-Computer Interaction*
      - A bit dated, but comprehensive
      - In bookstore
    - Other chapters/articles to be provided on Blackboard
  - Recommended:
    - Nielsen, *Usability Engineering*
    - Norman, *The Design of Everyday Things*

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## Overview of Course

- Weekly Requirements
  - Read (and absorb!) 50-150 pages
  - Your reading notes
  - Individual homework assignment
  - Team project assignment
  - Describe and discuss assignments in class
- Periodic Requirements
  - Perform a design session in class
  - Present a research paper in class

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## Typical Class\*

1. Review assignments. Presentation and discussion by randomly selected students
2. Lecture on HCI practice topic
3. Discussion of next week's assignments
4. Break
5. Intro to research topic by instructor
6. Research paper presentations or design session presentations by students

\* Changes may be made based on composition of the class

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## Overview of Course

- Your reading notes
  - Bullet lists of most important ideas
  - Bullet lists of thoughts/ideas generated during reading
  - Show evidence of thoughtful reading and synthesis of readings throughout course
  - Post prior to class and hand in hardcopy at class

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## Grading

- Prior experience suggests that **work in this course will generally fall into one of four categories:**
  - Superior, striking, or unexpected pieces of work with excellent effort demonstrating a mastery of the subject matter and a thoughtful use of concepts discussed in class; work that shows imagination, clarity of presentation, originality, creativity, effort, and attention to detail (A)
  - Good work demonstrating a capacity to use the subject matter, with adequate preparation and clear presentation (B)
  - Work that is adequate but that would benefit from increased effort or preparation (C)
  - Work that needs more effort (D)

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## Breakdown

- Your reading notes (10%)
  - Class presentation(s) (10%)
  - Individual assignments (30%)
  - Team assignments (20%)
  - Final project and project presentation (30%)
- } 50%

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## Schedule

- <http://bit.ly/neu-hci-spring-12>

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## Overview of Course

- Topics covered
  - HCI theory & practice
  - A bit on good design
  - A lot of hands-on experience  
(You haven't learned it until you can apply it!)
  - Cutting-edge HCI research
- Topics on your own:
  - GUI programming in your favorite language
- Prerequisites
  - Programming basics (or see me)

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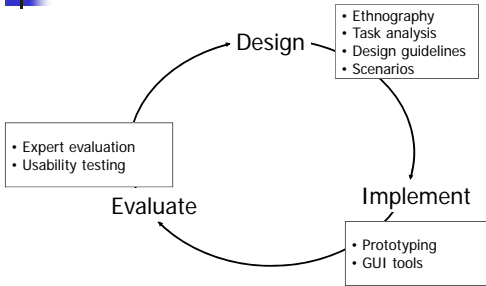
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## Some basic issues & concepts



The HCI development process

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## HCI: listening, adapting, and iteration

At every stage!

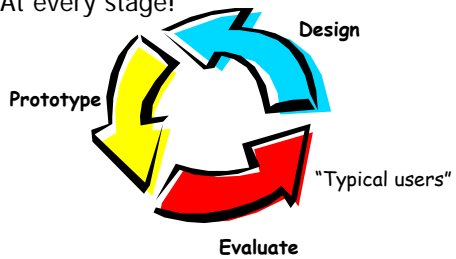


Diagram from J. Landay

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## Learn how to observe/listen...



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## Simplify/refine/stress-test tasks

- Gotchas
  - Missing what's truly important to user
  - Interruptions
  - Influence of environment/context
  - Boredom/lack of novelty
  - Dealing with problems created by
    - Environment
    - Other people
    - Technological limitations

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## Simplicity is Hard!

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## Some basic issues & concepts

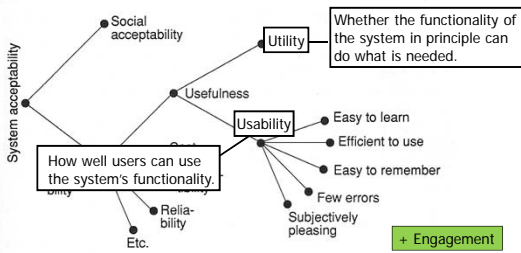


Figure 1 A model of the attributes of system acceptability.  
From Nielsen, *Usability Engineering*

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## Team Project

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Major focus of course

Will dominate your grade

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## Team Project Guidelines

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- 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?*

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## Team Project Guidelines

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- 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?*

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## 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

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## Team Project Categories

- App for older adults in senior center (to facilitate goals/tasks you identify)
- "Serious game" for older adults to generate food nutrition database
- App for older adults that meets guidelines for an available app competition (e.g., https://www.aarp.org/health/healthy-living/2017/07/17/2017-older-adult-app-competition/)  
(caveats)

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## Team Project Brainstorming Exercise

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## Project Brainstorming

- Think about a graphical user interface you'd like to build
  - Should be representative of your interests
  - **No commitment**
- Sketch out the idea
- Put a title and your name on it
- Be ready to talk about it
- 15 minutes

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## Individual Homework #1 UI Critique

- Find 2 good & 2 bad examples of UI design
- Some criteria
  - Consistency (inter & intra application)
  - Prevent errors
  - Permit error correction
  - Obviousness ("affordances")
  - Feedback
  - KISS
- Include visuals if possible

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## Overview

Dix Forward and Introduction

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## Important take-aways

- HCI is difficult, rewarding, necessary
- Multi-disciplinary
- Trying to get at scientifically rigorous ways to “know thy user”
- Errors result from “narrow optimization” that fails to account for context (especially human kind)

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## Important take-aways

- Usability analysis is nice .. But too late. Design is where the action is.
- Those who can evaluate but not design at a disadvantage!
- HCI is a discipline that outlines processes to help you with a very difficult task

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## X-centered design

- What do we want X to be and why?

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## Don't do this...

- "They'll do [x]" example
- Fingernail example
- "Don't have time" example

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## Do this...

- Spend the time HCI requires
- Learn to listen
  - And listen some more
    - And listen some more
- Trust the process
- Have courage: throw out ideas that are not working

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## Components

- People
- Computers
- Tasks
- Usability
  - Useful
  - Usable
  - Used
    - "Inventive inspiration"
    - Tricks of trade (e.g. architects)

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## Human Factors (the people)

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Dix Ch 1

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## Human Factors

- A body of scientific facts about human capabilities and limitations.
- The study of how humans behave physically and psychologically in relation to particular environments, products, or services.
- aka *Ergonomics*

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## Human Factors Highlights

- Inputs
  - Visual
  - Auditory
  - *Haptic*
  - *Olfactory*
  - *Vestibular*
- Outputs
  - Motor (hands, feet, head, gaze, speech, ...)
  - *Neural*

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## Haptic



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## Olfactory

Jofish Kaye



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## Vestibular



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## Head



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## Gaze



Gaze tracking

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## Vision

- Why can't you use color alone as an output modality?
- 8% males and 1% females color blind

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## Vision

- How can you tell if your display will suffer from optical illusions, or cause users to become dizzy or nauseous?
- Test it with real users!

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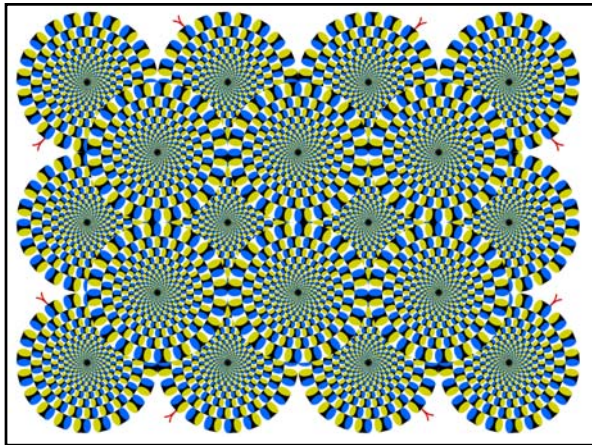
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## Visual issues impact design

- Examples
  - Magnify horizontal lines and reduce vertical (to look square, must be slightly tall)
  - Optical center – we see center of page as a little above optical center
  - WHY IS THIS HARDER TO READ?
  - Contrast
    - Negative (preferred but watch for flicker)
    - Positive

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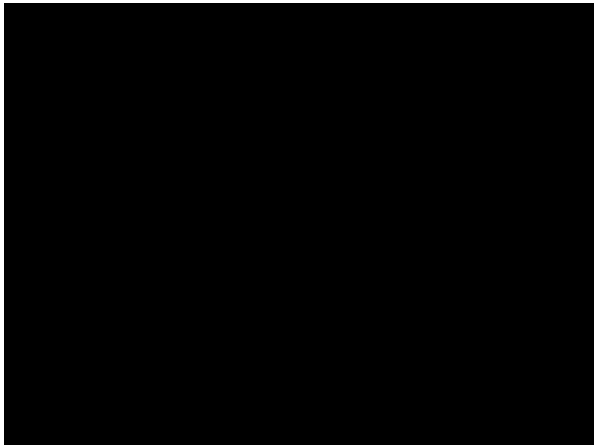
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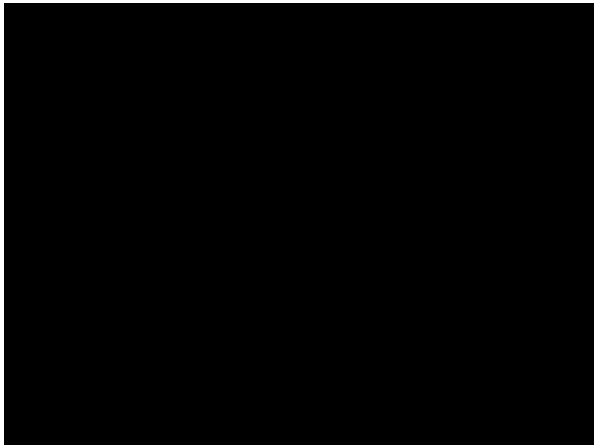
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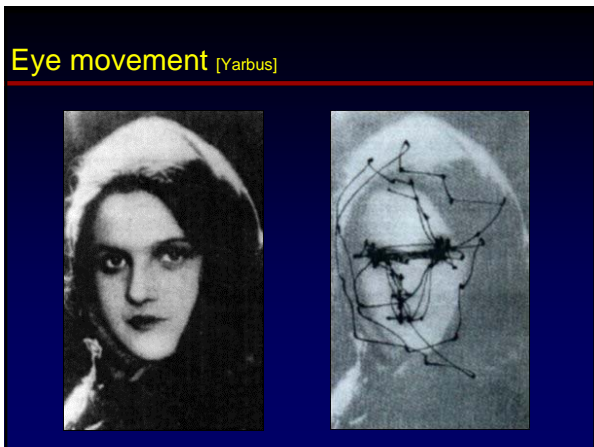
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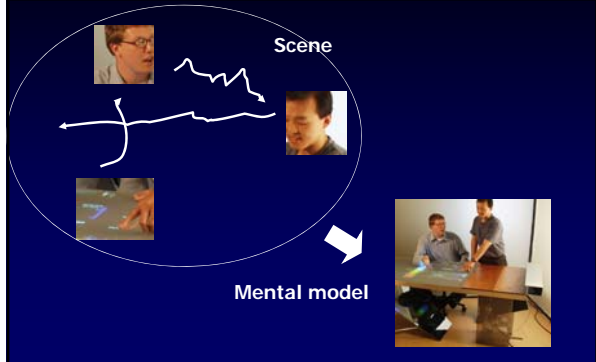
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# You don't "see" what you think



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# You don't "see" what you think



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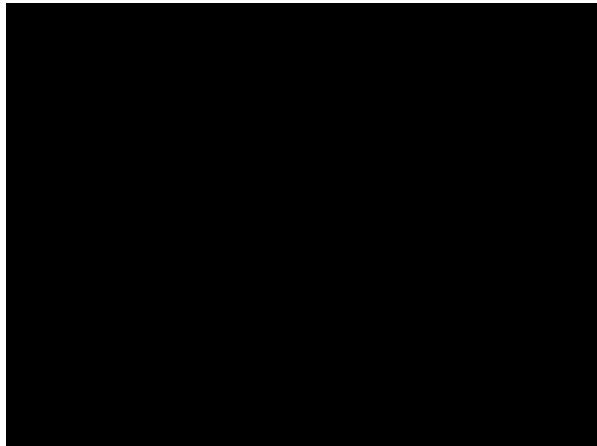
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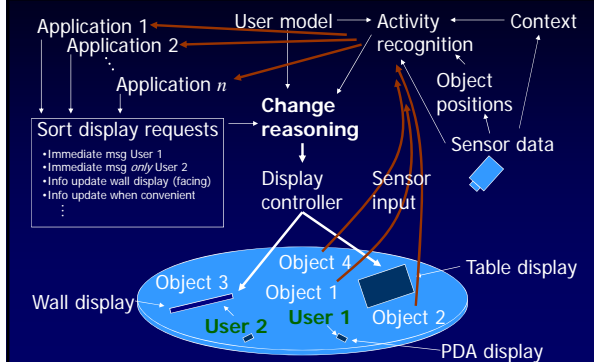
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## OSBA → need change reasoning system



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### Reasoning

- We fill in the gaps
  - This can lead to faulty mental models
- Novices
  - Group problems according to superficial characteristics
- Experts
  - Group problems based on underlying conceptual similarities

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### Errors

- Two major classes
  - Changes in the context of skilled behavior
    - Familiar overrides unfamiliar
  - Incorrect understanding of a situation ("mental models")
    - E.g., CITY postpone
  - Variation from conventions

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## Auditory

- Higher the frequency, harder to hear changes  
(Older adults may not hear high frequency at all – e.g., phone alarm)
- Cocktail party effect
- Audio underused in HCI

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## Touch

- What's amazing about tablets...
- Some neat papers recently on use of visual/tactile feedback

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## Fitt's Law

- Time to hit a target on the screen  
(function of target size & distance)

$$a + b \times \log_2(\text{distance}/\text{size} + 1)$$

- What about pie menus?

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## Human Memory

- People only have a limited amount of working memory (aka STM)
  - 7 +/- 2 chunks
- Implications for interface design?
  - Recall vs prompting
  - Chunking

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## Implications of STM flushing

Early ATMs gave the customer money before returning their bank card...



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## LTM

- Total time hypothesis
- Distribution of practice effect
- Meaningfulness

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## LTM

- Faith Age Cold Tenet Quiet Logic Idea Value Past Large

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## LTM

- Boat Tree Cat Child Rug Plate Church Gun Flame Head

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## LTM

- One day I was traveling down the Charles in a **Boat** and up in a **Tree** I saw a **Cat**. A small **Child** sat below on a **Rug** with an empty **Plate**, from a picnic, praying as if in **Church**. A man stood next to her with a **Gun** pointed at the cat. He pulled the trigger, and a **Flame** came out of the gun. It hit him in the **Head** and knocked him out. The cat jumped down and the girl left. Bizarre!

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## LTM

- Meaningfulness
  - Sentences
  - Stories (vivid imagery)
  - Emotive stories
- Think about forgetting
  - Decay
  - Interference

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## LTM

- Memory issues may be particular important for older adults less familiar with technology
  - Lack mental models to help with learning
- Tip: Avoid reliance on memory in Uis
  - Risky strategy
  - (E.g., command line interface)

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## Emotions

- Izard, "Four Systems for Emotion Activation", *Psyc Reviews*, 100(1), 1993
  - Neurotransmitters (depression & anxiety)
  - Sensorimotor (from motor activity, forced facial display)
  - Affective (motivations, discomfort of low energy, pain-anger)
  - Cognitive (appraisal & attribution, anger at goal-thwarting, embarrassment)

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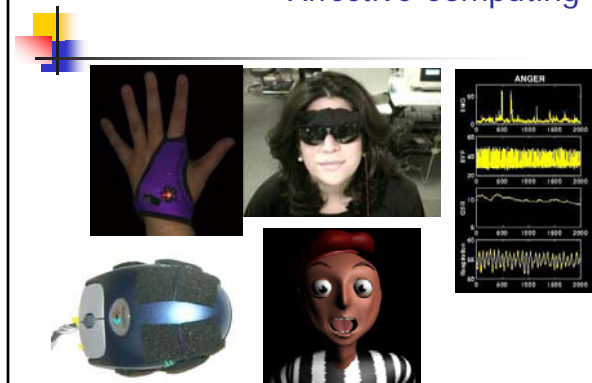
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## Affective Computing



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## Stress!

- People will react/reason differently based on physiological state/affect
  - What is the implication for testing?

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## Individual Differences

- People vary significantly in all types of physical and mental ability, knowledge, skills and values.
- **Your user is not you**
- Know your user.

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## The Computer

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Dix Ch 2

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## What jumps out about Ch 2?

- What's missing?
  
- What's old is new again...
  - E.g., QR codes, processor limitations (fancy swiping, scrolling, graphical glitz), memory limitations, latency challenges, cross-platform development

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## Tip

- Design for the worst-case, slowest hardware
  
- Design for the worst-case Internet connection
  
- Design for the smallest screen real estate

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## Quick: order of numbers

- Your phone
- ATM
- Calculator

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## Paradigm shift?

- Mouse: Engelbart 1964



- Touch takeover?



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## Pixel challenges

- Bits per pixel
- Number of pixels
- Density of pixels
- Screen size
- Anti-aliasing
- Point size
- Move toward adaptive layouts  
(How well does it work?)

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## Pinch and Zoom

- Based on Ch 1 & 2, what do you think?

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## History

Dix Ch 4

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## When was the Internet invented?

- Internet: 1969
- Web as we know it: 1993  
(Mosaic released)
- What took so long?

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## Look for ideas ahead of their time

- Many “bleeding edge” prototypes
- Concept videos

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## Paper Presentations

- Format
  - Pecha Kucha format (6 min, 40 seconds)
    - Brief description (least important - everyone has read it)
    - Your evaluation of the ideas
    - How you would extend it (most important part)
  - Demo/inspiration
    - 3-4 minute demo, video, or mock up of something that will help us understand the paper better than the text, or that will help us learn about a related topic. This should show us, or teach us, something new that we would not have learned just from reading the paper.
    - If you need to, you can do this in the middle of the Pecha Kucha slides or at the end, before your two discussion questions
- Load on your own laptop, test
- Do not
  - Cut and paste text from paper!
  - Just look at your slides. Look at the audience!
- Practice, practice, practice...
- Grading: See the web page – 10% of grade!

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## Research paper categories

- Health interfaces
- Ethnography
- Older adults / Special populations
- Mobile interfaces
- Anthropomorphic interfaces
- Speech interfaces
- Interface design and toolkits
- CSCW
- Tangible interfaces
- Affective interfaces
- Body interfaces
- Design
- People
- Games
- Other

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## If you are new...

1. Answer the email survey I will send you
2. Sign up for Piazza
3. Read (from last week)
  1. Dix Intro, Chapters 1, 2 (skim), 4
4. Setup individual course web page (with photo)
 

*Note: All assignments must be posted 1 hour before class on due date.*
5. Do Homework I1 (UI Critique)
6. Read through T1

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## Prep for Next Week

- Read (and make your notes)
  - Dix Chapter 3 (Interaction paradigms)
  - Dix Chapter 6 (HCI development process)
  - Fetterman selection (on Blackboard)
  - Research papers (TBD and emailed)
- Do Individual Assignment 2 (Project Brainstorming)
- Read Team Assignment 1 and start thinking seriously about it

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## Individual Assignment #2: Project Brainstorming

- Get inspired: Skim HCI bib older adults
- Come up with 3 project ideas
- For each, make 1 page sketch/description of the idea
- Post a 1-paragraph description (or a link to the project idea) to Piazza by Tue 1/24 at 6PM
- Then...

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## Individual Assignment #2: Project Brainstorming

- Monitor the website responses from Stephen and peers
- Comment on ideas from your peers.
- Revise your ideas (or come up with new ones) based on the feedback
- Post your three best ideas and write-ups and sketches on a web page in your order of preference (these will be used to help form project teams)

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## Remember, to get a really good idea...

- What do we do?

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## Memory

- Can you recall the 2<sup>nd</sup> set of words?

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## LTM

- One day I was traveling down the Charles in a **Boat** and up in a **Tree** I saw a **Cat**. A small **Child** sat below on a **Rug** with an empty **Plate**, from a picnic, praying as if in **Church**. A man stood next to her with a **Gun** pointed at the cat. He pulled the trigger, and a **Flame** came out of the gun. It hit him in the **Head** and knocked him out. The cat jumped down and the girl left. Bizarre!

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## Some project ideas

- Support for "aging in place"
- Medication adherence
- Personal health records
- Family health history guidance/contribution
- Chronic disease education
  - Diabetes, COPD, CHF, etc.
- Exercise promotion (e.g., exergames)
- Diet adherence
- "Serious games" for health or health research

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