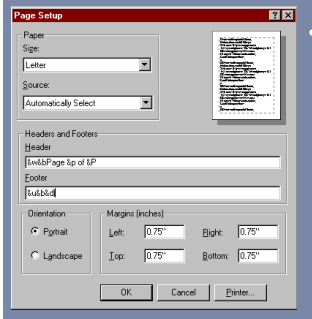
User Interface Design, Prototyping, and Evaluation

Introduction & Course Overview
CSE440: Introductory HCI

Prof. James A. Landay
University of Washington
Autumn 2008

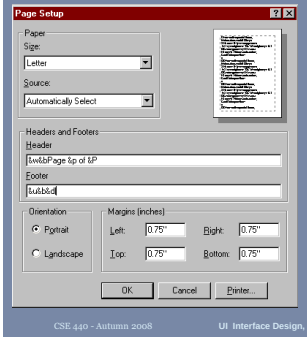
September 25, 2008

Hall of Fame or Shame?



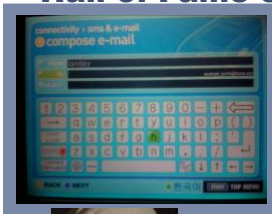
- Page setup for printing in IE5

Hall of Shame!



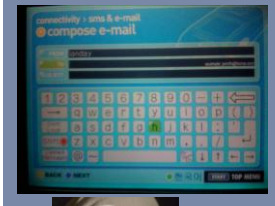
- Page setup for printing in IE5
- Page preview nice, but
- Problems
  - codes for header & footer information
    - requires recall!
    - want recognition
    - no equivalent GUI
  - help is the way to find out, but not obvious

Hall of Fame or Shame?



- Asiana Airlines interface for sending email or SMS from plane

Hall of Shame!



- Asiana Airlines interface for sending email or SMS from plane
- Cool, but
  - text entry using this this input device is VERY tedious
  - crashes often

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Outline

- Who are we?
- HCI introduction
- Course overview & schedule

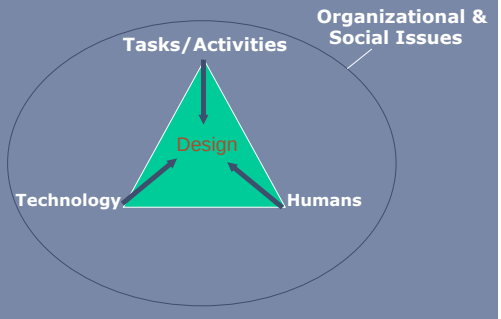
Who are we?

- James Landay
  - Associate Professor in CSE at the University of Washington
    - formerly professor in EECS at UC Berkeley
    - spent 3 years as Director of Intel Research Seattle (ubicomp lab)
  - Ph.D. in CS from Carnegie Mellon '96
  - HCI w/ focus on informal input (pens, speech, etc.), web design (tools, patterns, etc.), & Ubiquitous Computing
  - founded NetRaker, leader in web experience management
    - now subsidiary of KeyNote Systems
  - Co-authored *The Design of Sites* with D. van Duyne & J. Hong
- Kate Everitt
  - Ph.D. student in CSE
  - BSc in Computing & Info Science from Queen's University
  - MS in CS from UC Berkeley
  - HCI w/ focus on computer supported cooperative work

Human-Computer Interaction (HCI)

- Human?
  - the end-user of a program
  - *the others they work or communicate with*
- Computer?
  - the machine the program runs on
  - *often split between clients & servers*
- Interaction
  - the user tells the computer what they want
  - the computer communicates results

HCI Approach to UI Design



Factors Influence Each Other

"People change their knowledge as they perform, i.e., they learn"

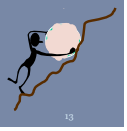
User Interfaces (UIs)

- Part of application that allows people
  - to interact with computer
  - to carry out their task
- User vs. Customer vs. Client
  - user is a term only used by 2 industries → bad!
  - *customer* – person who will use the product you build
  - *client* – the company who is paying you to build it

HCI = design, prototyping, evaluation, & implementation of UIs

Why is HCI Important?

- Major part of work for "real" programs
  - approximately 50%
- Bad user interfaces cost
  - money
    - 5%↑ satisfaction → up to 85%↑profits
    - finding problems early makes them easier to fix
  - reputation of organization (e.g., brand loyalty)
  - lives (Therac-25)
- User interfaces hard to get right
  - people are unpredictable
  - intuition of designers often wrong



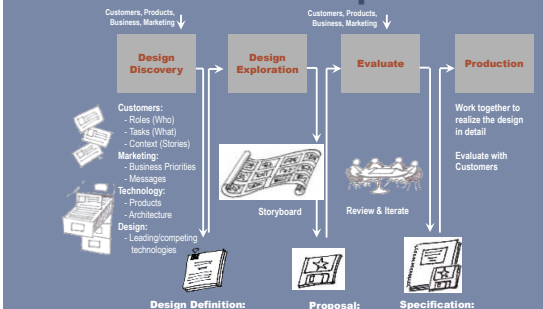
Who Creates UIs?

- A team of specialists (ideally)
  - graphic designers
  - interaction / interface designers
  - information architects
  - technical writers
  - marketers
  - test engineers
  - usability engineers
  - researchers (ethnographers, etc.)
  - software engineers
  - hardware engineers
  - industrial designers
  - customers

How to Design and Build Good UIs

- UI Development process
- Usability goals
- User-centered design
- Design discovery
- Rapid Prototyping
- Evaluation
- *Programming*

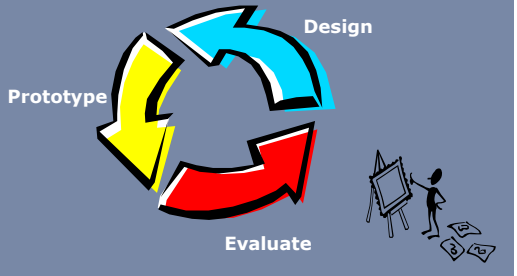
User Interface Development Process



based on slide by Sara Redpath, IBM & Thyra Trauch, Tivoli

Iteration

At every stage!



Design

- Design is driven by requirements
  - what the artifact is for
  - not how it is to be implemented
  - e.g., phone not as important as *mobile* app.
- A design represents the artifact
  - for UIs these representations include (?)
    - screen sketches or storyboards
    - flow diagrams/outline showing task structure
    - executable prototypes
  - representations simplify

Write essay
start word processor
write outline
fill out outline
Start word processor
find word processor icon
double click on icon
Write outline
write down high-level ideas
.
.
.

Web Design Representations

Site Maps

Storyboards

Schematics

Mock-ups

Usability

According to the ISO:
The *effectiveness*, *efficiency*, and *satisfaction* with which specified users achieve specified *goals* in particular environments

- This does not mean you have to create a "dry" design or something that is only good for novices – it all depends on your goals

Usability/User Experience Goals

- Set goals early & later use to measure progress
- Goals often have tradeoffs, so prioritize
- Example goals
  - Learnable
    - faster the 2nd time & so on
  - Memorable
    - from session to session
  - Flexible
    - multiple ways to do tasks
  - Efficient
    - perform tasks quickly
  - Robust
    - minimal error rates
    - good feedback so user can recover
  - Discoverable
    - learn new features over time
  - Pleasing
    - high user satisfaction
  - Fun

User-centered Design

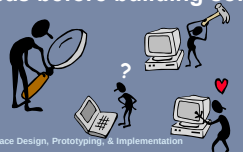
"Know thy User"

- Cognitive abilities
  - perception
  - physical manipulation
  - memory
- Organizational / educational job abilities & skills
- Keep users involved throughout
  - developers working with target customers
  - think of the world in users terms
  - not technology-centered/feature driven

Design Discovery

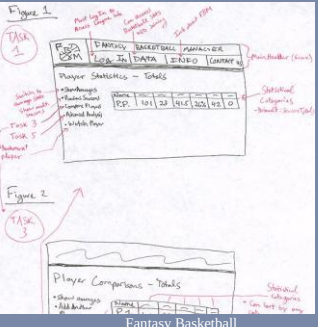
Task Analysis & Contextual Inquiry

- Observe existing work practices
  - augment with self-report tools (e.g., ESM)
- Create examples & scenarios of actual use
- Discover tasks to design for
- Answer key questions about tasks & users
- "Try-out"new ideas before building software



Rapid Prototyping

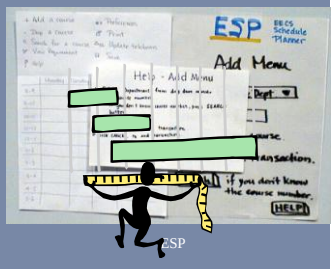
- Build a mock-up of design so you can test
- Low fidelity techniques
  - paper sketches
  - cut, copy, paste
- Interactive prototyping tools
  - HTML, Visual Basic, Flash, DENIM, etc.
- UI builders
  - Visual Studio .NET, JBuilder…



Fantasy Basketball

Evaluation

- Test with real customers (participants)
  - w/ interactive prototype
  - low-fi with paper "computer"
- Build models
  - GOMS
- Low-cost techniques
  - expert evaluation
  - walkthroughs
  - online testing



ESP

Goals of the Course

1) Learn to design, prototype, & evaluate UIs
   - the needs & tasks of prospective customers
   - cognitive/perceptual constraints that affect design
   - technology & techniques used to prototype UIs
   - techniques for evaluating a user interface design
   - importance of iterative design for usability
   - how to work together on a team project
   - communicate your results to a group
     - key to your future success
2) Understand where technology is going & what UIs of the future might be like

Course Format

- Interactive lectures
- Quarter long project & homeworks
- Readings
- All material is online
  - slides, exercises, readings, schedule
  - http://www.cs.washington.edu/cse440
- Have fun & participate!

How CSE440 Fits into CS Curriculum

- Most courses for learning technology
  - compilers, operating systems, databases, etc.
- CSE440 concerned w/ *design & evaluation*
  - technology as a tool to evaluate via prototyping
  - skills will become very important upon graduation
    - complex systems, large teams
    - don't look for large immediate impact in other CS courses

What is CSE441?

- Takes up where this course stops
- Focus on
  - executable prototypes
  - UI toolkits & implementation
  - advanced user testing
  - design principles & studio exercises/crits
  - even more project focused

Project Description (due Tue)

- Each of you will propose an interface idea
  - fixing something you don't like or a new idea
- Groups
  - 4 students to a group
  - work with students w/ different skills/interests
  - groups meet with teaching staff every 2 weeks
  - industrial mentors will meet with teams 3-4 times
- Cumulative
  - apply several HCI methods to a single interface
  - many projects will continue into CSE441 (optional)

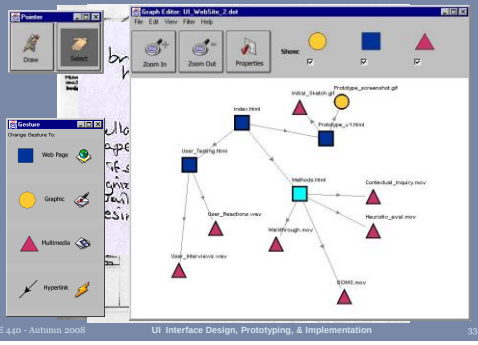
Project Process Overview

- Project proposal (individual) due Tuesday
- Break-up into groups next Thursday
- Project contextual inquiry
- Project task analysis
  - based on CI & field work with ESM tool on phone
- In class presentations & critiques
- Design sketching & video prototyping
  - i.e., rough proposals that can & will change
- Low fidelity prototyping & user testing
- In class presentations & critiques
- Rapid prototype using tools
- Final presentations & project fair with industry guests

Project Examples

- *SiteSketch*
  - web page design
  - sketch-based

SiteSketch



Project Examples (cont.)

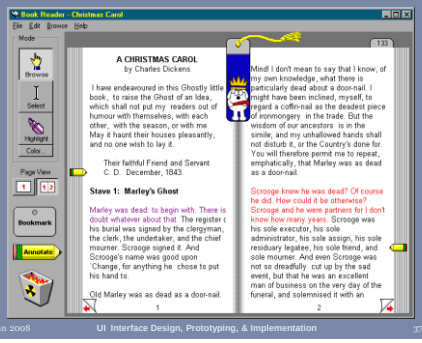
- *Clothes Shopper*
  - online shopping
  - knows your prefs & sizes

Clothes Shopper

Project Examples (cont.)

- *Electronic book reader*
  - take advantage of all the online texts on the net

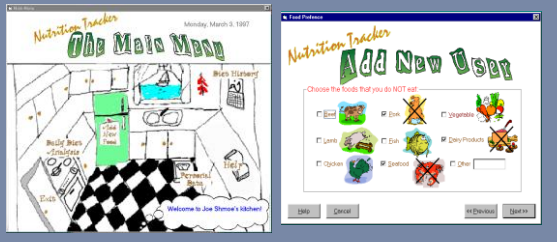
Electronic Book Reader



Project Examples (cont.)

- *Nutrition tracker*

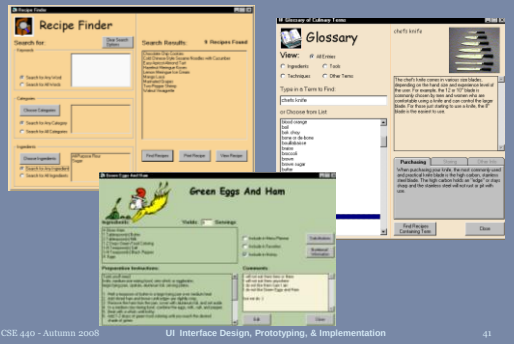
Nutrition Tracker



Project Examples (cont.)

- *cUIzine*
  - **recipe tool for the home**

cUIzine



Project Examples (cont.)

- **Read WWW over phone**
  - **find structure in pages & build voice menus**
  - **navigation problem**
  - **cache common paths & reorder?**
- *PDA brainstorming tool*
  - **small portable computers in a group meeting (say Palm Pilots)**

Project Examples (cont.)

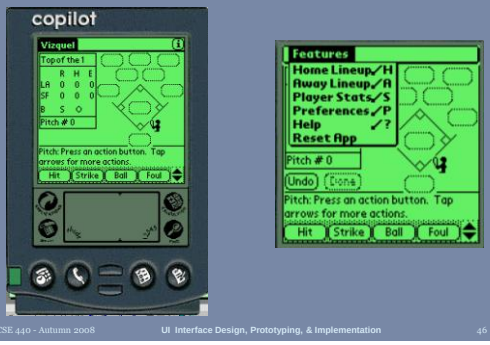
- Runner's training log
  - input daily workouts
  - reports
  - reminders
- *Mobile shopping*
  - scan in UPC & tells you whether a good price? environmentally friendly?
- *Home entertainment control* -"no more remotes"

Total Entertainment Control

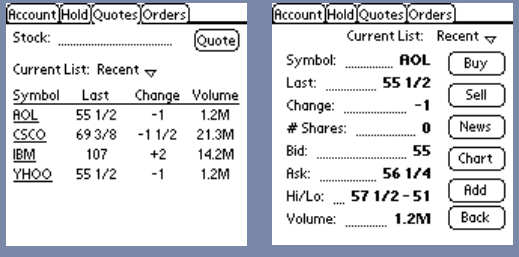
Project Examples (cont.)

- *PDA Baseball score keeper*
  - have stats of the players on your PDA
  - keep track of what happens during the game
  - upload stats after the game

PDA Baseball Scorekeeper

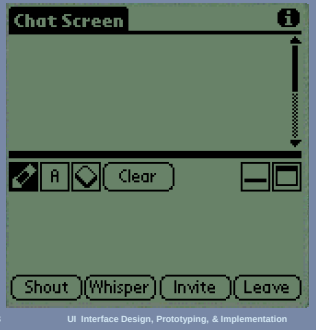


PalmStock



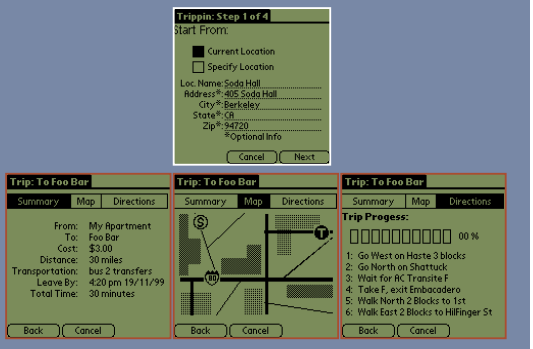
PalmStock

InkChat

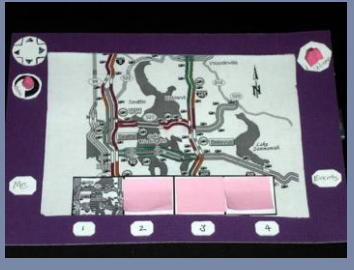


Nutrition/Exercise Tracker

Trippin'



Traffic Monitor



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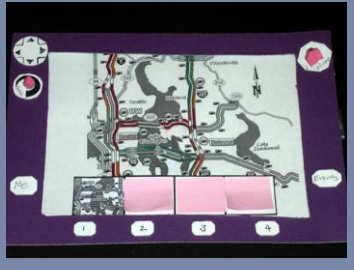
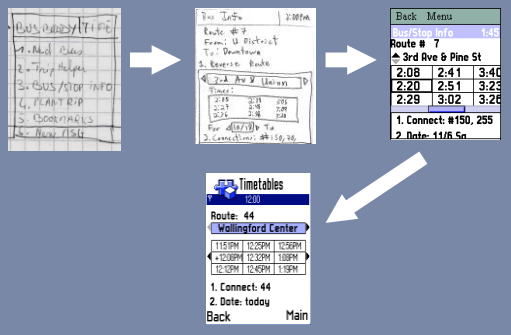


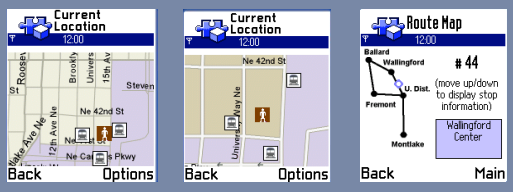
Traffic Monitor

Otto: Location-based Photos

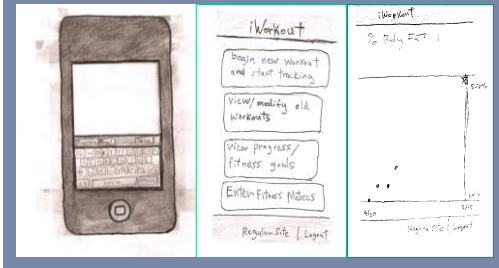
Bus Buddy



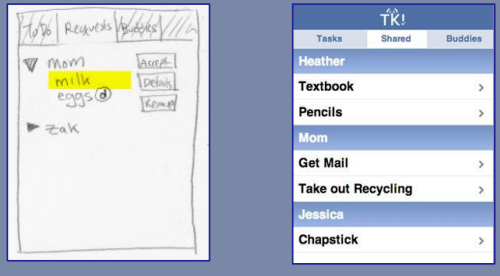
Bus Buddy



iWorkout



TaskKaster

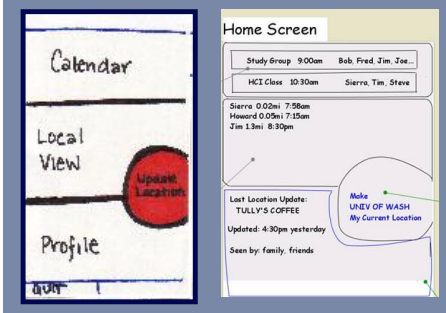


Radr

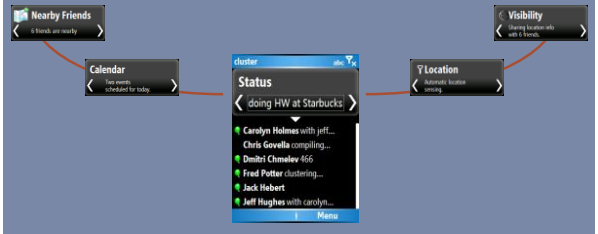
Swickr

Bargain Hunter

Cluster



Cluster



Mobile Computing Project Themes

- Location-enhanced computing
  - devices that are aware of their location
  - past examples include car navigation, Trippin', finding nearby restaurants, etc
- Activity-based computing
  - applications that use inference of human physical activity to enhance our lives
  - past examples helping care for an elder, helping people stay fit
- Target domain
  - decreasing environmental impact
  - submit best to CHI 2009 Design Competition

Books

- *The Design of Sites* by van Duyne, Landay, & Hong
  - online copies of the 4-5 chapters we will use
- We will also hand out other papers, give you web links, & refer to lecture slides
- Recommended textbooks
  - Human-Computer Interaction by Alan Dix, et. al., 3rd edition, 2003
  - order from Amazon.com (link off class web page)
- Other recommended books on web page

Assignments

- Individual
  - 3 written + one talk each
- Group
  - 5 written assignments
    - 4 presentation/demos with the write-ups + poster
  - all group work handed in on Web (group web site)

Grading

- A combination of
  - midterm (25%)
  - individual assignments (15%)
  - group project (55%)
    - demos/presentations/poster (group component)
    - project write-ups and exercises
    - ratings given by other team members & class
  - in class participation (5%)
- No curve
- No final (though late midterm)

Tidbits

- Late Policy
  - no lates on group assignments
  - individual assignments lose one letter grade/day
- Cheating policy
  - will get you an F in the course
  - more than once can get you dismissed
- More information (syllabus/schedule/slides)
  - http://www.cs.washington.edu/cse440

Administrivia

- Registration
  - limited by room and project constraints to 40
  - appeal email to me if not enrolled (due today at 5 PM)
  - tell us why you should be in the course
    - background, interests, what you can contribute
  - will email admits by Monday at 5 PM
- Roll
- James' office hours
  - Wed. 11AM-12 noon(642 Allen Center)
  - Mon. 3-4 PM online (send Kate Yahoo/MS/Google ID)
  - email landay@cs for appointments at other times

Administrivia (cont.)

- Discussion sections
  - new material will be covered in discussion → attend
  - also a time to get at least some of your team together
  - do people have Monday conflict?
    - Kate would like to cancel Wed.

Administrivia

- Fill out course survey at:
  - https://catalysttools.washington.edu/webq/survey/everitt/61610
- Project proposal due start of lecture Tue.
- Next lecture on History of HCI
- Read
  - As We May Think by Vannevar Bush
  - Tools For Thought Ch 9 (Engelbart Demo) (optional)

Summary

- HCI an important part of most software produced today
- Getting the interface right is hard, but…
- Solution in *Iterative Design* including repeated cycles of
  - Design
  - Prototyping
  - Evaluation