Sketching and Prototyping
SWE 632
Fall 2023
Administrivia

- HW2 due today
- HW3 due next week
- Midterm exam in 2 weeks (midterm review next week)
  - Covers all lectures & readings before exam
- 3 tech talks today
Iterative Model of User-Centered Design

**Observation**
(Re)Define the Problem
Understand User Needs

**Test**
Evaluate what you have built

**Idea Generation**
Brainstorm what to build

**Prototype**
Build
Iterative Model of User-Centered Design

**Observation**

- Understand User Needs

**Idea Generation**
- Brainstorm what to build

**Prototype**
- Build
Sketching & Storyboards

Based on slides by Bonnie John and Jennifer Mankoff
How do You Brainstorm?
What is a Sketch?

“A conversation between the sketcher or designer and the artifact”
Why Sketch?

• Sketching offers *visual* medium for exploration, offering cognitive scaffolding to externalize cognition
Being Creative with Sketches

• How do you come up with a great idea?
  • Generate lots of ideas
  • Work through ideas through externalization in sketch
  • Critique the ideas
  • Refine them to make them better

• Sketching offers a low-cost medium for working with early ideas before committing to one

• Design is process of creation & exploration
Sketching vs. Prototyping

**Buxton Design Exploration Sketches**
- For design
- Getting the right design
- Experimenting, exploring, being creative
- Goal: Support ideation to find a great design solution

**Low-Fidelity Design Refinement Prototypes**
- For UX engineering
- Getting the design right
- Following the UX process
- Goal: Support iterative refinement of a given design
Physical Sketches

• Production tools for sketching:
  • whiteboards, blackboards, cork boards, flip chart easels
  • post it notes
  • duct tape, scotch tape, push pins, staples
  • marking pens, crayons, spray paint
  • scissors, hobby knives, foam core board
  • duct tape
  • bits of cloth, rubber
The Space Remembers

- Covering walls, whiteboards, etc. w/ materials is extremely useful
- Provides fast access for revisiting and remixing old ideas
- Facilitates group discussion of designs
Sketches are Sketchy

- Not mechanically correct and perfectly straight lines
- **Freehand**, open gestures
- Strokes may miss connections
- Resolution & detail low enough to suggest is concept
- Deliberately **ambiguous** & abstract, leaving “holes” for imagination
Rules for Sketching

• *Everyone* can sketch; you do not have to be artistic
• Most ideas conveyed more effectively with sketch than words.
• Sketches are *quick* and inexpensive to create; do not inhibit early exploration
• Sketches are *disposable*; no investment in sketch itself
• Sketches are *timely*; made in-the-moment, just-in-time
• Sketches are *plentiful*; entertain large # of ideas w/ multiple sketches of each
Sketches Include Annotations

- Annotations explain what is going on in each part of sketch & how

Sketches part of design exploration

B. Buxton. Sketching User Experiences.

K. Moran, ReDraw Project Sketch
Sketches part of design exploration

B. Buxton. Sketching User Experiences.

K. Moran, ReDraw Project Sketch
Fidelity of Sketches & Mockups

Storyboard  Wireframe  Prototype

low  Fidelity  high

(many details left unspecified)  (more polished & detailed)
Storyboards
Classic StoryBoards

Storyboard from Studio Ghibli: “My Neighbor Totoro”
Classic Storyboards

Credit Studio Ghibli: “Spirited Away”
Storyboards for UI Design

- Sequence of visual “frames” illustrating **interplay** between user & envisioned system
- Explains how app fits into a larger **context** through a single scenario / story
- Bring design to **life** in graphical clips - freeze frame sketches of user interactions
- “Comic-book” style **illustration** of a scenario, with actors, screens, interaction, & dialog
Crafting a Storyboard

- Set the stage:
- Show key interactions with application
- Show consequences of taking actions
- May also think about errors
Example Elements of a UI Storyboard

- Hand-sketched pictures annotated with a few words
- Sketch of user activity before or after interacting with the system
- Sketches of devices & screens
- Connections with system (e.g., database connection)
- Physical user actions
- Cognitive user action in “thought balloons”
Example: Ticket Kiosk

Ticket buyer walks up to the kiosk

Sensor detects user & starts immersive process

Displays "Occupied" sign on wraparound case

Detects people with ID card
Example: Ticket Kiosk

- Greets buyer and asks for PIN
- Buyer selects “Boston symphony at Burruss Hall”
- Shows recommendations & most popular categories
- Plays music from symphony, shows date & time picker
Frame Transitions

• Transitions between frames particularly important

• What users think, how users choose actions

• Many problems can occur here (e.g., gulfs of execution & evaluation) - we will talk more in a future class!

• Useful to think about how these work, can add thought bubbles to describe
Wireframes & Design Critiques
Wireframes

• Lines & outlines (“wireframes”) of boxes & other shapes
• Capturing emerging interaction designs
• Schematic designs to define screen content & visual flow
• Illustrate approximate visual layout, behavior, transitions emerging from task flows
• Deliberate unfinished: do not contain finished graphics, colors, or fonts
Example
Example
Example
Wireframes

- Can be used to step through a particular scenario
- Focus on key screens rather than every screen
- Tools can help
  - Can be made clickable
  - Can use stencils & templates; copy & edit similar screens
Creating a Wireframe - (1)

• What are the key interactions needed to support design?
• What widgets support these interactions?
• What are the best ways to lay them out?
• How do these relate to conceptual design & user’s mental model?
Creating a Wireframe - (2)

• What are all of the items: toolbars, scrollbars, windows, …?

• Are there too many widgets on the screen?

• What happens when data is larger than available space? Will entire page scroll, or individual panel?

• How much detail of items to show?
Design Critiques

- Stylized meeting for getting feedback on design sketches & prototypes
- Solicit feedback from peers
- History: studio art education

http://www.flickr.com/photos/pjchmiel/2972140234/
Designer: Frame the Discussion

• State *explicitly*: What would you like comments on?
  • Overall idea?
  • Usability?
  • Specific interaction design?
  • Visual design?
• Take a *dispassionate* stance (this is hard!)
  • Show alternatives where possible
Critic: How to Avoid Deaf Ears

• Comments about the *design*, not the designer

• Point out positive aspects - be *specific*
  - Not: “I like this, but…”
  - “The layout effectively communicate the hierarchical nature of the data. However…”

• Ask for *alternatives* instead of offering solutions
  - Not: “You should really change X”
  - Instead “Have you considered alternatives for X?”
Prototyping
Prototyping

• How do you know your system design is right before you invest the time to build it?

• Answer: prototyping!

  • Evaluation performed before investing resources in building finished product

  • Early version of system constructed much faster & with less expense used to evaluate & refine design ideas
Types of Prototypes

- Which details do you leave out?
- **Horizontal**: broad in features, less depth
  - Explore overall concept of app, but not specific workflows
- **Vertical**: lots of depth, but only for a few features
  - Enables testing limited range of features w/ realistic user evals
- **T**: most of UI realized at low depth, few parts realized in depth
  - Combination of vertical & horizontal
- **Local**: focused prototype on specific interaction detail
Interactivity of Prototypes

- Scripted, click through prototypes
  - Prototype w/ *clickable* links to move between screens
  - Live action storyboard of screens
  - Simulates real *task flow*, but w/ static content
- Fully-implemented prototypes
  - Usually *expensive* to implement actual system
  - But can build key piece of system first to evaluate
Wizard of Oz

- Goal: *simulate* actual system w/out building it
  - Want user to interact *as if* they were interacting w/ real system
  - Helps explore how users would interact w/ novel interaction if it were to exist
- Example: natural command line (Good et al 1984)
  - Users typed in commands to interact w/ computer
  - Commands intercepted by hidden human who interpreted commands & executed them
Paper Prototypes

- **Low fidelity** prototype w/ paper mockups

- **Goal:** get feedback from users early w/ very low cost interactive prototype of envisioned interaction design
Paper Prototyping (1)

- Set a realistic deadline
- Gather set of paper prototyping materials
- Work **fast** & do not color within the lines
- Reuse existing sketches & mockups
- Make underlying paper mockups of key screens
Paper Prototyping (2)

- Use **paper cutouts** & tape onto full-size transparencies as “interaction sheets” for moving parts, making modular by including only a small amount
- Do not write or mark on interaction sheets
- Be **creative**
- **Reuse** at every level
- Cut corners wherever possible (trade accuracy against efficiency)
- Make a “this feature not implemented” message
Paper Prototyping (3)

- Include “decoy” user interface objects not needed for expected tasks
- Accommodate data value entry by users w/ blank transparencies
- Organize materials to manage complex task threads
- Pilot test thoroughly
10 Minute Break
In Class Activity
Group activity

• In groups of 2 or 3:
  • The venture capitalist from Lecture 3 who invested $5M in your new consumer product would like an update! They'd like to see how your app would work in one specific scenario, and how this would help better meet user needs.
  • Start with a specific set of user needs and develop a key scenario illustrating a benefit of your app.
  • Build a series of at least 5 wireframe “pages” supporting one scenario for the app.

• Deliverables
  • Few sentences describing the purpose of the app.
  • Few sentences describing the scenario for the app: what is the user's goal.
  • At least 5 wireframe pages describing what the app looks like at each step, with annotations below describing the user's goal.
  • Few sentences explaining why this design is better than current approach users might use.

• Due by 7:30pm today