Making Design Concrete

Learning objectives:
1. Understand the different aspects of your project’s design space.
2. Understand the benefits and different types of prototyping
3. Understand UI design principles, including Gestalt principles
4. Understand how to achieve Organization and Structure in your designs

Materials originally created by Prof. Jamie Ruiz
Impact

- Good visual design can significantly reduce processing time by user
  - Tullis (1981) redesigned screen for telephone line testing
    - 40% reduction in time to interpret display
    - 79 person years saved for every year of use
  - Tullis (1984)
    - 5.5 sec vs. 3.2 sec average search times for lodging info screens
Design Space

- Design space is both conceptual:
  - full range of possibilities for addressing identified problem; infinite in scope

- And real:
  - mapping of one or two dimensions of the design
  - e.g. tangible representations

- Mapping helps organize and suggest possibilities
Making Design Concrete

• Design process requires lots of cognitive resources
• Make *tangible representations* of every design idea to cope with this complexity
  – Write everything down!
  – Sketch!
  – Create example prototypes!
Benefits of Tangible Representations

• Offload cognition into environment
• Reflect on and evaluate the design
• Gather feedback from stakeholders
• Discover unintended side effects (positive/negative) of the design idea
Design Tools

• Low-fidelity prototypes (paper-based)
• High-fidelity prototypes (functional mock-ups)
• Scenarios & Storyboards
• **Sketches** – We’ll do an exercise from the *Sketching User Experiences* book (available on Canvas in the Files section) on Wednesday, using the 10 plus 10 method. **Today your team** needs to do part of the pre-work for this exercise; see the pre-work info on the Progress page
Why prototype?

• Faster, cheaper than building functional system
  – One bug in implementation can wreck evaluation
  – Broader design palette than computer-based tools

• Evaluation
  – Roughness of system encourages “right” level of evaluation
  – Can iterate on-the-fly
  – Palm Pilot, Laser Printer, Dynabook evaluated this way

• Communication
  – More clearly communicate intents
Types of Prototypes

Horizontal vs. Vertical:
- Horizontal
  - Broad overview of system at cost of great detail
  - Built from UEDs (more on this Wed)
  - Example: Website’s overall site design
- Vertical
  - Detailed rendition of one small part of system
  - Example: Detailed page design for one web page

Low Fidelity vs High Fidelity
- Low fidelity
  - Extremely coarse approximation of system using common physical materials
  - Intent is to get primary ideas across
  - Details follow
- High fidelity
  - Systems nearly identical to proposed production version
Horizontal or Vertical?
Low or High Fidelity?

Low Fidelity Prototyping
Paper Prototyping

• Start with blank sheets of paper
• As design starts to solidify, sketch unvarying system states on piece of paper / cardboard
• Use Post-Its to represent dynamic content
  – Drop-down menus
  – Views (e.g., graphs) that change
  – Drag-n-drop items
• Can also use tracing paper, transparencies for dynamic content
Wizard-of-Oz

- Low-fidelity prototypes can be brought to life
- Person fills in for computation
- Have different system states already built
  - Or build on-the-fly based on user demands
Designing interactive systems

• What Constitutes a Good Design?
• What Constitutes a Bad Design?

In reality, it is very difficult to describe why designs are good, but very easy to say what makes a bad design.

Conceptual Models and Design:
Mismatches cause “gulfs of execution and evaluation” for the user.
Moving Towards Good Design: UI Design Principles

• Affordances
  – Perceived and actual properties of a thing that determine how it can be used (e.g. turn knobs, push buttons)

• Mapping (take advantage of physical analogies/cultural standards)

• Constraints
  – Physical (e.g. only one way to connect, disabled buttons/menus)
  – Semantic Constraints (rely on knowledge of the situation and world)
  – Logical (e.g. My Documents, My Pictures, etc.)
  – Cultural (e.g. Next ➔, Prev ←)

• Visibility/Feedback
  – Provide some mechanism to show:
    • Input is received
    • When system is doing something
    • The outcome of an action
  – Minimizes Gulf of Evaluation

• Consistency (allows users to leverage control from familiar onto new)

• Metaphors
Gestalt Principles

“In anything at all, perfection is finally attained not when there is no longer anything to add, but when there is no longer anything to take away”

Antoine de Saint Exupery
Simplicity

• Simple designs present the *minimum* amount of information to achieve *maximum* effect

• Simplicity leads to quickly recognized and understood functionality
  – Less information == less time to process

• Simplicity can also aid recall
  – Less to remember
Achieving Simplicity

• Reduce, reduce, reduce

• Reduce some more

• Reduce until it hurts

• Regularize
Reduce!

• For every visual element (or interactive element)...

• ...Ask yourself if you can remove the element and still have a functional, understandable system/design

• Good candidates for removal
  – Lines used to segment areas
  – Bounding boxes
  – Gratuitous graphics

• Consider how many people will need the visual information over the long-term
Regularize

• Regularization and repetition can produce simplicity
• We see patterns and chunk them into a single unit
• Makes things more predictable
• Increases ability to scan

Regularize across:
- Size
- Color
- Line weight
- Alignment
- Shape
- Texture
- Orientation
- Spacing

Example: Keyboard
Irregularity

• With regularity, irregularity becomes meaningful

• Irregularities draw attention!!!

• People will ascribe meaning to irregularity, even if you did not intend there to be any
  – Avoid accidental irregularities!
Organization and Structure

• Structure doesn’t happen naturally
  – Explicitly planned, designed

• People naturally try to find order and structure, even if none was intentionally designed

• Use Gestalt principles to create structure...
Achieving Organization and Structure

• Grouping
  – Apply Gestalt principles to create groups of similar or related items instead of explicit structure

• Hierarchy
  – guide viewer, to allow scanning of information
  – according to intended reading/viewing sequence
  – adjust properties such as size, position, spacing, white space...

• Relationship
  – Establish relationships between elements by using position, size, value (color, shape, etc.)
  – Alignment is very effective tool at creating relationships
  – Similarity of form also effective

• Balance
  – Want to create visually stable composition, similar to physical balance
  – Stability achieved by manipulating properties such as position, size, hue, form
  – Symmetric layouts achieve balance naturally
Common Errors

- Haphazard layout

- Proximity not taken into account when laying out components in interface

- Unclear hierarchy

- Bounding boxes creating visual clutter, competing for attention
  - Use negative space (white space) instead

Testing it out...
  - Use the squint test...
  - Mimics early portion of visual recognition system
Wireframes

• Wireframes allow you to explore basic layout and visual composition of interface at high level

• Focus on functional areas and user’s flow through the visual interface
  – What functionality, where? What tools?
  – What information will user need?

• Draw and label boxes indicating different portions of interface
  – Don’t need to provide actual contents of boxes
  – Can use “squiggly” lines for text if want to add weight
Gestalt Grouping Principles

- Proximity (nearby elements associated)
- Similarity (elements with visual characteristics associated)
- Continuity (visual system prefers continuous, unbroken contours)
- Closure (visual system will create a complete picture)
- Area (smaller of 2 overlapping elements becomes object of interest)
- Symmetry (the greater the symmetry, the more we ascribe meaning)
Proximity

• Individual elements associated more strongly with nearby elements than with those further away
Similarity

• Elements associated more strongly when they share basic visual characteristics
  – Shape
  – Size
  – Color
  – Texture
  – Orientation
Continuity

• Visual system prefers continuous, unbroken contours

• Will seek out simplest possible explanation for abstract drawings
  – Even if several, plausible combinations exist
Closure

- Visual system will “fill in holes” to create a complete picture

- Will close figures when information absent
Principle of Area

- *Figure* is element that is interpreted as object of interest
- *Ground* is area on which figure rests
- Principle of *area* suggests that smaller of two overlapping elements seen as the *figure* while larger element is seen as ground
  - Also, darker objects appear more often as figure with lighter areas seen as ground
Figure/Ground
Symmetry

• We prefer symmetry

• The greater the symmetry, the more we ascribe meaning, relationships in the composition

• Symmetrical, unconnected elements are integrated into one coherent object
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