Review

SWE 432, Fall 2018
Web Application Development
Checkpoint - HW5

Go to: b.socrative.com, Click student login
Room name: SWE432
Student ID: Your G-number (Including the G)

Reminder: Survey can only be completed if you are in class. If you are not in class and do it you will be referred directly to the honor code board, no questions asked, no warning.
Information visualization

• Technology has made data pervasive
  • health, finance, commerce, customer, travel, demographics, communications, …
  • some of it “big”

• Information visualization: the use of interactive visual representations to amplify cognition
  • e.g., discover insights, answer questions
Example

Operating Revenues

1970: $3,549,385
1971: $4,520,362
1972: $4,916,444
1973: $6,814,503
1974: $11,014

Net Income (Loss)

1970: $(11,014)
1971: $397,747
1972: $521,943
1973: $1,647,001
1974: $1,435,102

Exploration & Development Expenditures

1970: $351,341
1971: $85,149
1972: $75,243
1973: $329,421
1974: $1,226,007

Bell
Weighted Electoral Map
# System 1 vs System 2

<table>
<thead>
<tr>
<th><strong>System 1</strong></th>
<th><strong>System 2</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic (unconscious)</td>
<td>Voluntary (conscious)</td>
</tr>
<tr>
<td>Effortless</td>
<td>Effortful</td>
</tr>
<tr>
<td>“Fast” thinking</td>
<td>“Slow” thinking</td>
</tr>
<tr>
<td>Associative</td>
<td>Planning</td>
</tr>
<tr>
<td>Heuristic</td>
<td>Logical</td>
</tr>
<tr>
<td>Gullible</td>
<td>Lazy</td>
</tr>
<tr>
<td>Can’t be turned off</td>
<td>Usually only partly on</td>
</tr>
</tbody>
</table>
Mental models

- Only single temperature sensor.
- Controls not independent, need to adjust both.
- (also delayed feedback)
Norman’s 7 stages of action

1. Goal (form the goal)
2. Plan (the action)
3. Specify (action sequence)
4. Perform (action sequence)
5. Perceive (the state of the world)
6. Interpret (the perception)
7. Compare (outcome w/ goal)
Designing For Action
Reasons’s Model of Unsafe Acts
Affordances, Constraints, Conventions
Usability

• A property of the relationship between
  • humans with goal-driven tasks
  • an artifact

• The speed and success with which the goals can be accomplished (task performance)
Life Threatening Errors

- Pilot typed in “R” and system completed full name of airport to Romeo
- Guidance system executed turn at low altitude to head for Romeo airport
- 9 seconds later plane struck canyon wall
- Is the pilot to blame?
Heuristic Evaluation

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition vs. recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation
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
Article Layout through movable windows (DADA) - drag and drop articles

News Timeline

- Run in + at
- Articles listed by time
- Could also just pictures

UID Wireframe

FLEXible News

- Even sizes?
- Different size boxes all same time? Only one?
Exploring Design Space with Sketching
Interviews

• May include both current users and potential users w/ related needs

• Questions
  • context of how product fits into lives or work
  • when, why, how is or will product be used
  • what do users need to know to do jobs?
  • current tasks and activities, including those not currently supported
  • goals and motivations of using product
  • problems and frustrations with current products or systems
Observations

• Most incapable of accurately assessing own behaviors
• May avoid talking about problems to avoid feeling dumb
• Observing yields more accurate data
• Capture behaviors: notes, pictures, video (if possible)
Design Thinking Case Study - Piles

• The context: Apple Computer, 1992, 3 researchers (Richard Mander, Gitta Salomon and Yin Yin Wang)
• The design problem: How should computers help users organize and file information?
• The method: How do users organize and file information best without computers?

Computer users are confronted with large amounts of information, but currently are only provided with a hierarchical filing system for managing it [folders].
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
Advantages of prototyping

• Offers concrete baseline for communication between users & designers
• Provides conversation “prop” to communicate concepts
• Allows user to “take design for a spin”
• Give project visibility & buy-in with customers
• Encourage early user participation and involvement
• Give impression that design is easy to change
• Afford designers immediate observation of user performance & consequences of design decisions
Disadvantages of Lo-Fi Prototypes

• Very rough appearance - can’t be used to find detailed layout/design issues
• Does not reflect the actual speed of your system (and responsiveness)
• Human computer’s logic may be difficult to capture in code
• Limited scenarios
Guidelines for Visual Design

Reduction in new map: relative distances don’t matter
Regularization in new map: Straight lines result in station names laid out in a line, rather than bouncing around
Train Tables: Which is Better?

<table>
<thead>
<tr>
<th>Train No.</th>
<th>3201</th>
<th>3301</th>
<th>3801</th>
<th>3803</th>
<th>3809</th>
<th>3817</th>
<th>3819</th>
<th>3821</th>
<th>3823</th>
<th>3825</th>
<th>3827</th>
<th>3829</th>
<th>3831</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:40</td>
<td>1:11</td>
<td>2:00</td>
<td>5:20</td>
<td>6:40</td>
<td>7:06</td>
<td>7:20</td>
<td>7:42</td>
<td>8:03</td>
<td>8:24</td>
<td>8:36</td>
<td>8:57</td>
<td>9:10</td>
<td>9:18</td>
</tr>
</tbody>
</table>

**Notes:**

- Train numbers 3201 to 3831 are shown in the table.
- Times are displayed in 24-hour format.
- The table includes departure and arrival times for various train stations.
- The table is used to compare different train schedules and routes.

**Train Numbers:**

- 3201: New York, N.Y.
- 3301: Newark, N.J.
- 3801: North Elizabeth
- 3803: Linden
- 3809: North Rahway
- 3817: Rahway
- 3819: Metro Park (Iselin)
- 3821: New Brunswick
- 3823: Jersey Avenue
- 3825: Princeton Junction S
- 3827: Trenton, N.J.
Layers

- Marshalling Signals
- Proceed: Watch Signals
- This Way
- Proceed to Next Signalman
- Turn Left
- Turn Right
- Move Ahead
- Stop
- Start Engines
- Insert Chocks
- Pull Chocks
- Cut Engines
- Slow Down
- Slow Down Left Engines
Organization & structure

- Organization needs to be **designed**
- Benefits
  - Unity - ties together related elements so that they work **together**
  - Integrity & readability - offers structure that helps user to easily scan & make comparisons
  - Control - determines where user will focus **attention** in the design
- Gestalt -> psychology of perception
Types of iconic representation

- Similar - visually **analogous** to action, object, concept
- Example - things that exemplify or are commonly associated
- Symbolic - represent concept at higher level of abstraction
- Arbitrary - little or no relationship to concept, must be learned through **standard**
Site Design vs Real World

• Challenges (differences from physical world):
  • No spatial sense of scale. 50 pages? 500 pages? 50,000 pages?
  • No sense of direction. Which way did I just go?
  • No sense of location. No spatial anchoring of where I am now and how that relates to where I could go.
Effective planning

• Help users plan most efficient ways to complete tasks
• Keep users aware of task progress, what has been done and what is left to do
• Provide constraints to avoid transaction completion slips
  • e.g., prevent users from starting task and accidentally throwing away work mid-task
Metaphors - disadvantages

- Tyranny of metaphor: ties interactions closely to workings of physical world
- Adds useless overhead in extra steps, wastes visual bandwidth
- Taken literally, becomes non-sensical
  - e.g., nesting folders 10 levels deep
Web navigation conventions

Site ID

You are here

Utilities

Sections

Local navigation

Footer navigation
Steps in a usability evaluation study

• Formulate **goals** of study
• Design study protocol, tasks, materials, data collection, …
  • Pilot study design
• **Conduct** study
• **Analyze** data to assess task performance and identify usability issues
Review: Fitt’s law

- Time required to move to a target **decreases** with target **size** & **increases** with **distance** to the target.
- Movements typical consist of:
  - one large quick movement to target (**ballistic** movement)
  - fine-adjustment movement (**homing** movements)
- Homing movements generally responsible for most of movement time & errors
- Applies to rapid pointing movements, not slow continuous movements
## Review: Design Details - Marking Menus

<table>
<thead>
<tr>
<th>Principle</th>
<th>Refinement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain visual context</td>
<td>Display only labels</td>
</tr>
<tr>
<td></td>
<td>Ignore pie wedges</td>
</tr>
<tr>
<td></td>
<td>Make labels symmetric</td>
</tr>
<tr>
<td>Hide unnecessary information</td>
<td>Hide parent menus</td>
</tr>
<tr>
<td>Support skill development using graphical feedback</td>
<td>Use eight item menus</td>
</tr>
<tr>
<td></td>
<td>Use compass star around menu center</td>
</tr>
<tr>
<td></td>
<td>Show idealized marks</td>
</tr>
</tbody>
</table>

Tapia & Kurtenbach ‘95
Review: Direct Manipulation
Color combinations

• Analogous color combinations - adjacent in color wheel

• Triadic color combinations - at corner of

  Anagalous
  Serene, harmonious

  Triadic
  Vibrant

  Complementary
  High contrast, vibrant

  Quadratic
  Two sets of complementary
Design Languages - Counter Example

![Image of a website interface with various buttons and links related to financial services.](image-url)
Why it matters

• Users will have idioms they expect to see, particularly if suggested by other related elements

• Branding: Users will see your website and have particular associations based on what it exemplifies
Next Steps

• Interested in deploying your React app online?
  • GitHub pages is a relatively easy free choice: https://codeburst.io/deploy-react-to-github-pages-to-create-an-amazing-website-42d8b09cd4d

• Interested in learning more web development?
  • Check out React tutorials: https://reactjs.org

• Interested in getting a job?
  • Update your resume with all of the great new marketable skills you have, like: React, NoSQL, Firebase, NodeJS, CSS, Event-oriented programming, JSON, Devops, User-centered design, prototyping

• Interested in learning more, generally?
  • Stay for an MS? It is FREE AND you get a stipend if you TA (and if you do it full time you can likely do it in 2 semesters).

• Interested in advanced topics?
  • Research opportunities available at all levels for credit and for $$$