Lecture 10-2: Design for the World Wide Web

- Hypertext and Hypermedia
- Web Design vs. GUI Design
- Design Principles for the Web
  - Nielsen - Top ten mistakes
  - Spool / UIE - Empirical studies
  - Evans - Literature review
- Recent Studies

Hypertext and Hypermedia

- Hypertext
  - Collection of non-linear, text-based nodes that are linked together
  - "Hyperlinks"
  - 1994 Definition (from Nielsen): Traditional text is sequential, linear, whereas hypertext is non-sequential - there is no single order which determines the sequence in which text is to be read.
  - Early 90s applications: interactive stories with no fixed narrative sequence
- Hypermedia
  - In addition to simple bits of text, pictures, video, sound, animations are hyper-linked
  - Hypertext + Multimedia = Hypermedia

History of Hypertext

- Predates the Internet by 50+ years
- Vannevar Bush (1945) Atlantic Monthly article "As we may think"
  - Proposed system for storing knowledge and linking by associations using portable computer-like devices
- Ted Nelson (1960 ff.) - Project Xanadu
  - Hypertext information system, side-by-side parallel document display
  - Two-way links, links don't "break"
  - Continues to this day - www.xanadu.net
  - "Web is an imperfect realization of Xanadu"
- Doug Engelbart (1980s) - Guide
- Bill Atkinson (late 80s) - Apple Hypercard
  - Inspired by Xanadu
- Ray Ozzie - Lotus Notes
- Tim Berners-Lee (Inventor of HTML) - Proposal for World Wide Web
  - Inspired by Xanadu and existing hypertext instantiations

Picture of Xanadu simulated terminal
Can be found at
http://xanadu.com/tech/index.html

1972 Realization of Xanadu

Picture of Apple Hypercard

The Future of Hypertext

- J. C.Spohrer et al. - WorldBoard
  - http://www.worldboard.com/
  - Spohrer (1999) “Information in Places” IBM Systems Journal
  - Enhancement of the web allows people to associate information with places
  - “virtually attach information, tools and services to any location on the planet or, using an identification tag, to objects or people in the environment”
  - “Augmented reality” instead of “virtual reality”
- From Spohrer (1998)
  - WorldBoard servers associate information (a personal, password protected Web page) with any plane at any location around the planet,
  - WorldBoard clients with "plus or minus one meter location sense” allow Web pages from the WorldBoard server to be browsed and authored,
  - WorldBoard glasses with "context sense" and head & eye tracking capabilities allow information to appear fixed and co-registered with reality
  - WorldBoard service archive information and design information spaces both indoors (offices, homes) and outdoors (national parks, tourist sites).

Worldboard Scenario

From Spohrer (1998) Apple Technical Report

“While on sabbatical during the summer of 1996, I was hiking near Mt. Shasta in northern California, and pondering the question: What comes after the WWW? However, I was soon distracted by a beautiful plant beside the trail, and wanted to know what it was. I imagined being able to use my PowerBook with Ricochet modem to search the WWW and find a similar picture. If I could find such a picture, then I would know what the plant was. However, the next person who came along and wondered what the plant was would be in exactly the same position as me. I took a digital picture of the plant, so I could later ask someone what kind of plant it was. A few people in my group at Apple had been playing with GPS systems, and it occurred to me they had been talking about using a camera in conjunction with a GPS to geocode or "place stamp" pictures. I pushed my glasses back up my nose, and imagined putting it all together, including a new viewing system built into my glasses, and a way to leave information at that spot for the next hiker who asked the question I had asked. Eventually, I came to call this notion WorldBoard.”

Historical Connections to the Web

- Tim Berners-Lee
  - 1989 Writes hypertext editor for NeXT at European Physics Lab CERN
    - Method of associating technical papers in physics
    - First web server
    - Original proposal (http://www.w3.org/History/1989/proposal.html)
  - Introduced to physics, NeXT, and hypertext communities, 1991
  - Definitions for URLs, HTTP, and HTML published on 1st web server
  - 1993 Mosaic browser (for PC) written at Illinois by Andreessen
  - Browsers move beyond NeXT, Mosaic is parent of both Netscape and IE
  - 1994 World Wide Web Consortium formed

Web Design:
Functions Relating to Usability

- User Interface Design
  - Readability, button design, navigation, page organization, menus, etc.
- Graphic Design
- Information Architecture
  - Site-wide organization and navigation
- Prototyping
  - Extremely blurred in this domain
  - Less emphasis on throw-away prototyping
  - Designers may produce HTML up front
  - Sites may be posted and improved rather than "prototyped"
- Usability Testing

Web Design vs. GUI Design

How different is web design from designing GUI screens & windows?

- Adaptation of document model
- Browser variability – Cross-Platform Design
- Tension between exact graphic control versus abstraction
- Response Time
- User controls navigation
- Design does not control complete environment
- Real estate and scrolling

Nielsen (1997) – Workstation vs. WebTV

Pictures of text on web TV

See article at

http://www.useit.com/alertbox/9702a.html

Web Browsing on PDAs

- Web pages built specifically for PDAs vs. general surfing from PDA
- Web based-email: cross-platform viewing is expected

Pictures of webmail, MS Hotmail

Try it out at http://foraker.research.att.com/unimsg/cgi-bin/webmail.cgi

Browse the web long enough and you'll hit one of these

Example – Font not available to browser

"Anyone who slaps a 'this page is best viewed with Browser X' label on a Web page appears to be yearning for the bad old days, before the Web, when you had very little chance of reading a document written on another computer, another word processor, or another network."

-Tim Berners-Lee in Technology Review, July 1996

http://www.anybrowser.com

Go to http://www.lynda.com/hexh.html

Tension between exerting control over graphics versus allowing abstraction – EXAMPLE: Nielsen (2000) = Don't defeat browser's built in facility to change color of visited links

Semantic Encoding (Nielsen, 2000)

- HTML Tags
- Specification of font and size versus logical category
  - **<bl>** and **<ol>** → obsolete = **<menu>**
  - **<code>** computer code sample (fixed width font)
  - **** Emphasis
  - **** Strong Emphasis
  - **<tt>** Typewriter Font (fixed width)
  - **<b>** Bold
  - **<i>** Italic
  - **<font face="Arial, Helvetica, sans-serif">**
- Style Sheets

Nielsen (2000) on Response Time (1)

- Miller (1968)
  - 0.1 seconds -- perceived as instantaneous
  - 1 second – user notices delay but flow uninterrupted
  - 10 second – limit by which users don't turn to another task
- Web delays unpredictable
  - Multiple points of delay
    - server throughput
    - server connection
    - Internet
    - user's connection
    - user's browser and computer

J. Nielsen (2000) *Designing Web Usability*. New Riders.

Nielsen (2000) on Response Time (2)

- Design pages for speed
  - Minimize needed number of graphics
  - Repeat graphic images, etc.
  - Design page so it works equally well when graphics not rendered (before rendered)
  - Avoid flash, plug-ins etc or allow user to skip
  - Keep pages below 34 kilobytes for modem users

Nielsen: Top Ten Mistakes (1)

- Using frames
  - Violate the user model of web pages
  - Can bookmark page as user sees it, can't copy down URL
  - Printing is difficult
  - Search engines have trouble point to correct frame composite
  - Not compatible with older browsers (no longer an issue)
  - Back button may not work predictably (older browser versions)
  - A page is the unifying atomic unit of the Web: combines what the user sees, the addressable unit, navigation unit, author's editable unit -- frames violates this
- Gratuitous use of "bleeding-edge" technology
  - Will discourage users, most users care about content and not latest technology
  - If a site crashes a users browser or computer, user will not be back
  - Example: Use VRML ("virtual reality") only if content truly requires mapping onto 3-D space

Nielsen: Top Ten Mistakes (2)

- Scrolling text, marquees, and constantly running animations
  - "Dancing baloney"
  - Moving images are overpowering
    - motion has special attention-orienting effect on peripheral vision
  - "<BLINK> is evil" (Nielsen)
  - Common compromise solution: Animated GIFs which go thorough a few change cycles then stop
- Complex URLs
  - User do not ignore URLs but rather attempt to decode and understand the architecture of the site from the URLs
  - URLs should contain human-readable directory and file names that are relevant to the content
  - Users type in URLs, therefore
    - use short names
    - use all lower case
    - avoid special characters (e.g. tilde, ~, may be diffucult to find or type, appears many different places on many keyboards)

Nielsen: Top Ten Mistakes (3)

- Orphan pages
  - Users may come into pages without going through top level/home page
  - All pages should have clear indication of the web site in which they reside
  - There should be a link to the home page on every page
  - There should be some indication of where user is inside "site map"
- Long scrolling pages
  - All critical content and navigation should be on top part of page
  - 1996: Only 10% of users scroll a page
  - More recent finding indicate users are more willing to scroll
- Lack of navigation support
  - Communicate structure of site to user
  - Provide site map
  - *Always provide a search feature*

Nielsen: Top Ten Mistakes (4)

- Non-standard link colors
  - Link color (blue for new, red/purple for links that have been followed) is one of the few built-in and consistent navigation cues
  - Don't alter default link colors
- Outdated information
  - Need to prune old, irrelevant pages
- Overly long download times
  - Traditional guidelines give 10 seconds as max response time
  - Nielsen says can increase limit to 15 seconds
  - Both are impractical, but download is still more important and troublesome factor (even thought users are used to the "World Wide Wait")
  - Need to consider factors which slow download times, large graphics files, flash animations etc.
    - E.g., Pictures which are re-sized should also be re-sampled

J. Nielsen (1996, 1999, 2003) *http://www.useit.com/* & elsewhere.

UIE Website Study (1997)

- Jared Spool et al. (1997) User Interface Engineering
- 9 Web sites (HP, Edmund's, Disney, etc.)
- "Scavenger hunt" tests: Asked 4 types of questions
  - Simple fact
    - Can you get a Honda Accord for under $15,000?
  - Comparison of facts
    - Which is cheaper to fly to, Nevada or England?
  - Judgment
    - Do you think a used Ford F-10 is safe enough?
  - Comparison of judgment
    - Which convertible is the best deal for under $20,000?
- Obtained rankings
- Examined web sites, correlated factors with success of site

UIE Study Implications

- Graphic design neither helps nor hurts
  - does not help users retrieval information from site
  - professionally design sites were at top and bottom of rankings
- Text links are vital
  - users examined text links before considering image links
- Navigation and content are inseparable
  - *shell strategy* or common overall structure to site
  - generic links in "shell" sites were a problem
- Information retrieval is different from surfing
  - sites aimed at information retrieval must be differently designed
- Webs sites aren't like software
  - when asked which site they liked best, some users choose the one they were most successful with, but others did not
  - contrary to results found with software

Evans (1989)

- University of Washington thesis
- Review of literature as applies to web design questions
  - not all empirical research directly on web interfaces per se

The Questions:

- Page downloading time
  - Web surveys show people use modems and have slow connection speeds
  - Slow page downloading identified as problem
  - Errors increase as delays go beyond 12 seconds
- Vocabulary
  - Must use user's language
  - Studies show vocabulary can prevent people from obtaining information or actions they want from a system
  - Problem is that people differ widely

Evans (1989) (2)

- Writing to be read online
  - People read online text differently from print
  - Users scan blocks of text, move quickly among pages
  - Sites should be designed to be easy to scan, with concise language
- Site topology - hierarchy vs. other
  - People are “searchers” or “browsers”
  - Hierarchy works best for searchers, network better for browsers
  - Study found users find information fastest in site organized as a combination of hierarchy and network
  - Arrange information in a manner meaningful to users
- Number of levels on a site
  - Users complete searches faster and more accurately with broader menu structures
  - With more options, deep structures are better
  - Information must be meaningfully organized

Evans (1989) (3)

- Make links predictable
  - Users choose menu option more accurately when they can view information which helps them predict the results
  - Add descriptors
  - Have users pick option names
- Link colors
  - Only a weakly positive effect of using default link colors observed in empirical research (Spool, 1997)
- Embedding links in text
  - Do links embedded in content text distract, hinder comprehension?
  - Studies indicate no:
    - Provide links in text versus menus separated from text
    - Navigation faster and info found more quickly with embedded links

Evans (1989) (4)

- Arranging links (in menus)
  - Users can search for information faster when links or menu options are arranged vertically rather than horizontally
- Image links
  - Difficult to create icons that are meaningful to all users in the same way
  - Difficulties: images do not change color when visited
  - Text labels should be included with all images that are links
    - Also required for accessibility
- Number of links
  - Do more links make search difficult?
  - Studies indicate no:
    - People found information faster when pagers contained more links versus fewer links
    - Presenting alternative links on same page allowed users to find information faster

Evans (1989) (5)

- Information overviews (Site maps)
  - People prefer having an overview
  - User searching for information prefer an index, users exploring a system preferred graphical representation
- Page density (white space)
  - Increasing the amount of text/graphics slows information search
  - However, with web *sites*, high densities on few screens was better than low densities on many screens
- Background and text color
  - Text and background should contrast strongly in brightness and hue
  - White/black is most legible
  - Blue and cyan good for backgrounds but bad for text
- Legibility
  - Affected by font size, case, style, but little research done on *online* text

Evans (1989) (6)

- Blinking text and animations
  - Study show people irritated by animations, no study done on blinking text
  - Word search not affected by blinking of some text on screen

Examples for discussion

- Portals - MSN, etc.
- Volkswagen - “mystery meat navigation”
  - http://www.mace.co.uk/mace/
- Text visibility and animation
- Others