Introduction:

The field of human-computer interaction (or from the computer scientists’ point of view, computer-human interaction) is uselessly broad. I describe it thus because it seems that anything remotely related to a computer and its human user have been aggregated into the field. There are also never-ending groups from web developers who have no training, to graphic design schools who frolic in the fields of color and whiz-bang, to Schools of Communication who study building sites from a communications perspective, to the not-surprising work in ergonomics and cognition.

I had considered assigning readings – but which to select? Those that encourage designers to objectify the user (in the sense that end-user cognition is a bad thing, so don’t make ‘em think), or any of the countless works that all claim to teach human-computer interaction, but turn out to be a basic introduction to Photoshop. As this class is not a research course in any of the myriad of dimensions of human-machine behaviors, we will not have specific monographs assigned. Of course the student is encouraged to do outside readings because any exposure broadens one’s learning. For now, though, let us be happy with the below, highly outlined, review of some important features of human-computer interaction, keeping an eye open to the fact that we are building front-ends to web-enabled information systems.

1. Objectives
   • Understand the basics of human and computational abilities and limitations
   • Understand how these lead to models of interaction
   • Understand basic theories, tools and techniques in HCI
   • Apply appropriate techniques to real-world problems
   • Be aware of HCI issues, implications and developments

Contents:
1. Introduction to HCI
2. HCI and the Web
3. Aspects of Human Cognition
4. Human-Centered Design
5. The Computer Principles
6. Computational Aspects Models of Interaction
7. of Design
8. Interacting with the User
9. Usability Evaluation
10. Dialogue Design
11. Interactive Session
12. Task Analysis
13. Examples of TA Organizational Impact
14. Groupware
15. Creativity and HCI
16. Future Applications
17. Conclusions

1. What is HCI?

“‘The study of how humans and computers can work with each other on common tasks.’”

Key concepts:
• What are the strengths and weaknesses of users
• What are the strengths and weaknesses of computers
• How can we design systems to facilitate successful interactions

2. Areas of HCI
   Research into Interactional Hardware and Software
   • Ergonomic design to virtual reality
   Research into Matching Models
   • User model vs System Model
   Research at the Task Level
   • Task Definition and Fit

3. Research into Design and Development Software engineering vs Human factors

4. Research into Organizational Impact
   What impact does a new system make to an organization?
   Training users vs Good design

5. HCI Is Multidisciplinary

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6. Components of HCI
   [see pix]
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7. Models of Interaction
   Cooperative Paradigm
   System
   • adopts goals of User
   • models User’s beliefs
   • corrects misconceptions of User

   User
   • assumes System has no goals of its own
   • attributes perfect knowledge to the System

   Problems
   • Many tasks are not cooperative in nature
   • Many commercial systems have their own goals
   • Systems are fallible in their knowledge

8. Why is HCI important?

• On average, 70% of code for any real application is devoted to the graphical user interface
• Similar figures for cost/effort during development
• Poor design limits the actual usage of the System
• Worst case: the system might not be used at all!
  ○ compare amazon.com with boo.com

9. Are HCI issues really important?
10. What kind of study is HCI?

- Science: A better understanding of the nature of interaction
- Psychological aspects of computer use
- Research into how better systems can be developed
- Craft
- Design of interfaces/systems, which achieve a certain task
- Technology
- The development of specific techniques and hardware use

11. General principles of HCI design:

- Consistency
- Physical analogy
- Expectations and stereotypes
- Ease of learning vs. ease of use
- Avoiding excess functionality and using multiple paths
- Design for progressive disclosure and graceful evolution

12. Consistency:

- Lack of consistency in system design results in
  - User must develop a new mental model of the system
  - User relies on several different models during use
- Real projects involve a group effort in design/implementation
- Graphical user interfaces are no exception
- Specification is essential
- GUI should be consistent at every level

Example
Word processing:
13. Physical analogy

- Users often rely on physical analogies in modeling systems
- This can be exploited

Example
- Users often compare word processing tools with typewriters
- A word processor design could exploit this by mimicking a typewriter
- Direct manipulation dialogues
- Objects are represented as icons, which can be manipulated directly
  1. Object is represented continuously
  2. Physical actions are used instead of complex syntax
  3. Operations are fast, incremental and reversible

14. Expectations and stereotypes

Expectations from other domains can be exploited to facilitate learning

Example:

<table>
<thead>
<tr>
<th>Traffic lights</th>
<th>User interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Alarm</td>
</tr>
<tr>
<td>Amber</td>
<td>Caution</td>
</tr>
<tr>
<td>Green</td>
<td>Safe</td>
</tr>
</tbody>
</table>

15. Stereotypes can also have negative effects by creating false expectations

Example:
Electrical companies often use Red to denote "live"
So, should Red should be used in their systems, and not in the system above?

16. Ease of learning vs. ease of use

Ease of learning for novices often reduces ease of use for experts:
- Learning requires prompts, which an expert can ignore
- Learning limits functionality, which an expert can exploit

17. Steps must be taken to avoid these limitations:
1. Design for three levels of expertise: novice, intermediate, expert (Apply user modeling techniques to adapt to the user)
2. Avoid and prioritize excess functionality
3. Provide multiple paths

18. Using multiple paths (can you think of examples? Pros/cons?)
1. Menu bypass: keyboard shortcuts/expert menus
2. Stacking and type ahead commands to bypass menus
3. User defined macros
4. Input device options

The choice of multiple paths depends on the application and the task

19. Progressive disclosure & graceful evolution

- Progressive disclosure - Increased Functionality modeled by expertise of User
- Graceful evolution - smooth development of User from Novice to Expert
• Make fundamental features easy to learn
• Make frequently used functions quick to perform
• Encourage experimentation through consistency and reversibility
• Use defaults that can be later changed by experts
[Can the technology you think of using do this? If not, is that bad?]

20. Summary
a. HCI - the study/design/application of techniques and hardware to facilitate productive interaction between humans and computers
b. HCI involves developing techniques which
   • Promote the strength of the User
   • Promote the strength of the Computer
   • Are designed for a specific task and type of interaction
d. Which is relevant depends on the type of user/system/task [and the designer must make these decisions and defend them].
2A - USABILITY AND THE WEB.

Subsections
  a. Overview
  b. Golden rules for web design
  c. Handcoding HTML vs authoring tools
  d. Advantages of handcoding HTML
  e. Basic HTML
  f. HTML page layout
  g. HTML tags
  h. My first webpage
  i. General principles of HCI
  j. Multiple paths and search engines
  k. Frames
  l. 3 click rule
  m. Browser compatibility
  n. Minimizing the effects
  o. Consistency and the web
  p. Internet access for the disabled
  q. W3C guidelines
  r. E-commerce and internet services
  s. Summary
  t. Further reading

1. Overview
   • Why HTML?
   • Basic HTML
   • Examples of poor design
   • Applying usability to webpage design
   • E-commerce

2. Golden rules for web design
   • Content is the most important thing
     o Webpages with little content are ignored
     o Users use the internet for information, not for experiencing multimedia
   • Content is audience specific
   • The requirements of specific types of User must be modeled
   • Usability techniques should be used to facilitate access, they should not replace or obscure content
   • Content always comes first!

3. Handcoding HTML vs authoring tools (tho I prefer the term “tagging” – not coding!)
   • Many applications exist to make webpage design easy (Dreamwaver, Flash, Frontpage)
   • Most are graphical editors with WYSIWYG functionality
   • Such tools are more trouble than they are worth
   • Problems:
     • they overspecify
     • this limits User discretion (and reduces graceful transformation)
     • this ensures pages are complex (and difficult to update)
• slower to download
• they impose style guidelines, which are hard to adjust

4. Advantages of handcoding HTML

• You will develop a better understanding of how HTML works
• You will be able to view (the source of) other pages and learn how they achieved certain effects
• You will be able to troubleshoot webpages, when small errors occur
• Your assessment requires handcoding
• It’s easy anyway

5. Basic HTML

• HTML (HyperText Markup Language) is the standard language for publishing hypertext documents on the internet
• HTML is a restricted subset of SGML (and a relative of XML)
• HTML is not:
  o a programming language
  o a semantic specification of content in a document
• HTML is a formatting language
• HTML has gone thru many versions: standardized by W3C (http://www.w3.org). Current version is 4.01

6. HTML page layout:

[width=12cm]page.jpg

7. HTML tags

  • Basic syntax: `<command attribute=x attribute=y attribute=z> text </command>`
  
  Example: `<font color=''red''> some red text </font>`

  `<ul>
  <li> list item one</li>
  <li> list item two</li>
  <li> list item three</li>
  </ul>`

8. My first webpage

```html
<HTML>
  <HEAD>
    <TITLE>My First Webpage</TITLE>
  </HEAD>
  <BODY bgcolor="white">
    <CENTER>
      This is an example of a <b>very</b> simple webpage. <br>
      Below here is a table containing some text and a picture. <p>
      <TABLE BORDER="1">
        <TR>
          <TD>
            Hello World!
          </TD>
        </TR>
      </TABLE>
    </CENTER>
  </BODY>
</HTML>
```
9. General principles of HCI
   Consistency
   Physical analogy
   Expectations and stereotypes
   Ease of learning vs. ease of use
   Avoiding excess functionality and using multiple paths
   Design for progressive disclosure and graceful evolution

10. Multiple paths and search engines
   - Search engines operate by collating according to keyword content
   - Content can be keywords in the text or meta html tags
     <META keywords='HCI webpage Simmons'>
   Problem:
   - If a search engine collates using keywords in any document then the user can be directed to any webpage on the server (and therefore skip any introductions to the webpages)
   - Therefore, the web provides multiple paths to webpages
   - All webpages must be self sufficiently understandable and link back to the main webpage

11. Frames
   - Frames were introduced by Netscape in 1996 and then were accepted by W3C as a standard feature
   - Frames immediately posed severe usability problems:
     1. Bookmarking frames vs framesets
     2. Printing of webpages
     3. Navigation issues (using the back button)
     4. Search engine access to frames rather than complete pages
     5. Use by older browsers
   - Some of the issues have become less serious
     1. New releases of browsers have tweaked some of the initial bugs
     2. All recent browsers deal with frames
   - Frames are still considered bad for usability and user choice

12. 3 click rule
   - 3 click rule: Any feature of an application should be reachable by the User from main menu in 3 or less “clicks” (or logical steps)
   - In the case of webpage design any content should be accessible to the User within three hypertext links
   - Key content of a website should be “instantly” available!
   - This is much more important than some “nice graphics”
13. Browser compatibility
   - In an ideal world: Same content Different browsers Same display
   - This is not the case in reality:
     - IEExplorer and Netscape differ in their interpretation of HTML in a number of ways
     - Different features are available in different releases (frames)
     - Different users will have different preferences (switch off graphics, Lynx)
     - Different platforms provide different facilities

14. Minimizing the effects
   - Adhere to correct HTML (as defined by W3C)
   - Close ALL tags
   - Use uppercase for HTML
   - Provide room for different preferences
   - Alt tags on graphics
   - Offer alternatives
   - Avoid “bleeding edge” technology
   - Wait until new formats are widely accepted and used
   - Never assume that any user is prepared to install a plug-in for any application
   - Use HTML style checkers and test with several browsers

15. Consistency and the web
   - Consistency is an important principle for Usability
   - Consistency applies to the structure of webpages at ONE site
   - What about the rest of the web?
     - Bad design decisions have become standard features:
       - blue underlined hypertext links
       - yellow sidebar indices (cf. CNET)
     - Sometimes the principle of consistency must overrule our own usability decisions

16. Internet access for the disabled
   - W3C provides criteria for ensuring web access for all
   - The key concept is Graceful Transformation
   - Technology exists to aid disabled users (speech synthesis for blind people)
   - Any webpage can be “transformed” to any user-preferred medium “gracefully”

17. W3C guidelines
   1. Provide equivalent alternatives to auditory and visual content
   2. Don’t rely on color alone.
   3. Use markup and style sheets and do so properly
   4. Clarify natural language usage
   5. Create tables that transform gracefully
   6. Ensure that pages featuring new technologies transform gracefully
   7. Ensure user control of time-sensitive content changes
   8. Ensure direct accessibility of embedded user interfaces
   9. Design for device-independence
   10. Use interim solutions
   11. Use W3C technologies and guidelines
   12. Provide context and orientation information
   13. Provide clear navigation mechanisms
   14. Ensure that documents are clear and simple
18. E-commerce and internet services
  o Internet services originally provided only information (including advertising)
  o Web publishing vs web-based services (free e-mail)
  o The situation has become more complex
    o Single source information providers
    o Collaborative source information providers
    o Server-side service providers
    o Sites that provide standardized information/services from several sources
    o Different types of services require different approaches to design

19. Summary
  • The internet can be an excellent resource
  • Often poor design ensures that it is not
  • Usability design guidelines can help
  • Content should be the most important consideration
  • Designers should ensure that webpages facilitate access to the content
  • Best websites - with content and high levels of usability to access the content

20. Further reading
  o HTML books from Main Library
  o http://www.webmaster.bham.ac.uk/html_tutor/
  o http://www.w3c.org
  o http://www.w3c.org/MarkUp/Guide/
  o For disabled access: http://www.w3.org/TR/WAI-WEBCONTENT/
  o http://www.w3schools.com

Tutorials for webpage design
  http://www.htmlgoodies.com/ see The Alert box “Current issues in web usability”
  http://www.useit.com/alertbox/ Validating webpages
  http://www.webmaster.bham.ac.uk/weblint/
Lecture 2b: Aspects of human cognition

Subsections
- Introduction
- The problem of Introspection
- Visual processing
- Depth perception
- Perceiving brightness
- Expectation and context
- Expectation and visual perception
- Reading
- Hearing
- Haptic Perception
- Movement
- Human memory
- Sensory buffer
- Short term memory (working memory)
- Working memory
- Long term memory
- Forgetting long term memory
- Deductive reasoning
- Abductive reasoning
- Inductive reasoning
- Inductive reasoning 2
- Analogy
- Skill acquisition
- Summary
- Further reading

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1. Introduction

HCI comprises three aspects: (1) the Human, (2) the Computer and the (3) actual task they are interacting on. The Human is the most important and most complex aspect.

2. Perception

- 5 senses: Sight, hearing, touch, taste, smell
- Only the first three are involved in HCI
- Memory
- Sensory, short and long term
- Procedural vs declarative
- Reasoning
- Deduction/Induction/Abduction/Analogy/Skill acquisition

3. The problem of Introspection

- Designers often think that they know how people work because they are people themselves
- The problem - we do not know ourselves very well

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>43</td>
<td>34</td>
</tr>
</tbody>
</table>
Subjects were asked to memorize a table of numbers. When asked to recall pairs of numbers they were faster at recalling numbers above or below, but not diagonally. The pattern of recall suggested a memorized list - not a table.

Lesson: Do not think you know what your own mind is doing.

Visual processing: involves two types of cells: rods and cones.
- Rod - highly sensitive to light
  - edges of retina/dominate peripheral vision
- Cones - less sensitive
  - central
  - three types - each sensitive to a different wavelength
- Ganglion cells - X cells (fovea) pattern detectors - Y cells - motion

Notes: 8% of males 1% females are color blind, caused by fewer blue cones than red or green cones.

4. Depth perception
- Visual acuity: normally can detect lines at 0.5 seconds of arc
- Size perception is partly dependent on visual angle
- Other factors maintain size consistency: cues
  1. Foreground versus background
  2. Size and height
  3. Familiarity
  4. Stereoscopic vision

5. Perceiving:
- Perceiving brightness
- Brightness is subjective
- Affected partially by amount of light emitted by object (luminance)
- But dependent on compensations within eye
- Low brightness: rods dominate, so peripheral vision is accurate
- Normal brightness: cones dominate, so central vision is accurate
- Visual acuity increases with luminance
- Also perception of flicker
- Flicker is detected by peripheral vision, so more flicker with bigger screen

6. Expectation and context (cover each line and you pretty much expect (and are right) of the next line. Change the context and the expectation.

The quick brown fox jumps over the lazy dog.

7. Expectation and visual perception
- Vision is partially determined by expectation
- Expectations are dependent on context

But...
Gibson's theory of optic flow and affordances (very briefly)

1. argues that visual perception is a direct bottom up process
2. depends on optic flow - which is the continuous input of light
3. Affordances - object uses are directly perceived

8. Reading
   Reading is composed of sacchades and fixations

   Sacchades - eye motion
   Fixation - actual understanding
   Reading is not linear - eyes skip back and forth through a text:
   1. Poor perception
   2. Linguistic:

   Examples:
   "The horse raced past the barn fell (garden path)"
   "The boy saw the girl with the telescope"

9. Reading speeds:
   o 250 words a minute on paper
   o 9 to 12 font the same as long as prop. spacing
   o 2.3 to 5.3 inch lines the same
   o Computer reading speeds are slower

10. Negative contrast - higher luminance = more accuracy

   (more flicker) [computer screen]

11. Hearing
   o Sound is vibrations in air pressure
      o Pitch - frequency of sound
      o Loudness - Amplitude of sound wave
      o Timbre - Type of sound
   o Human ear
      • frequencies between 20 Hz and 15Khz
      • distinguish changes of 1.5 Hz at low frequencies
   o Two ears allow location of sound to be determined
12. Haptic Perception
   - Touch - not localized, feedback from skin & joints
   - Often overlooked in HCI but important
   - Especially for people with sense impairments - Braille etc.
   - Three types of receptor:
     1. Thermoreceptors - heat & cold
     2. Nocioreceptors - intense pressure/heat/pain
     3. Mechanoreceptors - pressure
   - Two types of Mechanoreceptor
     1. Rapidly Adapting: Fast but not continuous
     2. Slowly Adapting: Continuous pressure
   - Sensitivity varies - two point threshold test
   - Kinesthesia - Awareness of position of limbs:
     - rapid response/slow response and positional

14. Movement
    Reaction time
    Dependent on age and health of subject:
    - Auditory signal: 150 ms
    - Visual signal: 200 ms
    - Tactile signal: 700 ms (pain)
    - Reaction times are faster for multimodal signals
    Accuracy
    - Can be trained
    - Experts with faster reaction times make less mistakes than slower novices
    - Speed
      - Time taken for cursor to move to a button:
      - Fitts’s law:
        Movement time = a + b \log_2(Distance/Size +1)

15. Human memory
    - Sensory Buffers - Sensory Channel Specific
    - Very Brief
    - Short Term - Limited Capacity
    - Brief but fast access (70ms)
16. Sensory buffer
   - Our senses receive information all the time
   - We attend to only a minority of that information
   - However, the majority is still stored very briefly
   - Studies have shown sensory buffers for vision (iconic buffer) & sound (auditory buffer)
   - Sperling’s experiment
   - Presentation of a table of numbers - recall 4 or 5 with location
   - Cue before or after indicating which row of numbers is required improves performance
   - This effect is lost if Cue over 0.3 seconds after presentation
   - Words are recalled better than noises (suggests pre-processing)

17. Short term memory (working memory)

   - Central Executive
     - modality free, used in cognitively demanding tasks
• Articulatory loop
  Holds phonological information

• Visuo-spatial sketch pad
  Spatial information (claim is that spatial information is held better than descriptive)

18. Working memory
  o Capacity: Often measured as number of items that can be remembered
  o Typically 7 +/- 2 chunks
  o Chunking is the ability to learn large semantic chunks and is part of the skill acquisition of an expert for a given domain (cf. Chess)
  o The learning of a larger category of chunk is termed closure
  o Recency effect
  o In free recall, last chunks are remembered better than first chunks in a list
  o This effect disappears after another task is performed
  o Abstract vs Concrete
    o Abstract concepts such as friendship remembered less well than concrete concepts such as cat
    o Possibly due to visual cues

19. Long term memory
  There have been several distinctions between types of long term memory
  a. Episodic vs Semantic
  b. Declarative vs Procedural
  c. And several models of long term memory

20. Forgetting long term memory
  o Knowledge moves from short term to long term by repetition and processing (processing is more effective)
  o Long term memory is aided by:
    • Concrete concepts
    • Meaningful concepts
    • Structured concepts
21. Decay
   - Knowledge decays slowly
   - (Logarithmically (Ebbinghaus))
   - Interference
   - Information is lost by interference from other information
   - Retroactive interference is where new knowledge makes old knowledge harder to remember

22. Deductive reasoning
   - Deductive reasoning involves logically necessary conclusions following premises
   - *Modus Ponens* is used by most people well
     - (if a then b, a => b)
   - *Modus Tollens* is not (if a then b, not b => not a)
   - People reason counterfactually
   - Logically this is hard to model

23. Abductive reasoning: People are good at deriving explanations from effects
   - Abduction is the process of matching causes with effects
   - If “X proceeds Y” then infer “X causes Y”
   - Not logically valid
   - Designers of systems must be careful that users do not incorrectly learn causal relationships while building a system model

24. Inductive reasoning
   - [can you determine a rule about the sequence]
   - **Rule:**
     - if card has a vowel on one side, then it has an even number on the other

25. Inductive reasoning 2
   - Induction is the inference of generalizations from evidence
   - Suppose we see 4 white rabbits. Then we would be inclined to guess that the next rabbit would be white. But this is not logically valid, tho it is useful because people prefer positive evidence over negative

26. Analogy
Suppose a patient has a tumor. The tumor will kill the patient unless it is destroyed but the x ray strength required to kill the tumor will also burn through the flesh of the patient.

What do you do?

A castle had to be invaded by the dark prince but the army within the castle was very strong and repelled the prince's army from every side the prince tried to attack. Eventually the prince split his army into four and attacked from the north, south, east and west. The castle could not be defended from all sides and fell.

People are good at reasoning from analogies

Good system design should exploit this.

27. Skill acquisition

Learning proceeds by:

- Learning a few examples
- Generalizing a rule to cover most examples
- Over generalizing rule/mistakes with exceptions
- Learning exceptions (past tense acquisition in infants)

Skill Acquisition (Anderson's Act•)

- Learner uses general purpose rules to interpret problem
- Learner develops specific rules to task
- Rules are fine tuned to speed up performance

Chunking and clustering

Experts use large chunks of meaning

Experts cluster problems according to deeper structures

28. Summary

In this lecture, we have covered some of the areas of cognitive psychology relevant to the design of HCI systems.

1. Sensory input: Vision/Hearing/Touch
2. Memory & Learning: Sensory Buffer/Working Memory/Long term memory
3. Reasoning: Deduction/Induction/Abduction/Analogy and Skill Acquisition

How such results are applied to HCI is a complex issue.

However, as technology becomes more advanced, psychological aspects will become more important!

29. Further reading:

a. Dix, Finlay, Abowd & Beale: Human-Computer Interaction
c. Carroll (ed.): HCI in the New Millennium, Chapter 6, User Interface Evaluation: How Cognitive Models Can Help
Lecture 3a: Human-Centered Design Principles for the Internet

Subsections
- Introduction
- Text fonts & readability
- Text fonts & readability 2
- Central versus peripheral vision
- Text layout
- Scrolling text & Reading
- Cursor movement
- Memory and clustering
- Analogical reasoning
- Spatial awareness and sitemaps
- Linear documents
- Network documents
- Hierarchical documents
- Grid documents
- Spatial awareness and whitespace
- Web page schema
- Summary
- Further reading

1. Introduction
   In the previous outline, we looked very briefly at some findings in cognitive psychology

   In this lecture:
   Some applications of cognitive psychology to Internet technology design
   - Visual displays of information
   - Reading Memory and spatial awareness
   - Reasoning (by analogy)

   Omissions:
   - Auditory
   - Deductive/abductive/inductive

2. Text fonts & readability
   - Normal text - optimal reading speed if good contrast with background
   - Upper case - Slow to read due to lack of distinction between letters & relative unfamiliarity
   - Italic - Slow to read due to unfamiliarity. Useful for emphasis (without being irritating)
   - Blue - Due to relatively small number of blue cones in retina - poorly perceived by humans. Slows reading and not useful for important messages. (warnings)
   - Blinking - Slow to read - also quite irritating.
   - Useful if used sparingly and for important messages at the edges of the screen
   - Mixed color - Slows reading. Mixed color and special effects on text slow down understanding. Should be used sparingly and treated as graphics - not as text.
   - Inverse video - Due to higher levels of luminance (brightness of text), more accurate to read but increases flicker & can be hard to print

3. Central versus peripheral vision
   - Gangliant cells in the eye are specialized
     X cells - central - used for early detection of pattern
Y cells - peripheral - used for motion detection
- Humans are good at detecting motion on the edges of screen.
- Humans are good at detecting patterns at the centre of screen.

Therefore
- Concentrate all fine detail (and the most relevant information centrally).
- If important information is peripheral then motion can be used to aid detection.
- Avoid irrelevant motion at the edges of the page - it distracts.

- Text layout
  - Humans are very quick to become accustomed to regular features.

- Consistency is a good principle of HCI since it aids in the learning and exploration of an application.
- Consistency can be a bad thing if it bores the User but offers no educational advantages.
- A good example is text layout
- Text can be viewed in terms of visual blocks

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4. Scrolling text & Reading
   Despite our intuitions
   - Reading is composed of sacchades and fixations.
   - Our eyes skip and backtrack through sentences

Therefore:
- Scrolling text is a bad thing
- Does not match how we actually read
- Has to be slow enough to allow User to understand sentence (and is still difficult to understand)
- Hard for user to refer back to information

5. Cursor movement
   - Usability can be measured in the ease & speed of access to relevant information
• In most GUIs (and web applications), this involves the user clicking options
• The time taken to move a cursor over a button/link is significant to the speed of access
• Three Click rule
• Fitt's law (time = a + b.log2(distance/size +1)

Therefore
• Make Icons and Hyperlink anchors as large as possible
• Prioritize common sequences of clicks

6. Memory and clustering
   o Humans have a very limited amount of short term memory: 5 ± 2 chunks.
   o Never expect users to be able to cope with more than 5-7 options at one time
   o Humans can however cluster meaningful items together into larger chunks - this allows more information to be remembered.
   o Explicitly cluster objects in the GUI in meaningful ways so that the user can memorize the layout easily.

7. Analogical reasoning
   o Humans are very good at reasoning from analogy:
     o This allows information from old domains to be used in new ones
   o Designers should exploit this by adding references to domains which the user is familiar with
   o Consider the shopping trolley analogy used by Amazon.com (and Bol.com)
   o Or... http://my.netscape.com/index2.psp

8. Spatial awareness and sitemaps
   • Humans are good at spatial reasoning and learning

Therefore
• Information should be presented spatially where appropriate
• Knowing where the user is can be just as important as knowing where they can get to
• The form of the site map also depends on the nature of the underlying site

9. Linear documents
   o Very common
   o Conversion of legacy linear documents
   o Timeliness - anything which requires a specific order (e.g. procedures)
   o Prioritized lists
   o Presentations - achieved versions of oral presentations
   
   o page 1
   o page 2
   o page 3
   o page 4
10. Network documents

- Easy to present. Vital that user is shown where in the chain they are

Often seen in websites, which have not been planned but have organically grown in size
Can be very difficult to conceptualize and present

11. Hierarchical documents

- The basic design principle behind hypertext
- Also matches the structure of computer directories
- Useful for taxonomy classification
- Very good in psychological terms since this design avoids overloading the user with technical or detailed information.
- Instead the user can choose how much information is required.
- Sitemaps are more difficult to design
- Must be able to move up to the top node at every level

12. Grid documents
• Used for Database information/multi parent hierarchal nodes
• Navigation is similar to the hierarchal model
• Problem with several potential parent nodes - hence no concept of “Up to top node”
• One possibility is to tailor individual “tops” (using frames?)

13. Spatial awareness and whitespace
• Good spatial awareness can be achieved via use of whitespace
• Whitespace refers to the unused parts of the web page
• Whitespace allows the page to be separated into meaningful semantic chunks
• This aids short-term memory and allows for an easy conceptualization of the site.

A is for Apple, Alligator, Anaconda and axe. It is a very useful letter indeed.

Good use of whitespace

A is for Apple, Alligator, Anaconda and axe. It is a very useful letter indeed.

Bad use of bordering

14. Web page schema
14. Summary

- Usability is the art of making applications easy to use
- In terms of webpages - this means easy to access information
- Good principles of usability should be based on aspects of cognitive psychology
- As the technology matures, such principles will become more and more important

Further reading

Websites:
- http://www.wired.com
- http://www.amazon.co.uk
- http://www.bol.com
- http://my.netscape.com
- http://www.microsoft.com/windows/ie/default.asp (use Netscape)
- http://www.bham.ac.uk

Reading

*Making Computer and Internet Usability a Priority* C.B. Kreitzberg and B. Shneiderman
A man attempting to set up his new printer called the printer's tech support number, complaining about the error message: Can't find the printer. On the phone, the man said he even held the printer up in front of the screen, but the computer still couldn't find it.

Subsections
- Introduction
- Keyboards
- Qwerty keyboards
- Dvorak keyboards
- Chord keyboards
- Pointing
- Speech Recognition
- Speech Recognition 2
- Speech Generation
- Visual Display Units
- The paperless Office (a dream)
- Memory
- Von Neuman Bottleneck
- Compression
- Text Formats
- Access
- Processing
- Limitations on Performance
- Summary
- Further Reading

1. Introduction
   - HCI has three aspects: the Human, the Computer & the actual task they interact on.
   - The second aspect, the Computer is ever changing with new technology.
   - However it is not apparent that our knowledge of design is improving!

These notes will cover aspects of:
1. Input from the User
2. Output to the User
3. Processing & Memory
4. how the above affect the User

2. Keyboards
   - The main and preferred choice for input to a computer
   - Input by key presses connecting a circuit under the keyboard
   - Feel of keyboard is important:
     - Response of keys:
       - hard press versus light touch
       - full travel versus half travel (for laptops; 2-3 cm)
   - RSI repetitive strain injuries due to inflammation of ligaments and tendons.
   - due to poor keyboard design and poor keyboard placement.

3. Qwerty keyboards
   Layout is Q W E R T Y (first five letters of first alphabet row)
Original design for keyboards, proposed by Charles Sholes in 1868
Non-optimal arrangement of keys (though intentionality of non-optimally probably an urban myth). However due to widespread acceptance of qwerty unlikely to ever be replaced widely.

4. Dvorak keyboards
   - Designed in 1930s by August Dvorak
   - Provides a better ratio of usage between both hands (56% for right-hand) and common letter collocations are grouped together.
   - Typists make fewer errors on a Dvorak keyboard and hands travel less distance.
   - Typing speeds improve after training by 10 - 15%.
   - However cost of retraining typists is too great.

5. Chord keyboards (court room reporters used to use)
   - Different from traditional keyboards - letters are input via chord combinations.
   - Advantages:
     - Very Small (palm sized)
     - Can be used one handed.
     - Learning time is hours
     - Faster than conventional keyboards (up to a third)
   - Disadvantages: Fatigue - hard to use for long time.

6. Pointing
   - Pointing involves moving a cursor on the screen to perform tasks or move objects.
   - Common today on all computers but originally used solely in CAD.
   - Typically uses a mouse to move the cursor (ease of use & small)

   Other devices:
   - Trackball: like an upside down mouse/useful on laptops.
   - Joystick: good for games
   - Touchscreens: good for public access but obscure screen & Light pens and tiring to use
   - Keyboard: slow to use and can't be used diagonally - but might be a positive feature in some applications (e.g. architecture)

7. Speech Recognition
   - Speech is a natural medium for interaction & faster than typing.
   - Advantages
     - Hands free control
o Limited access to computer (e.g. via phone)
o Useful for disabilities and avoidance of RSI

o Disadvantages
  o Privacy
  o Accuracy (97% accurate, still much lower than typing) (poor signal/accents/emotions/homophones aisle/i’ll/isle two/too/to )
o Background noise
  o Currently speaker dependent (i.e. trained to be used by one user)
o Speech is continuous/text is discrete

Speech recognition systems transform a continuous speech signal into a set of discrete phonemes via some learning technique.
o Learning technique is trained on a specific user.
o Phonemes are the minimal sound change to change the meaning of a linguistic term
o Phonemes are language specific (English has 40-60 phonemes)
o Phonemes must be transformed into linguistic units (letters/words) via rules. (Further NLP is often required)

8. Speech Generation

o Concatenation of human voiced phonemes. Easy to do but unnatural speech due to lack of context at word level and no intonation/prosody.
o Synthesis by rule
  o Phonemes generated via rules which relate to the basic context of what is uttered (using some unsupervised learning)
o Captures some prosodic information (intonation and stress)
o  •  Artificial voices demand more attention than human voices! (Shneiderman 1987)
o  •  Should be used when message is short/simple/not referred to later/Temporal/Immediate response/visual channels are overloaded/ User must be free to move around/High G forces/Low Oxygen states. (Michaelis & Wiggins 1982)

9. Visual Display Units
Visual Display Guidelines (Reid 1985)

1. Avoid overfilling screen.
2. Use upper right corner for important messages.
3. Use different letter fonts & color to distinguish different parts
4. Design layout so that eye follows content. (Left to right/Up to down)
5. Use Blinking to attract attention - but avoid overuse.

& Use Icons!
  • Coding: Code Icons & maximize symbol differentiation. (color/shape/blinking)
• Sequencing: Segments of entire display are shown over time as process is ran

Both techniques are used to avoid clustering!

10. Example: The Paperless Office (a dream)
   o All information held & displayed via computer screen & avoid costly floor space for files & save trees.
   o The problem is that people still prefer to work with paper.

Printers
   o One A4 page at 300 dpi can contain 8 megabytes of information (ten minutes to transfer down a serial cable)
   o Page Description Languages (PDL e.g. PostScript & PDF)
   o Scanners and OCRs
     o Scanning creates a bit map of the page - this is an inefficient method of storage.
     o Optical Character Recognition allows Compression/Processing

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11. Memory
   o Computer memory shares an analogy with human memory: Primary Storage (Short Term Memory)
   o Registers on the computer chip
   o Random Access Memory (Fast: 10 Mbytes per second)
   o Low capacity: Mbytes
   o Most is volatile but a small amount will be non-volatile (though this ratio is changing).
   o Secondary Storage (Long Term Memory)
   o Slower access: 10 ms to locate information/100 kilobytes per s
   o Floppy discs (1.4 Mbytes)
   o Hard discs (100 Gbytes (and climbing))
   o CD-Roms (largely read only)

12. Von Neuman Bottleneck
   o RAM is now usually big enough for most single applications
   o Multi-tasking however is common
   o The difference in access times and capacities between primary and secondary memories causes a bottleneck.
   o Can be avoided by clever memory management: lazy swapping and preempting paging requests.
   o Applications fill the memory available. (c.f. Parkinson’s law) (e.g. increased use of video/more human-based applications)
   o Therefore memory usage is a central concern to HCI.

13. Compression
   o Compression techniques greatly improve memory usage.
   o Huffman encoding: gives codes to frequent words
   o Run-Length encoding: long runs of the same value can be represented by an integer
   o Video: Compute the difference in a scene and only represent new scenes when scene changes. (hence delay in video feeds)
   o Fractal compression:
Fractals are any image which has parts which when enlarged are similar to whole. Quick to display but refines over time.

14. Text Formats
   - The most common format for text is ASCII (7 bit code plus 1 for parity)
   - Recent advances include an extended 16 bit ASCII standard which allows mathematical symbols and Japanese Kanji.
   - Such standards only deal with text but not structure. Rich Text Format (RTF) is common.
   - OSI standards for document structure (but mainly ignored by industry!)
   - SGML (and its subsets) have become dominant markup languages (and are user/application extendable) (HTML & the web!)

15. Access
   - The huge amount of information makes selective access more important.
   - HCI must identify which indices to index any database. Too few limits the functionality of the system. Too many makes the indexing too slow & inefficient (and possible privacy issues)
   - Free text indexing/DWIM/Soundex (Forgiving Systems)
   - Natural Language Processing is becoming more relevant.
   - Information Retrieval (IR) & Information Extraction (IE)
   - IR document retrieval & indexing IE extracting and collating information from documents into a new format. [recall & precision is only one (and a very simple one) form of evaluation
     - Precision N of relevant documents / N of irrelevant
     - Recall N of relevants recalled/ N of total set of relevants

16. Processing
   - Processing speeds are fast (10 million instructions a second) but this is easy to use up
   - It is important to try to match the processing speeds of a computer with that of a human.
   - This involves the design of the Human-Computer Interface.
   - Buffering of input helps Problems: Cursor Tracking & Icon Wars
   - Designers must avoid the myth of the infinitely fast computer!
   - But Computers can be too fast. E.g. scrolling text which is too fast.
   - Flashing icons on LCD displays (build in explicit delays)

17. Limitations on Performance
   There are several different types of limitation:
   a. Computation bound
   b. Storage bound
   c. Graphic bound
   d. Network capacity
   e. Human bound (often overlooked)

   Good design must factor all of these constraints for the optimal solution for a specific user/computer/type of interaction.

18. Summary
   - Computer systems have become faster/bigger/smarter (but) Applications have become more complex
   - Good design is now more important
Design should:
  o cover the hardware aspects of interaction (input & output)
  o cover the software aspects in terms of speed/presentation and usability.

Both are sensitive to the type of interaction. This will be covered in the next (theory) lecture.
Subsections

• Introduction
• HTML 4
• New commands
• New commands 2
• Sub-commands
• Deprecated commands
• DEAD Commands
• Cascading Style Sheets
• CSS Syntax
• DHTML
• Layers
• Active channels
• Web graphics
• Bitmaps
• GIF files
• JPEG
• XML
• XML Syntax
• Document Type Definitions
• Beyond XML
• Summary
• Further reading

1. Introduction

Last Lecture: An Overview of current computer capacities and hardware

This Lecture:

Recent developments in Internet Technology:

• HTML 4
• CSS
• DHTML
• Active Channels
• Layers
• Images
• XML

Advances are browser-led & standardized post-hoc

Typically most advances are questionable from a HCI point of view

2. HTML 4

  o Agreed by WC3 to be the latest standard in 1997.
  o Still not •totally• accepted by the web community
  o Still not •totally• implemented by Browsers
  o Why a new version of HTML?
  o Add some consistency to the standard (e.g., blink & center)
  o Add some new capacities

New commands

<ABBR> Abbreviation - allows a rollover title (also <ACRONYM>)
<BDO> Allows RTL & LTR text (useful in Foreign Languages & Spell checkers/Search engines)
<BUTTON> Standard method of creating Link Buttons
<COLGROUP> Affects an entire table so column sizing is trivial <colgroup=30%> ... </colgroup>
<DEL> Strikes through text
<FIELDSET> Groups controls on a page (so for instance several JavaScripts don't interact)
<FRAME> Given new features - allows use of style sheets
<FRAMESET> Ditto
<IFRAME> Same usage as In-line Frames
<LABEL> Attaches a label to Form commands
<LEGEND> Works with Frameset to ensure all details are aligned
<NOFRAMES> Use this portion if frames are not recognized by browser
<NOSCRIPy> Ditto for scripts
<OBJECT> Replaces and groups
<SPAN> Alter a span of text (e.g. color it green)
<TBODY> Affect a body of cells in a table (see also TFOOT puts a footer under each TBODY command)
<THEAD> Same as TFOOT only above the TBODY cells
<Q> Quotes

Sub-commands (attributes)
<TAG Subcommand=value>
CLASS Apply a Class which has been designed using Style Sheet Commands
DIR Read text left or right
ID Can be used as a CLASS command or to jump to other parts of the text
Lang Specifies the language the text is in
Title Provides a rollover title for just about anything

Deprecated commands
APPLET Use Object
BASEFONT Use Style Sheet Commands
CENTER <SPAN ALIGN=CENTER>
DIR Use <UL>
FONT Style Sheet Commands
ISINDEX Use several INPUT Commands
MENU <UL>
<S> Use DEL or strike through
<STRIKE> Ditto
<U> Create Underlined text through style sheets

DEAD Commands
LISTING> Use Pre
PLAINTEXT Use Pre
XMP> Use Pre

Browsers will eventually stop recognizing dead commands. They might lose a few depreciated ones
3. Cascading Style Sheets
   - Consistency in web design is a good thing
   - Style Sheets enforce consistency by specifying in one place the look and feel of the web page.
   - Used in Netscape 4.0 and Explorer 3.0 and above (original idea was Microsoft’s...called explorer style sheets)
   - Style sheets are cascading because several style sheets can affect one document.
   - In-line CSS: specified in the document
   - Span CSS: outside the document and affects several docs
   - Closest CSS to affected text has priority

CSS Syntax  (for an in-line CSS)

```html
<HEAD>
  <STYLE TYPE="text/css''>
  <!--
  TAG {definition: value; definition: value; }
  H1 {font-size: 16pt; fontstyle: italic;}
  A:link {color: #FFFFFF}
  A:visited {color:#123456}
  -->
  </STYLE>
</HEAD>
```

(for Span CSS)

```html
<Link REL="stylesheet" HREF="http://www.address.com/file.css TYPE="text/css">
```

Note - heavy use of CSS means that the web page will
- break the law of consistency with other pages on the WWW
- not be graceful in transforming

4. DHTML
Dynamic HTML is a current Buzzword in HTML design
This does not make it a "good thing"

Originally only Microsoft's Internet Explorer 4.0

Now:
   - Any interactivity using standards from IE/Netscape 4.0
   - Style Sheets
   - JavaScript
   - Layering
   - Positioning and Page Division
   - (and according to Microsoft - the future of the Internet) ... Still doesn't allow anything new from a HCI design perspective

5. Layers
Only developed for Netscape 4.0 and above
Layering allows images to be superimposed on each other.
6. Active channels
Requires Internet Explorer 4.0
• Allows users to open a channel between the internet server and allows you to push information to them
• This channel is updated when the User connects to the internet
<A href="channel.cdf"> Click here to open active channel</a>
• CDF file contains XML specifying what information can be pushed
• Information pushed can be pre-cached before the User explicitly reads the information.
• Information can be more than webpages - screen savers/programs/updates can be pushed controlled using time intervals

7. Web graphics
Main types of image files for web pages:
• BITMAP
• GIF
• JPEG

All three formats are raster image formats
• Image is broken up into pixels
• Color is specified by the set of bits used per pixel

Meta/Vector images (an aside)
• Vectors of data expressed mathematically
• Allow for more precision (e.g. perfect circles)
• Are scalable to any size

8. Bitmaps
Original BITMAPS
o • Invented by Microsoft (so viewable by IE)
o • Essentially a series of pixels expressed by bits
o • Tend to be large.
o • Often auto-generated (e.g. page counters)
o • High resolution
o .BMP (or .RLE) files
o • Often use some compression - e.g., .BMP files use run length encoding & limit bits per pixel to 8 (so 256 colors)
9. **GIF files**
   
   GIF87a
   Graphic Interchange Format (1987 by Compuserve)
   - Is a compression algorithm not an image file per se.
   - 8 bits per pixel - 256 colors.
   - Was designed to work across server types

   GIF89a
   - Extended version of GIF
   - Animation
   - Transparency
   - Supports interlacing

10. **JPEG**
    
    Joint Photographic Experts Group
    - Compression algorithm
    - Stored Jpeg file is smaller than when displayed.
    - Jpegs "inflate"
    - Tend to be less grainy than GIF
    - Smaller to download
    - But can take up too much memory when displayed.
    - Compression algorithm is "lossy": data is lost by compression
    - Quality of image is dependent on rate of compression
    - Progressive JPEG - interlaced version of jpegs
    - Advice: avoid heavy compression

11. **XML**
    
    eXtensible Markup Language
    - A specialization of SGML (like HTML)
    - Syntax is far stricter than HTML
    - But can be extended (semantic tagging)
    - New tags can be added to XML as required

    Because of this
    - touted as becoming the new language of the WEB
    - tags can accurately refer to content
    - can be used to generate several different formats
    - far more useful than just webpages
    - XML provides a portable means to transfer data between different types of server (while being simpler than SGML)

12. **XML Syntax**
    
    Any XML document has to be well-formed & valid
    To be well-formed:

    - Start with an XML declaration
    - Have a root element (tag) in which all other tags are nested
    - No overlapping tags
    - All tags are case sensitive

    HTML - breaks in syntax are often ignored
13. Document Type Definitions (see examples of DTD and XML-Schema)

- XML must also be valid
- Validity is defined by the DTD
- DTDs are specify the contents of the XML tags
- Browsers maintain DTDs for HTML
- Some browsers also maintain a standard DTD for XML (using the same set of tags as HTML)
- DTDs can be created for XML from scratch

14. Beyond XML

- In addition to the XML file and the DTD
- We need some way to generate readable output
  - XSL
  - CSS files
  - (also Java, Perl & other scripting languages are used to generate pages)

Final points:
- If XML is adopted by browser developers remains to be seen
- XML is significantly more difficult than HTML
- The Internet will slowly become more “elite”

15. Summary

- Internet technology is rapidly becoming more sophisticated

Unfortunately:
- Not all of the new developments are good from a HCI perspective
- Changes are mainly (browser) industry led
- Standards tend to “catch up” with industry very slowly
- Some of the changes are bad for very good design reasons

Further reading

http://www.geocities.com/SiliconValley/Peaks/5957/xml.html
http://xml.coverpages.org/xml.html
Reading 5b: Models of Interaction

Subsections

* Introduction
* Range of interaction
* Terms of interaction
* Execution-Evaluation Cycle
* Problems with interfaces
* Interaction Framework
* Translation between languages
* Social and organizational context
* Ergonomics and Control Arrangement
* Ergonomics and health issues
* Dialogue - interaction styles
* WIMP
* Dialogues
* Dialogue Design Guidelines
* HCI and Human Dialogue
* Dialogue Control
* Factors in dialogues
* Finally...
* Summary

Introduction

- HCI comprises of three aspects: the Human, the Computer & the task which they interact on.
- In this lecture, we will look at the structure and dynamics of the interaction.
- Execution-Evaluation Cycle.

Gulfs of Execution & Evaluation

- Interaction Framework
- Ergonomics
- Dialogues

Range of interaction

- The level of interaction between user and computer varies with task/domain/application.
- Providing an optimal solution to a problem involves finding the correct level of interaction.
- HCI research has concentrated on tasks with high levels of interaction with the user.

Terms of interaction

- The purpose of a System is to allow the User to accomplish Goals in a given Domain.
- The Domain can be defined by a set of concepts specifying:
  1. The ontology of possible objects
  2. Conceptual relations between objects
  3. Operations that can be performed
  4. Potential goals that can be desired and accomplished.

- Task Analysis: the identification of the problem space for the
- User in terms of the Domain.
- The problem space is the initial state of the domain plus the
- goals the User wishes to achieve plus the set of operations allowable.
User’s problem space is expressed in a task language.
The System's domain space is expressed in a core language.

Execution-Evaluation Cycle
  - Execution
    1. Establishing the goal.
    2. Forming the intention.
    3. Specifying the action sequence.
    4. Executing the action.
- Evaluation
  1. Perceiving the system state.
  2. Interpreting the system state.
  3. Evaluating the system state with respect to the goals/intentions.

Problems with interfaces:
- Users find problems with poorly designed interfaces because of Gulfs of Execution & Evaluation
- Core and Task language are two different languages with two sets of terms/concepts describing the same interaction.

Gulf of Execution:
- The difference between the User’s formulation of the actions to reach a goal and the actions allowed by the System = Gulf of Evaluation
- The difference between the physical presentation of the system state and the expectation of the User. Our Concern is to minimize both gulfs

Interaction Framework:
Problem: execution-evaluation cycle only deals with the user’s view.
Abowd & Beale propose a different framework with 4 components:
- System,
- User,
- Input and
- Output.

Each Component has its own language.

Translation between languages
- Articulation: from tasks to input and the relative ease of translation.
- Performance: coverage of input language to full set of capabilities of system.
- Presentation: coverage of relevant information to the output.
- Observation: ease of evaluation by user of output information.

Social and organizational context
ACM SIGCHI Curriculum Development Group.
• **Ergonomics**: Issues on the user side. -- Physical characteristics of the interaction.
• **Dialogue**: Issues on the computer side. -- Deals with how the interfaces maps to the system.
• **Screen Design**: -- How to map the application to the display

Ergonomics and Control Arrangement
• Ergonomics is more established and better understood than the cognitive aspects of computer use. Therefore, such guidelines are more often used.
• Functional Controls should be grouped by function (but contrary controls kept apart)
• Sequential: Sequential operations should be represented in a linear order
• Frequency: Frequent controls should be placed at the most accessible position

Ergonomics and health issues
• Physical position
• Keyboard (RSI), Monitor use etc.
• Temperature performance is affected at high and low temperatures (best at room slightly below normal room temperature).
• Lighting: Avoid glare on monitor and low light conditions (eyestrain)
• Noise: Excessive noise can be harmful. Some noise can be a stimulus
• Time: Excessive time affects performance & CRT can be harmful.

Dialogue interaction styles
• Command line interfaces
• Menus
• Natural Language Processing
• Question/Answer dialogues
• Spread sheets and forms
• WIMP (Windows, Icons, Menus, Pointers)

WIMP
• Widgets: windows, icons, menus and pointers (obviously) but also:
  • Buttons & Radios
  • Palettes
  • Dialogues
• Look & Feel are important...

Dialogues
• Dialogues involve the exchange of information
• (natural lang,) semantics (literal) versus pragmatics
  • (contextual).
• Computer dialogues do not have the richness of human dialogues but
  • still have a pragmatics dependent on the style, structure and content
  • of the dialogue.
• Initiative

Dialogue Design Guidelines (from Shneiderman (1987))
1. Dialogues should be consistent
2. Systems should allow shortcuts through dialogues
3. Dialogues should offer information feedback
4. Systems should offer simple error handling
5. Actions should be reversible
6. Systems should allow users to feel that they are in control
7. Systems should aim to reduce short-term memory strain.

HCI and Human Dialogue

- Human-Computer dialogues (HCD) share a number of concepts with human-human dialogue (HHD).
- All dialogues involve the sharing of information.

Information is expressed via the words and symbols used plus the context of the utterance.
- Dialogues require agreement

HHD - mutual knowledge.

HCD - overlap between system model and user model.
- Dialogues involve anaphor & deixis.

Anaphor - reference to concepts past.

(Deixis - expressions that refer to the context, e.g., “yesterday” is ambiguous if you don’t know what today is)

Dialogue Control

- Dialogues are achieved by the use of dialogue acts.
- Acts can be of two types: Task-oriented and Dialogue control

Task oriented acts

Dialogue control acts
- HHD: dialogue control involves repetitions, clarifications, elaborations and interruptions.
- Dialogue control acts can be modeled separately from the task and performed as the dialogue unfolds.
- In HCD:
  - We need error handling dialogue control acts.
  - These must be immediate and responsive.

Factors in dialogues
  - Block Interaction Model (Morton et al. 1979)

Finally...
“...the cognitive context of a dialogue exchange includes mental representations and cognitive processes relating not only to the explicit structure and content of the dialogue, but also those representations and processes relating to the general cognitive demands imposed by the system, information extracted from the wider task environment, the specific question or problem motivating an exchange, and the cognitive strategies mobilized in the course of learning, use and remembering.” Barnard and Hammond (1983)

Summary
• The precise nature of any interaction depends on the task and the capabilities and knowledge of the user and computer.
• Several formal models of this interaction exist.
• Each attempts to classify and explain how and why break downs of interaction occur.
• A common form of interaction between humans is dialogue.
• Dialogues also play an important role in HCI.
• Analogies from human conversation can be used to improve human-computer interactions.

Resources:
BAD DESIGN (in general) http://www.baddesigns.com/

Preparing a Site
1. Establish clear goals: example:
   To design a prototype website to support the Lancaster Folk Guild. The purpose of this society is to promote all types of folk activities, including the presentation of concerts and workshops, and the promotion of local musicians and artisans who would participate both as presenters and participants in such activities.
   The website should include at least the following:
   • a description of the mission of the society
   • a description of the overall organization of the society
   • a description of contact information for society organizers
   • a calendar of events
   • directions to events
   • a form to allow members to enter information about themselves, including (but not necessarily limited to)
     • name of group or individual
     • address
     • phone number
     • email address
     • webpage url
     • size of the group
     • description of the group
     • whether the person/group is a performer, and instructor, and/or a support services provider (type?)
     • whether the person/group provides music, dance, storytelling, and/or crafts
   • a presentation of the information created by the member form above
   • a survey for visitors about their interests, as related to the mission of the society
   • an on-line newsletter
   • a mechanism for joining the society
   • links to related sites and sponsors

2. Determine Evaluative Criteria (before the project, not after!)
Judge your site on its overall organization, adherence to accepted design practices, and innovative design. The final project should also include a report, detailing all design methods you used, include prototypes, storyboards, navigational layouts, etc. Your website should also be as accessible as you
can make it. BTW, you should provide your client with a CD or Zip disk of the entire site (make certain the site can be navigated entirely from the disk), along with a written report containing the design materials and a general description of assumptions you made about the content and the client’s needs, as well as all design decisions you made.