

Chapter 5 - Attention and Memory Constraints

- Why is the human brain limited in capacity?
- Importance of designing for attentional and memory constraints
- Meaningful and memorable interfaces
- Apply techniques to structuring interfaces that are attention-grabbing and require minimal effort to learn and remember
- How to deal with information and not get overloaded

Focusing Attention

- Focused and divided attention
 - focused attention
 - the ability to attend to one event from a mass of competing stimuli in the environment
 - cocktail party phenomenon
 - relevant to activities and intentions at present time
 - divided attention
 - attempting to attend to more than one thing at a time
 - properties of attention
 - involuntary vs. voluntary attention

Relevance to HCI

- Structuring information
 - make it easy to navigate through and find information
 - never too much information, never too little
 - grouped and ordered in a meaningful manner
 - other techniques for guiding attention
 - spatial and temporal cues
 - color
 - alerting techniques (flashing, audio)
 - windows (partitioning)

Guidelines for Designing Interfaces

- Important information displayed in prominent place to catch the user's eye
- Less important information is relegated to the background
 - specific areas, user should know where to look
- Information not often requested should not be on the screen, but should be accessible
- Attention and perception are intertwined

Multitasking and Interruptions

- Interruptions
 - moment to moment demands of the situation
 - phone calls, doorbells, etc...
- Multitasking
 - carrying out a number of tasks during the same period of time by alternating between them
 - Primary vs. Secondary tasks
 - primary task = most important task at that time

Distraction

- People good at multitasking
 - prone to distraction
 - repetition and automation
- Solution = cognitive aids
 - external representations that are intended to gain our attention at a time relevant to the task that needs to be performed
- Applications to HCI
 - system inform user where he was
 - remind user of common tasks

Automatic Processing

- Automated activities
 - activities done without thinking
 - reading, writing, biking, etc...
 - characteristics of automated activities
 - fast
 - demanding minimal attention
 - unavailable to consciousness
 - Stroop effect
 - conflict between automatic skills

Automatic Processes vs. Controlled Processes

- Automatic processes
 - not affected by limited capacity of brain
 - do not require attention
 - difficult to change once they have been learned
- Controlled Processes
 - non-automatic processes
 - limited capacity
 - require attention and conscious control

Memory Constraints

- Levels of Processing Theory
 - information can be processed at different levels, from shallow analysis to deep semantic analysis
 - meaningfulness affects how well something can be remembered
 - more deeply processed items are better remembered
 - meaningful items are more deeply processed
 - contributions to meaningfulness
 - familiarity - frequency at which word occurs in everyday language
 - imagery - ability to elicit images in one's mind

Meaningful Interfaces

- Remembered items at interface should be memorable / meaningful
 - what is meaningful?
 - confusion with commonly used words
- Common errors in interfaces
 - arbitrary assignment of commands
 - abbreviations / combination of control keys
- Use contextual, cultural, user characteristics

Meaningful Icons

- Context
 - setting in which icons are used (shoe example)
- Function / Task
 - benefits of icons
 - when recognition plays a major part in tasks
 - when unsure of precise nature of information
 - when there are a diversity of manipulative operations to be performed
 - drawbacks of icons
 - retrieve text in textual form

Meaningful Icons (cont.)

- Representation form
 - 3 forms of representation
 - use of concrete objects
 - use of abstract symbols (arrows, circles, dots)
 - combination
 - Mapping used to represent underlying concept
 - resemblance icons - depict underlying concept through analogous images (falling rock sign)
 - exemplar icons - the typical example (bathroom)

Representation Form (cont.)

- symbolic icons - conveys underlying referent that is at a higher level of abstraction than the image itself (wine glass with crack)
- arbitrary icons - no relation to underlying concept and hence association has to be learned (elephant example)
- Meaningfulness related to underlying concept
 - concrete icons = easy to remember (files)
 - abstract icons = harder to remember (warning signs)

Combinations and Animated Icons

- Combination of icons and commands
 - reduces icon confusion
 - takes up more space on screen
- Animation
 - dynamically conveys meaning of icon
 - must focus on key aspects of a function
 - small size of icons
 - can be distracting

Recognition vs. Recall

- Recognition
 - information from the world
- Recall
 - information stored in the head
- Recognizing material far easier than recalling from memory
- Cognitive mnemonics
 - aid to memory

Knowledge in the World and User Interfaces

- Graphical interfaces reduces mental effort - interface does the remembering
- People use one another as knowledge resources
- Episodic memory
 - information that is retrieved by searching through memory (experts)
- Semantic memory
 - large body of general knowledge we build up throughout our lives