

Comp 388/441 - Human-Computer Interface Design

Week 4 - 11th February 2016

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Human Memory - I

- context in user interaction is important
 - *helps establish an application in a user's short-term memory*
- predominant models for human memory include
 - *short-term or working memory*
 - *long-term memory*
- inter-related structural nature of working and long-term memory

Human Memory - 2

Short-term, working memory

- conceptually similar to a temporary memory store
- able to hold a limited amount of data
 - *might include words, numbers, symbols...*
 - *related to current user task*
- working memory decays quickly & often lost
 - *we lose focus, switch to another task...*
- rehearsal and repetition of a given task is useful prevention
 - *helps us maintain useful or important information*
- capacity of working memory
 - *"seven, plus or minus two"*
 - *Miller, G. A. "The magical number seven, plus or minus two: Some limits on our capacity for processing information." 1956.*
- 7 numbers for North American local dialling
- harder for most people to hold more than about 7 digits...

Human Memory - 3

Changing limited capacity in working memory

- free up working memory to replay and rehearse new information
- compare with computer memory, and related performance without free memory
- learning is naturally reduced and slows down
- a good example of this is mental arithmetic
- difficult to hold even limited amounts of information and process effectively
- burden on working memory is known as 'cognitive load'
- reduction of cognitive load fosters learning by freeing working memory

Human Memory - Working Memory Video

Why the Human Brain Can't Multitask



Why the Human Brain Can't Multitask - Source: YouTube

Human Memory - 4

Long-term memory

- more permanent, persistent store
- allows us to save and recall knowledge, memories at a later date
- store any facts, both good and bad
- also stores procedures and skills
 - *both cognitive and sensory-motor tasks related*
- also permanent memory store
 - *some data will naturally degrade or deteriorate over time*
- may experience some sense of false recall
 - *memory items become confused or combined irregularly*

Human Memory - 5

The very act of memorisation

- the act of intentionally committing something from short-term to long-term memory
- normally achieved through repetition
 - *more frequent we encounter something, more likely we are to remember*
- eg: studying involves actively & intentionally re-reading, rehearsing & practicing
- also need to be able to store other long-term data
 - *important, novel, surprising, and unusual information without repetition*
- exact nature of how this works still remains largely unknown
- such memories are believed to be stored symbolically
- we may not retain exact copy of event or material
 - *instead we create symbolic hooks to allow easier recall of data*

Human Memory - 6

Memory storage & recall

- tend to store information in logical groupings
- psychologists refer to this as **chunks**
- memory most effective when **chunks** are related
 - *these are logical connections or relationships*
- eg: association between a person and related information
 - *their face and name*
 - *their job title and name*
 - *family or colleague associations...*

Human Memory - 7

Memory recognition & recall

- recall of information, events etc normally triggered by a prompt or cue
 - *eg: recognising someone in a crowd may trigger recall of their name...*
- more recent information tends to lead to better recall
 - *known as **recency effect***
- often easier to recall related information as well
- poor, fractured recall shows imperfect nature of long-term memory
- often recall hazy or false data from long-term memory



Human Memory - 8

Retrieval and transfer of new knowledge and skills

- not sufficient to simply add new knowledge to long-term memory
 - *new knowledge needs to be easily retrieved in context*
- retrieval of new skills essential for successful transfer of knowledge and experience
- interface design necessarily needs to incorporate context to help retrieval
 - *examples and practice exercises*
 - *simple mnemonics as a child*
- job learning and training scenarios, role play, troubleshooting exercises...
- link or hook new knowledge to long-term memory

Human Memory - Improving Memory Video

Andi Bell explains the 'link method' me...  



Andi Bell explains the 'link method' memory technique - Source: YouTube

Human Memory - Mind Palace Video

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Sherlock Holmes Mind Palace - Source: Critical Commons

Human Memory - 9

Our brain forgets...

- less frequently accessed chunks of information or skill processes
 - *more likely to be forgotten*
 - *natural aspect of our brain's memory structure*
- **recency effect** tends to protect daily routines...
- older facts more easily become hazy or unclear
- loss of long-term information is not universal
- highly developed motor & cognitive skills with sense of easy repetition
- some things are simply like **riding a bike**

Human Memory - Video

Ten second tom scene from 50 first da...  



Ten Second Tom from 50 First Dates - Source: YouTube

References

- Card, S.K., Moran, T.P. and Newell, A. *The psychology of human-computer interaction*. Lawrence Erlbaum Associates. 1983.