

Our Attention is Limited, Our
memory is Imperfect

Our Attention is Limited, Our memory is Imperfect

- Again notes here are heavily based on
Designing with the Mind in Mind
- By Jeff Johnson

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- Like the human visual system our memory has strengths and weaknesses
- A better understanding of these strengths and weaknesses will help us design better UIs
- Can't remember much in short term memory so tasks and tools that rely on it or tax it will stress a user
- Long term memory should be taken advantage of where possible

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- short term memory retains information from a fraction of a second to a couple of minutes
- long term memory retains information over minutes, hours to an entire lifetime
- while it is tempting to think of these as separate memory stores it is not the case
- a lot of the early research in fact thought that they were separate

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- more recent research from 2008 shows that they are more closely linked (Jonides et al 2008)
- with regards to long term memory perceptions that enter through the senses all have individual processing in parts of the brain specifically for that sense
- however after this they start to spread into other areas of the brain that are not related to senses.
- Before the spread the brain recognises low level features (dark-light edge, sour taste, red colour)
- After the spread the brain combines these features to make high level features (animal, the word "duck") etc

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- what this means is that different combinations of perceptions will generate different patterns of neural activity
 - because it is dependant on the low and high level features of the overall perception
- the more similar two perceptions are the more similar the two corresponding neural patterns will be
 - as the stimuli will overlap to produce similar low and high level features

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- all perceptions have a strength associated with them
 - anything that causes a weak perception will result in the perception barely registering or not even being recognised
- memory formation consists of long term changes in the neurons that are activated by a pattern.
- the more perminant the changes the easier it is to reactivite that pattern.

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- activating a memory consists of reactivating the same neural pattern
- the brain has the ability to distinguish between a reactivation by memory as compared to a perceptual activation
- new perceptions that reactivate similar patterns in the brain will lead to recognition if the reactivated perception reaches awareness
- in the absence of a similar perception that leads to awareness it will lead to recall.

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- The more a pattern is reactivated the stronger it becomes
 - as the neurons make stronger connections
- meaning that every time a memory is accessed it is modified
- A side effect of this is that there is no one spot in the brain that stores all memory
- because there are neurons from several areas of the brain that is involved in a memory.

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- Thus damage in a part of the brain will not wipe out a memory but will reduce their detail.
- unless a critical pathway is injured in which case a pattern may not be able to reactivate at all

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- short term memory is not a store it is a place where perceptions go to be worked on
- it's a combination of phenomena arising from perception and attention
- each sense has its own short term memory that can be used as input to other parts of the brain
- also available to the short term memory are long term memories that have similar patterns to the stimuli

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- the brain has many attention mechanisms both voluntary and involuntary
- they focus awareness on a very small subset of perceptions and long term memories (ignoring all else)
- so short term memory can be thought of as a combined focus of attention
- and as such the items to be held in short term memory is small and limited.

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- damage to the brain can affect short term memory by eliminating the ability of the brain to focus on certain objects and events
- characteristics of short term memory
 - short term memory is equal to the focus of your attention.
 - it has very low capacity
 - it is extremely volatile

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- How many items can short term memory hold
- according to Broadbent's research in 1975 it is four +/- one
- three to five items
- the variance is that there is because it can't be measured with perfect accuracy

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- more recent research from 2004 and 2008 shows that short term memory is about item features rather than whole items
- as for volatility it was thought that new stuff coming in would replace old stuff
- but the modern view is that short term memory is the current focus of attention
 - if you get distracted you will lose that memory

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- this is why people lose track so easily when they get distracted by something
- there was an experiment by simons and levin in 1998
 - A “tourist” with a map asked for directions
 - While distracted by the task a door was moved in the gap between person and tourist and tourist was changed (hair colour and all) and none of this was noticed by the person.

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- implications of short term memory for Uis
 - The core implication is that UIs should help people remember essential information
 - Don't make people remember system status or what they have done
 - The more people have to remember about your UI the more difficult it will be


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- Avoid modes if possible
 - e.g. accelerator pedal in a car depends on mode the car is in
 - cameras may take a photo or start recording etc
- The advantage of modes is more functions than controls
- The disadvantage is that people often make mode errors (forget system mode and different context to action)

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- Search results
 - when users are searching for items it helps to display what the user searched for
 - people often don't remember the search terms they were looking for when they start going through lists
 - thus they should be displayed at all times

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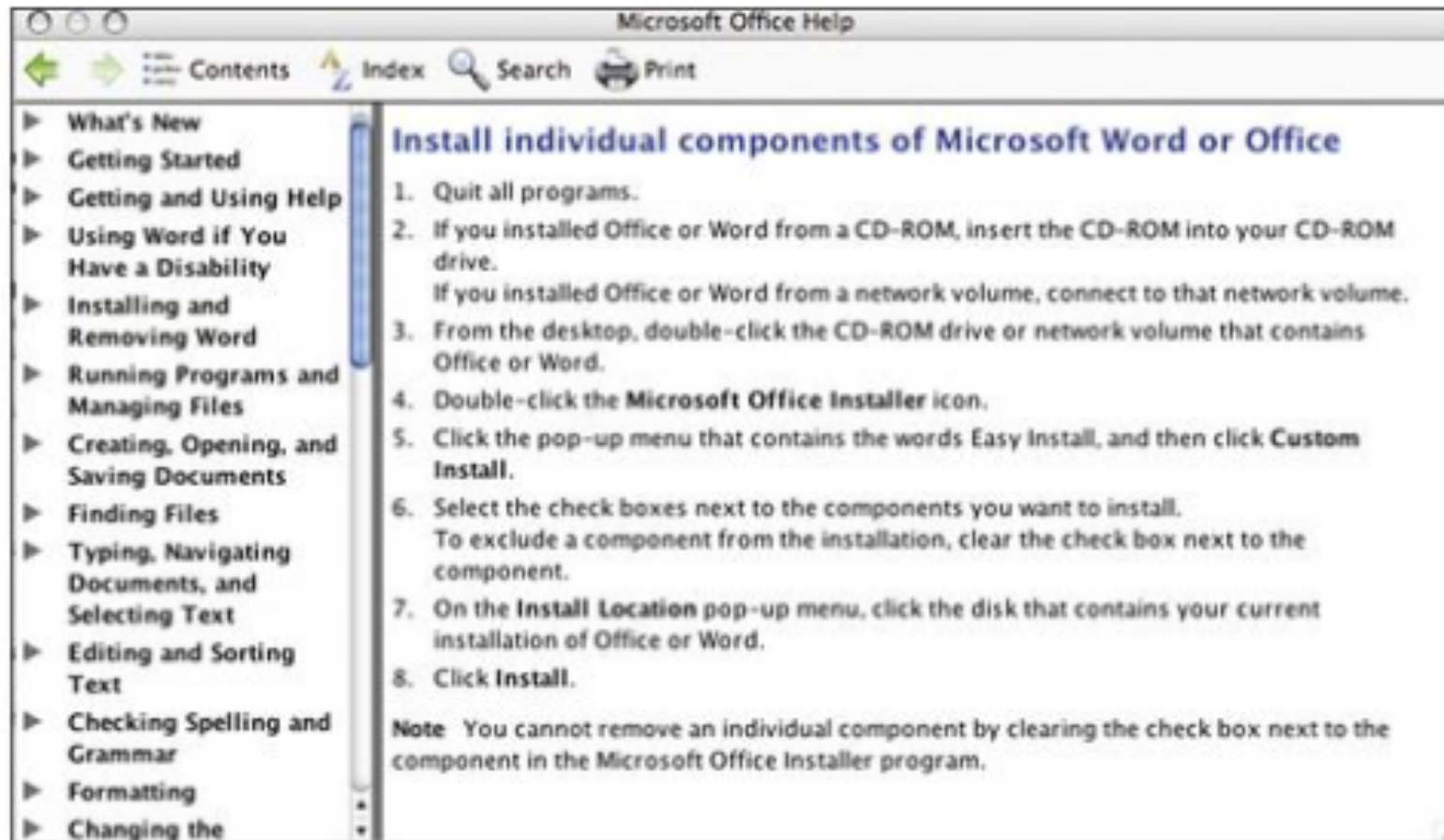
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- Instructions should be available at all times and easily accessible
 - if you were given a list of instructions you would ask for them to be written down
 - as you would not remember them all
 - so a long list of instructions should be available at all times while the user is performing the task

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