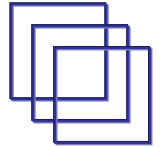


# Lecture 7

chapter 1

## the human

### 2 of 3

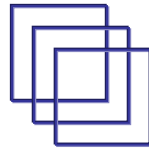


## Next week's presentations

- Imagine you are competing with the other project groups for a \$30,000 contract
- This is your one chance to convince us that your design is the best
- If you were spending \$30,000 how would you expect the sales team to look?
- Remember there is the possibility of a couple of \$4,000 summer scholarships 😊

## the human

- Lecture 6 Information i/o ...
  - visual, auditory, haptic, movement
- Lecture 7 (today)
  - Information stored in memory
    - sensory, short-term, long-term
- Lecture 8
  - Information processed and applied
    - reasoning, problem solving, skill, error
  - Emotion influences human capabilities
  - Each person is different



## Memory

There are three types of memory function:

Sensory memories



Attention

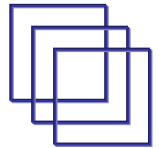
Short-term memory or working memory



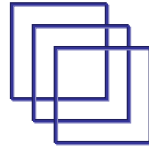
Rehearsal

Long-term memory

Selection of stimuli governed by level of arousal.



## Sensory memory

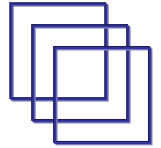


- Buffers for stimuli received through senses
  - iconic memory: visual stimuli
  - echoic memory: aural stimuli
  - haptic memory: tactile stimuli
- Examples
  - “sparkler” trail
  - stereo sound
- Continuously overwritten

the human 2 of 3

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## Short-term memory (STM)

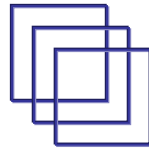


- Scratch-pad for temporary recall
  - rapid access ~ 70ms
  - rapid decay ~ 200ms
  - limited capacity -  $7 \pm 2$  chunks
- Some research suggests that programmers have better short-term memory than ‘average’ people
  - This means you will have better short-term memory than your users!

the human 2 of 3

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## A Chunk is 1 item in short term memory



212348278493202

0121 414 2626

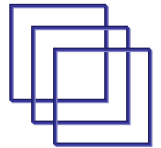
HEC ATR ANU PTH ETR EET

Microsoft product keys ☺

Put your pens down for a minute and watch the screen

the human 2 of 3

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the human 2 of 3

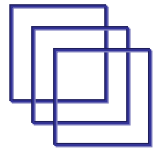
8



the human 2 of 3

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## Long-term memory (LTM)



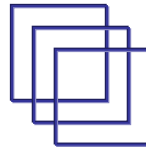
- Repository for all our knowledge
  - slow access ~ 1/10 second
  - slow decay, if any
  - huge or unlimited capacity
- Two types
  - episodic – serial memory of events
  - semantic – structured memory of facts, concepts, skills

semantic LTM derived from episodic LTM

the human 2 of 3

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## Interesting trivia

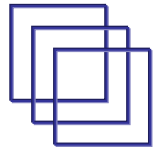


- Mega memory techniques
  - Combine episodic and semantic
- Experienced programmers
  - Use chunked techniques that they have used before to solve problems
  - They decompose the problem into bigger chunks than a novice programmer
  - Then apply known solution to each chunk
  - Takes about 10 years to build up repertoire

the human 2 of 3

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## Long-term memory (cont.)

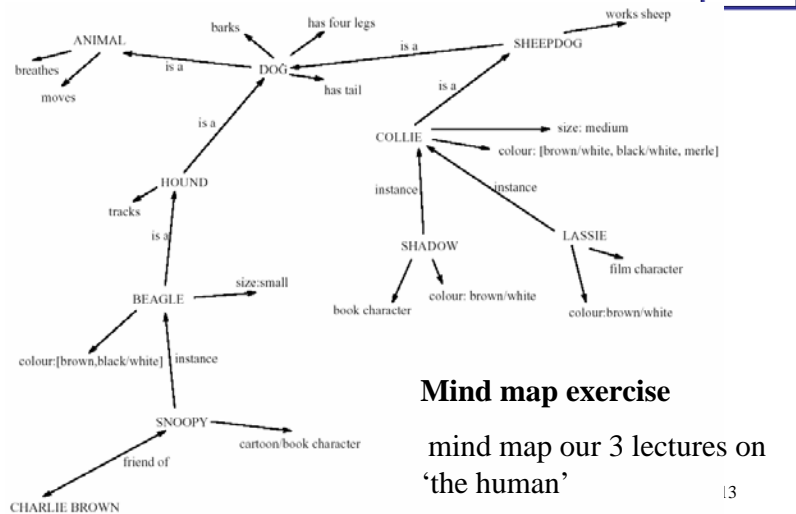


- Semantic memory structure
  - provides access to information
  - represents relationships between bits of information
  - supports inference
- Model: semantic network
  - inheritance – child nodes inherit properties of parent nodes
  - relationships between bits of information explicit
  - supports inference through inheritance

the human 2 of 3

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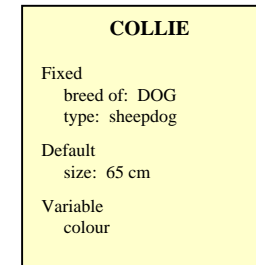
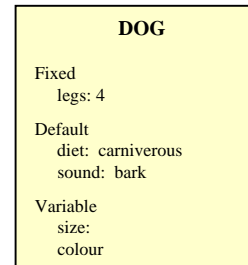
# LTM - semantic network



**Mind map exercise**  
mind map our 3 lectures on 'the human'

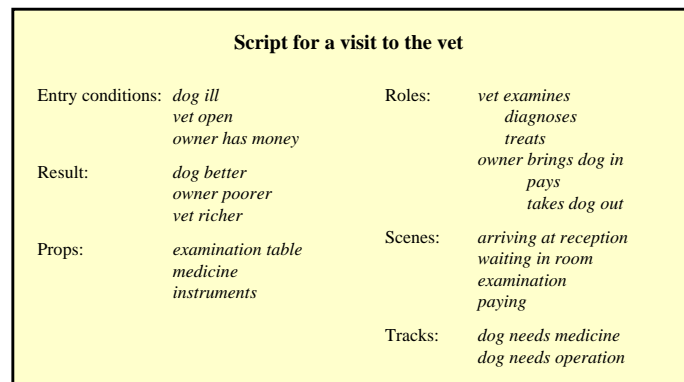
# Models of LTM - Frames

- Information organized in data structures
- Slots in structure instantiated with values for instance of data
- Type-subtype relationships



# Models of LTM - Scripts

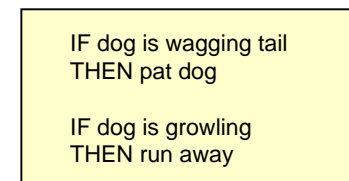
Model of stereotypical information required to interpret situation  
Script has elements that can be instantiated with values for context



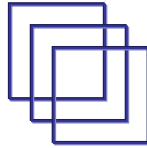
# Models of LTM - Production rules

Representation of procedural knowledge.

Condition/action rules  
if condition is matched  
then use rule to determine action.

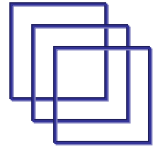


## LTM - Storage of information



- rehearsal
  - information moves from STM to LTM
- total time hypothesis
  - amount retained proportional to rehearsal time
- distribution of practice effect
  - optimized by spreading learning over time
- structure, meaning and familiarity
  - information easier to remember

## LTM - Forgetting



### decay

- information is lost gradually but very slowly

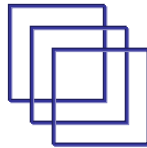
### interference

- new information replaces old: retroactive interference
- old may interfere with new: proactive inhibition

so may not forget at all memory is selective ...

... affected by emotion – can subconsciously 'choose' to forget

## LTM - retrieval



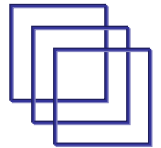
### recall

- information reproduced from memory can be assisted by cues, e.g. categories, imagery

### recognition

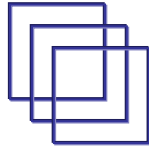
- information gives knowledge that it has been seen before
- less complex than recall - information is cue

## Applying this to your learning



- Mind maps
- Pre-read
- Take notes
- Revise
- Look for connections between subjects

## What knowledge do you have your users will not have?



- How much of what we have covered today is general knowledge?
- How hard is it for a user to build up a mental model of an interface?
  - Do site maps work?
  - Do you use them?
- What can you do to help?