Lecture 4
chapter 1

the human
2 of 3

the human

- Lecture 3 Information i/o …
  - visual, auditory, haptic, movement
- Lecture 4 (today)
  - Information stored in memory
    - sensory, short-term, long-term
- Lecture 5
  - 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

Short-term memory (STM)

- Scratch-pad for temporary recall
  - rapid access ~ 70ms
  - rapid decay ~ 200ms
  - limited capacity - 7± 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!

A Chunk is 1 item in short term memory

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Microsoft product keys ☺

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

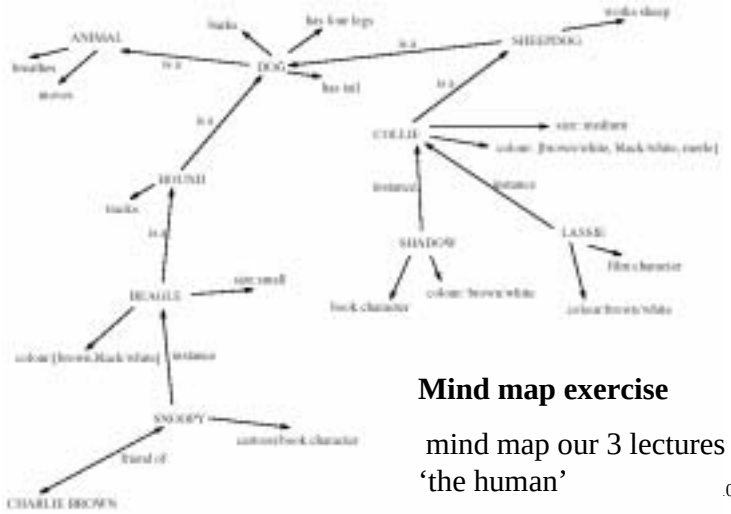
Interesting trivia

- 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

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

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

DOG
Fixed legs: 4
Default diet: carniverous sound: bark
Variable size: colour

COLLIE
Fixed breed of: DOG type: sheepdog
Default size: 65 cm
Variable colour

Models of LTM - Scripts

Model of stereotypical information required to interpret situation

Script has elements that can be instantiated with values for context

Script for a visit to the vet

Entry conditions:	*dog ill* *vet open* *owner has money*	Roles:	*vet examines* *diagnoses* *treats* *owner brings dog in* *pays* *takes dog out*
Result:	*dog better* *owner poorer* *vet richer*	Scenes:	*arriving at reception* *waiting in room* *examination* *paying*
Props:	*examination table* *medicine* *instruments*	Tracks:	*dog needs medicine* *dog needs operation*

Models of LTM - Production rules

Representation of procedural knowledge.

Condition/action rules

if condition is matched

then use rule to determine action.

IF dog is wagging tail
THEN pat dog

IF dog is growling
THEN run away

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?