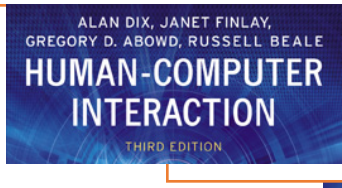

Human-Computer Interaction

Dr. Ibrar Hussain

Week: 04

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

Thinking

Reasoning

deduction, induction, abduction

Problem solving

Deductive Reasoning

- Deduction:
  - derive logically necessary conclusion from given premises.

    e.g. If it is Friday then she will go to work
    It is Friday
    Therefore she will go to work.

- Logical conclusion not necessarily true:

    e.g. If it is raining then the ground is dry
    It is raining
    Therefore the ground is dry

Deduction (cont.)

- When truth and logical validity clash …

  e.g. Some people are babies
  Some babies cry
  Inference - Some people cry

  Correct?

- People bring world knowledge to bear

Inductive Reasoning

- Induction:
  - generalize from cases seen to cases unseen

    e.g. all elephants we have seen have trunks
    therefore all elephants have trunks.

- Unreliable:
  - can only prove false not true

… but useful!

Abductive reasoning

- reasoning from event to cause

  e.g. Sam drives fast when drunk.

  If I see Sam driving fast, assume drunk.

- Unreliable:
  - can lead to false explanations

Problem solving

- It is the process of finding solution to unfamiliar task, using the knowledge we have.
- Several theories.
- **Gestalt -** problem solving involves both reuse of knowledge and insight.
  - Addresses productive problem solving (insight and restructuring of a problem) and reproductive problem solving (on previous knowledge).
  - Backed up their claims with experimental evidence.
  - Move away from behaviourism and led towards information processing theories.

Problem solving (cont.)

Problem space theory -

- Problem space comprises problem states, problem solving involves generating states using legal operators.
- Heuristics may be employed to select operators. E.g. means-ends analysis.
- Operates within human information processing system

  e.g. STM limits etc.
- Largely applied to problem solving in well-defined areas

  e.g. puzzles rather than knowledge intensive areas.

Problem solving (cont.)

- Analogy
  - analogical mapping:
    - novel problems in new domain?
    - use knowledge of similar problem from similar domain
  - analogical mapping difficult if domains are semantically different

- Skill acquisition:
  - skilled activity characterized by chunking
    - lot of information is chunked to optimize STM
  - conceptual rather than superficial grouping of problems
  - information is structured more effectively

Errors and mental models

Types of error

- slips
  - right intention, but failed to do it right
  - causes: poor physical skill, inattention etc.
  - change to aspect of skilled behaviour can cause slip.

- mistakes
  - wrong intention
  - cause: incorrect understanding
    humans create mental models to explain behaviour.
    if wrong (different from actual system) errors can occur.

Emotion

- Various theories of how emotion works
  - James-Lange: emotion is our interpretation of a physiological response to a stimuli.
  - Cannon: emotion is a psychological response to a stimuli.
  - Schacter-Singer: emotion is the result of our evaluation of our physiological responses, in the light of the whole situation we are in.
- Emotion clearly involves both cognitive and physical responses to stimuli.

Emotion (cont.)

- The biological response to physical stimuli is called *affect*

- Affect influences how we respond to situations
  - positive  creative problem solving
  - negative  narrow thinking

"Negative affect can make it harder to do even easy tasks; positive affect can make it easier to do difficult tasks"

(Donald Norman)

Emotion (cont.)

- Implications for interface design
  - stress will increase the difficulty of problem solving.
  - relaxed users will be more forgiving of shortcomings in design.
  - aesthetically pleasing and rewarding interfaces will increase positive affect.

Individual differences

- long term
  - Gender, physical and intellectual abilities
- short term
  - effect of stress or fatigue
- changing
  - age

Ask yourself:
will design decision exclude section of user population?

Psychology and the Design of Interactive System

- Some direct applications
  - e.g. blue acuity is poor
    - ☞ blue should not be used for important detail

- However, correct application generally requires understanding of context in psychology, and an understanding of particular experimental conditions.