

Lecture 3: Cognitive Psychology Overview II

- Review & Memory continued
 - More Recent Memory Theory
 - Applications of Theory to Engineering

Review – Cognitive Psychology

- Cognitive Psychology → “mentalism”
 - Infer models of mental processes thru behavior
 - Exposed through experimental manipulations
 - Choice reaction times → mental processes take time
 - Models → functional explanations
- Patricia Kitcher (1984)
 - “Psychological explanations will ultimately appeal to things like and-gates and neurophysiology will tell us how and-gates work”
- To what extent does this affect Applied Psychology?

Kitcher, P. (1984) In defense of Intentional Psychology. *The Journal of Philosophy*, 81(2), 89-106.

Applications of Memory Theories (1)

- (Mis)Application to HCI
 - Short Term Memory and Magic Number 7 plus/minus 2
 - Shneiderman (1st ed text): Menus and memory
 - Has been applied to
 - Place only 7 items on a menu bar
 - Place only 7 items on a pull-down menu
 - Have only 7 bulleted items in a list
 - Never have more than 7 radio buttons or check boxes in a unit
 - Place on seven tabs on top of a website
 - What is wrong with this?
- How much is memory involved?
- Memory Theory has moved on since 1956
 - Working memory: more than just rehearsal area
 - Seven +/- 2 may be wrong: May different estimates, empirical data now in disagreement, may depend upon type of task and material

Applications of Memory Theories (2)

- Application to HCI: Automated Telephone Services
 - If you have a problem with your bill, press 1
vs.
 - Press 1 if you have a problem with your bill
 - Direct applied research shows Object-Action order is better
 - Could there be a memory reason for this?

 - Golden rule – 4-5 items in each voice menu
 - Memory reason?
 - Virzi & Huitema (1997) – Broader better than deeper

Recent Memory Theories

Theoretical Developments over Last 2 Decades

- Levels of Processing Theory (Craik and Lockhart, 1972)
- Episodic and Semantic Memory (Tulving)
- Constructive Memory - Schema Theory
 - All memories (particularly texts and experiences) are constructed from memory (Applied Psych: Eyewitness testimony)
- Computational Approaches (Preece et al. term)
 - Production systems
 - Movement away from “multistore” models
- Connectionist Approaches (Rumelhart & Norman, many more)
 - Computer simulation of neural network
 - Spreading activation among nodes in network (directed graphs)
 - Extremely loosely based upon neurology
 - Simulations sometimes mimic older symbolic models

Levels of Processing Theory

Levels of Processing

- Information can be processed to different depths or levels
- Replaces old theory of 'rehearsal'
- Shallow processing
 - Stimulus analysis, physical properties such as a word's sound
- Deep processing
 - Semantic analysis (meaning)
 - familiarly
 - imagery
- Deeper processing provides stronger storage of item in LTM

Levels of Processing Theory Applications

Game: Name that Unix Command

- cat
- grep
- ls
- lint
- mv
- pr
- lpr
- awk
- perl
- catenate - rare English word - types file on screen
- global regular expression and print
- list - as in “list files” or “list directories”
- analogy: shreds of fiber from clothing = debugging
- move - refers to computer concept
- print (2/3 letter abbrev.) formats but does not print
- lpr - line printer (anachronism)
- A, W, K - acronym for authors of program
- PERL - practical extraction and report language

Distributed Cognition (Hutchins, 1995)

- Cognitive activities are embodied and situated within the work context in which they occur
- Functional system -
 - individuals
 - setting
 - social context, organizational structure
 - computer systems and technology
- Suchman (1987) - Plans and Situated Actions
 - ethnomethodological analysis of novice user and Xerox machine
 - “situated” cognition, cognition is in a social context