Introduction

Phil/Psych 256

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Overview

- Cognitive Science (CogSci): Study of mind and intelligence
- Main concerns:
  - Identify resources used
  - Understand how they are deployed
- Classic view (1950s–1980s):
  - Symbolic representations
  - Symbol processing
- Recent challenges:
  - Adequacy of symbol processing
  - Brain studies
  - Consciousness, emotions

Overview (cont.)

- Aims of the course:
  - Examine classic CogSci as an account of human thinking and intelligence
  - Examine challenges to classic CogSci
- For now:
  - The CogSci paradigm
  - History of CogSci

will cover the story of development of cognitive science

The Cognitive paradigm

- Cognitive Scientists disagree on the nature of thinking and intelligence
- **Central Thesis**: Thinking is like computation (in a digital computer)
  - Information is represented (data structures)
  - Calculations are performed
- Note: The thesis is an analogy, not a claim of physical resemblance between brains and PCs

thinking is the mental computation, ex the activity that goes on your cpu is the activity that goes on in your brain.

The Cognitive paradigm (cont.)

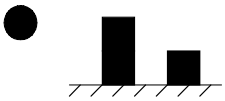
- The thesis is a **paradigm** (Kuhn) more than a theory; it tells researchers …
  1. What to investigate,
  2. What sorts of theories to test, and
  3. How to test and evaluate them.
- For CogSci:
  1. Investigate intelligent behaviours
  2. Theorize about mental representations and procedures
  3. Test using computational models, experiments, etc.

Intelligence

- **Q**: What activities require intelligence?
- Typical answers include recreational challenges, argumentation, technological work
- In classic CogSci: intelligence is any activity in which **expertise** plays a major role
- Intelligence is **knowledge**-intensive

Mental representations and procedures

- Mental representation - statements:
  - Block A is on block B.
  - Block B is on the ground.
  - Block C is on the ground.
  - Block C is right of block B.
- Mental procedures - rules:
  - To have block x on block y, place block x on top of block y.
  - To place block x on top of block y, remove other blocks from on top of y, pick up block x, move it on block y and let go of block x.
- Make a plan to spell “CAB”



Theory assessment

- Theory: model or explanation of how an intelligent activity occurs
  - Claim about mental representations and procedures, e.g., statements and rules
- Model confirmed if performance matches human behaviour, disconfirmed otherwise
- CogSci is highly interdisciplinary
  - Different disciplines employ different testing methods, e.g., brain scans in neuroscience

Summary

- Central thesis: Thinking is like computing
  - CRUM: Computational-Representational Understanding of Mind
- CRUM is a paradigm rather than a theory
  - Intelligence is knowledge-intensive
  - Produced by mental representations and procedures
  - Theories are testable through simulation, experiment, etc.
- Evaluation of CRUM depends on
  - Record of success or failure of CRUM theories
  - Performance relative to other paradigms
  - Prospects for future success

Prehistory of CogSci

- Basic questions:
  1. What do you know and how do you know it? (**epistemology**)
  2. What kind of thing is a mind? (**metaphysics**)
  3. How does a mind give rise to thinking? (**psychology**)
- Some responses:
  - Plato (ca. 400 BC): grasp of ideas, hydraulic analogy
  - Locke (ca. 1700): possession of statements, blank paper analogy
  - Watson (ca. 1920): S-R arcs, switchboard analogy
  - Weiner (ca. 1940): control configurations, rangefinder analogy

The cognitive revolution

- 1940s: Turing, electromechanical computers, computer analogy
- 1950s:
  - Miller: short term memory (7+-2 chunks)
  - Newell & Simon: General Problem Solver
  - Chomsky: syntax as mental representation
- Some general historical trends:
  1. Thinking and intelligence have often been associated with information processing
  2. Information processing technology has often been used as a source of inspiration for theories of cognition