Unit 01 L13 Cognitive Theory

2020年1月19日　　下午 12:35

- Theory, Hypothesis, Facts
  - What are theory, hypothesis, and facts?
    - A theory is a knowledge that has been scientifically validated many times and accepted.
      - E.g. The earth moves around the sum.
    - A hypothesis is a new idea which has not yet been proved or validated
      - Lemon juice is good for your heart.
    - Facts are observable truths.
      - It is raining today.
- Central Hypothesis of COGS
  - Mental processes are analogous to computational processes and can be understood better by programming the computers to mimic human behaviour or produce similar responses.
  - Computer
    - Computation = Data structures + Algorithms
  - Mind
    - Thinking = Representations + Procedures
  - Brain
    - Reaction = Neuron structure + Firing and signal propagation rules
- Mind vs Computer
  - Mind
    - Thinking = Representations + Procedures
    - Apply procedures to representations to produce thought or action
  - Computer
    - Computation = data structures + algorithms
    - Apply algorithms to data structures to perform computation and generate results
  - Brain
    - Reaction = Neuron structure + firing and signal propagation rules
    - Apply physical firing and signal propagation rules on the neuron structure to generate reaction
- Type of Data Representation
  - Representations for mental cognitive processes:
    - Logic Propositions
    - Rules
    - Concepts
    - Analogies
    - Images
    - Connections

- The Tri-level Hypothesis
  - How can we study information processing systems?
    - David Marr (1982) proposed that information processing systems must be understood by three distinct, complementary levels of analysis:
      - Computational level
      - Representation and Algorithmic level: How is the data represented and what are the steps needed to execute the process?
      - Hardware or Implementation level: How can a system be implemented to generate the desired outcome in practise?
- Cognitive Approach
  - Cognitive scientists primarily focus on the representation and algorithmic level.
    - At the brain implementation level, it can easily get very complicated.
  - Experimental data from other disciplines are used to develop computational models.
  - At the implementation level, these models are implemented on computers.
  - Read the research paper on: Cortical Regions Involved in Navigation.
- Evaluate a Cognitive Theory
  - Cognitive scientists explore hypothesis and define theories to be used in subsequent studies.
  - The theories are evaluated based on the following.
    - The theory must be computationally based
    - The theory should be compatible with the existing theories in the related disciplines.
      - What is known about human behaviours and actions.
      - The processes of evolution, the structure, and operations of the brain.
    - The theory should explain consciousness.