

Lecture 1 (WK1)

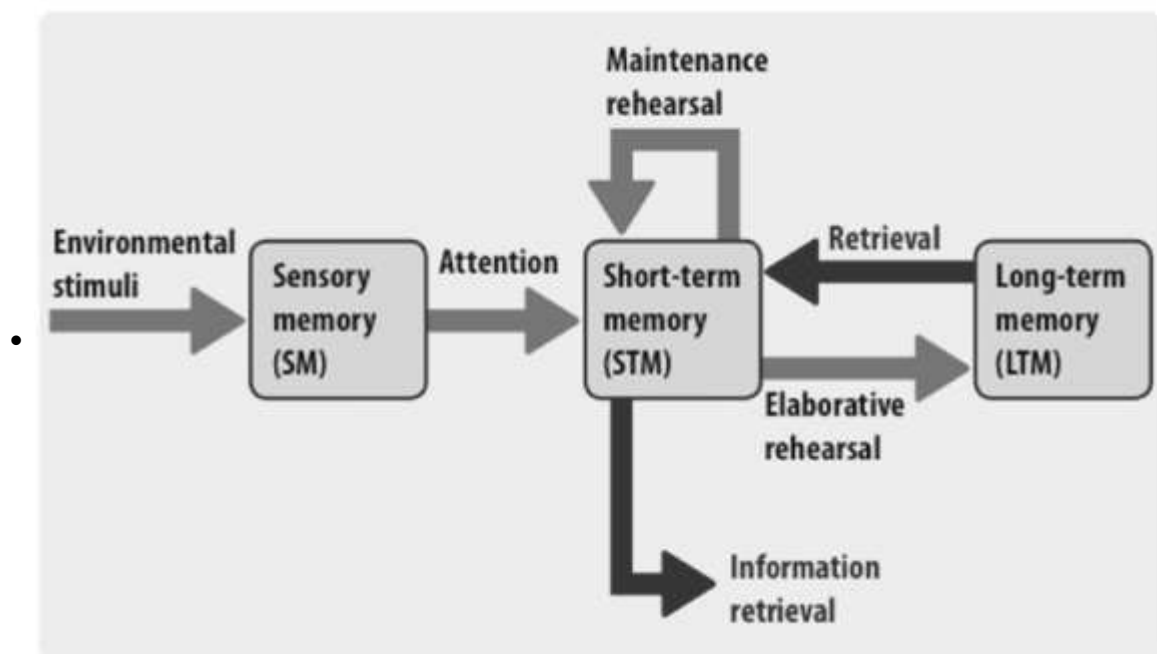
What is cognition?

- Activity of acquiring, organizing and using information to enable adaptive, goal-orientated behaviour
- Study of information processing
- The mind is a system that creates representations of the world so that we can act within it to achieve our own goals- allows us to mentally represent things that aren't actually present
- Cognitive abilities = intelligence
- Cognitive agents (cognisors)
 - Sense and act on the environment
 - Detect and effect changes in the environment
 - Gain information
 - Construct mental models to represent the causal structure of that environment
 - Adapt their mental models in response to feedback from their behaviour
 - Use mental models to guide future behaviour

The computational metaphor of cognition

- Cognition is a flow of information through processing devices that encode, store and retrieve symbolic representations of knowledge
 - Brain is hardware- almost redundant as other areas may have a similar role
 - Mind is software
- Cognition is analogous to the operations of a digital computer

Information processing model of memory



- Sensory signals provide 'input' to the system
- Transduction of sensory signals to a mental code for central processing
- Further processing (computation) in short-term/working memory, informed by long term memory

Classical cognition

- Thought process reflect the mental manipulation of symbols according to syntactic rules for combining those symbols
- Symbols represent our knowledge of the things and events (concepts) and our knowledge of the way concepts can relate to one another
- Natural languages translate mentalese into a publicly expressible format
- Can be used to model intelligent behaviour
 - Problem solving
 - Reasoning
- Steps taken to solve a problem can be represented in an explicit symbolic code
- Good for formal problems and logical reasoning
- Bad for perception, action and recognizing patterns

Propositional representations

- A symbolic code to express the meaning of a particular relationship among concepts

Propositions

- Derived from propositional logic
- Express underlying meanings
- Abstract code, not words or images
- Composed of
 - Predicate- expresses relationship between elements
 - Arguments- expresses subject and object elements
- Take form of predicate-argument schema
 - Kevin gave Julia a kiss - (Gave(Kevin, Kiss, Julia)
- Same abstract prepositional schema can express many different surface forms

Analogue representations

- Individuals simulate physically rotating and moving objects in their minds

Dynamic, embodied, situated cognition (DES)

- Cognition is dynamic
 - Unfolds in time and space
 - Cognition insuperable from sensing, thinking and acting in real time
- "Real-time cognition is best described not as a sequence of logical operations performed on discrete symbols but as a continuously changing pattern of neuronal activity."
- Between describable states of mind, mental activity does not lend itself to the linguistic labels relied on by much of psychology.
- Using continuous online experimental measures such as eye-tracking and computer-mouse-tracking (instead of outcome-based measures such as reaction time and accuracy), it is possible to see that mental activity is being conducted in between those seemingly discrete thoughts.
- Thus, we argue that cognition is best analyzed as a continuously dynamic biological process, not as a staccato series of abstract computer-like symbols."
- Cognition is embodied
 - Our embodied interactions with the world provide the basis for higher level thought processes
 - Our knowledge is grounded in physical interactions with the world
- Cognition is situated
 - We structure the physical environment to support our cognitive processes
- DES approach
 - Bottom up- objects --> world
 - Emphasises the role of development, social interactions and emotions in supporting higher level cognitive processes

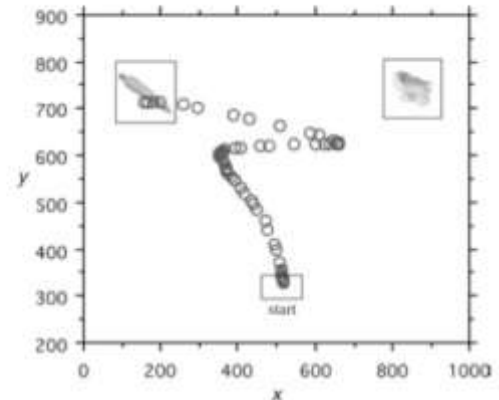


Figure 3.9. Mouse-movement trajectory (in pixels) for "Click the carrot," with a carriage as the cohort competitor.