

Core Papers

Palmeri, T.J., & Cottrell, G. (2009). Modeling perceptual expertise. In I. Gauthier, D. Bub, & M. Tarr (Eds.), *Perceptual Expertise: Bridging Brain and Behavior*. Oxford University Press.

JR Anderson (1991). The Adaptive Nature of Human Categorization, *Psychological Review*. by the American Psychological Association, Inc. 1991, Vol. 98, No. 3, 409-429.

Tenenbaum, J. B., Kemp, C., Griffiths, T. L., & Goodman, N. D. (2011) How to grow a mind: Statistics, structure, and abstraction. *Science*, 331, 1279-1285.

Christopher J. MacLellan, Erik Harpstead, Vincent Aleven, Kenneth R. Koedinger (2016) TRESTLE: A Model of Concept Formation in Structured Domains. *Advances in Cognitive Systems* 4 (2016) 131-150 Submitted 8/2015; published 6/2016

Arthur C. Graesser, Murray Singer, and Tom Trabasso (1994). Constructing Inferences During Narrative Text Comprehension, *Psychological Review*, Vol. 101. No. 3, 371-395

Chi, M. T. H., and Van Lehn (2010). "Seeing Deep Structure from Interaction of Surface Features.

A Tversky, D Kahneman (1981). The framing of decisions and the psychology of choice *Science* 30 Jan 1981: Vol. 211, Issue 4481, pp. 453-458.

Lu Hong and Scott E. Page (2004) Groups of diverse problem solvers can outperform groups of high-ability problem solvers *PNAS* November 16, 2004 101 (46) 16385-16389;

Mark O. Riedl and Vadim Bulitko (2013). *Interactive Narrative: An Intelligent Systems Approach*, *AI Magazine*, Spring Issue, 67—77.

Pat Langley, John E. Laird, Seth Rogers (2009). *Cognitive Systems Research*, Volume 10, Issue 2, June 2009, Pages 141-160, *Cognitive architectures: Research issues and challenges*.

Capabilities of Cognitive Architectures

- Recognition and Categorization
 - represent patterns and situations in memory
 - learn these patterns
 - Decision Making and Choice (one step plans?)
 - allowable alternatives
 - desirability of alternatives
 - goals, objectives, and utilities
 - learning allowability/desirability/effectiveness
 - Perception and Situation Assessment
 - Compose large-scale environment models from percepts
 - relies recognition and categorization of patterns in the environment
 - relies on inferential mechanisms
 - Prediction and Monitoring
 - model of the environment
 - effects of actions
 - Problem Solving and Planning
 - goals, objective, and utilities
 - partially ordered actions
 - enabling conditions
 - predicted effects
 - learning to reduce effective breadth and depth of search
 - Reasoning and Belief Maintenance
 - deductive reasoning
 - abductive reasoning
 - inductive reasoning
 - incremental or online learning
 - Execution and Action
 - actuators in environment
 - primitive actions
 - composite actions
 - Interaction and Communication
 - translating knowledge for other agents
 - question asking and answering
 - Remembering, Reflection, and Learning
 - cognitive structures formed during external or cognitive activities
 - explanation/justification
 - metareasoning
- Learning is pervasive and in human instantiations, perhaps
- emotional awareness and response
- is too.

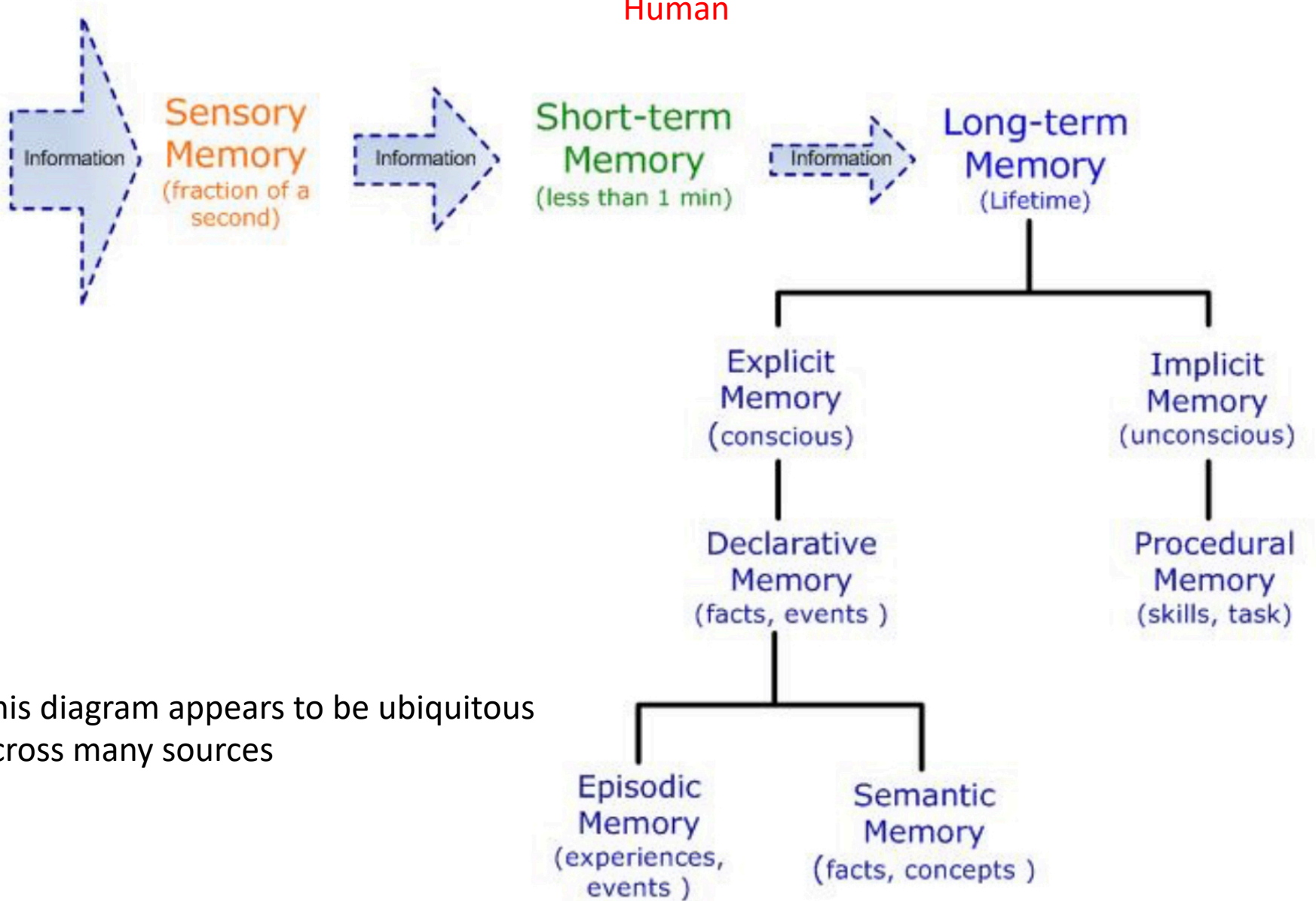
Capabilities of Cognitive Architectures

Pat Langley, John E. Laird, Seth Rogers (2009).

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 - Palmeri, T.J., & Cottrell, G. (2009).
 - JR Anderson (1991).
 - Tenenbaum, J. B., Kemp, C., Griffiths, T. L., & Goodman, N. D. (2011)
 - Christopher J. MacLellan, Erik Harpstead, Vincent Aleven, Kenneth R. Koedinger (2016)
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- emotional awareness and response

Types of Memory

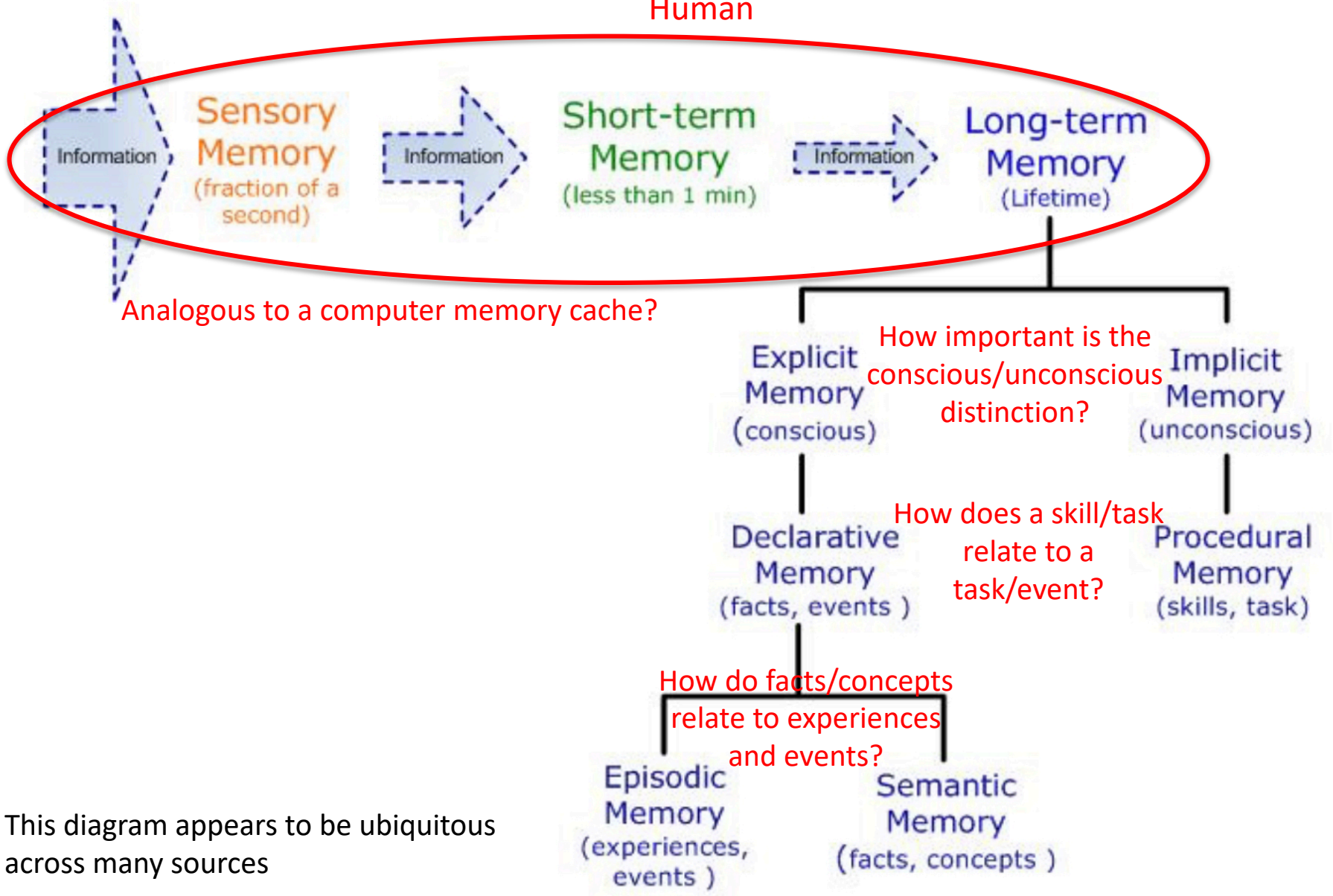
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Human



This diagram appears to be ubiquitous across many sources

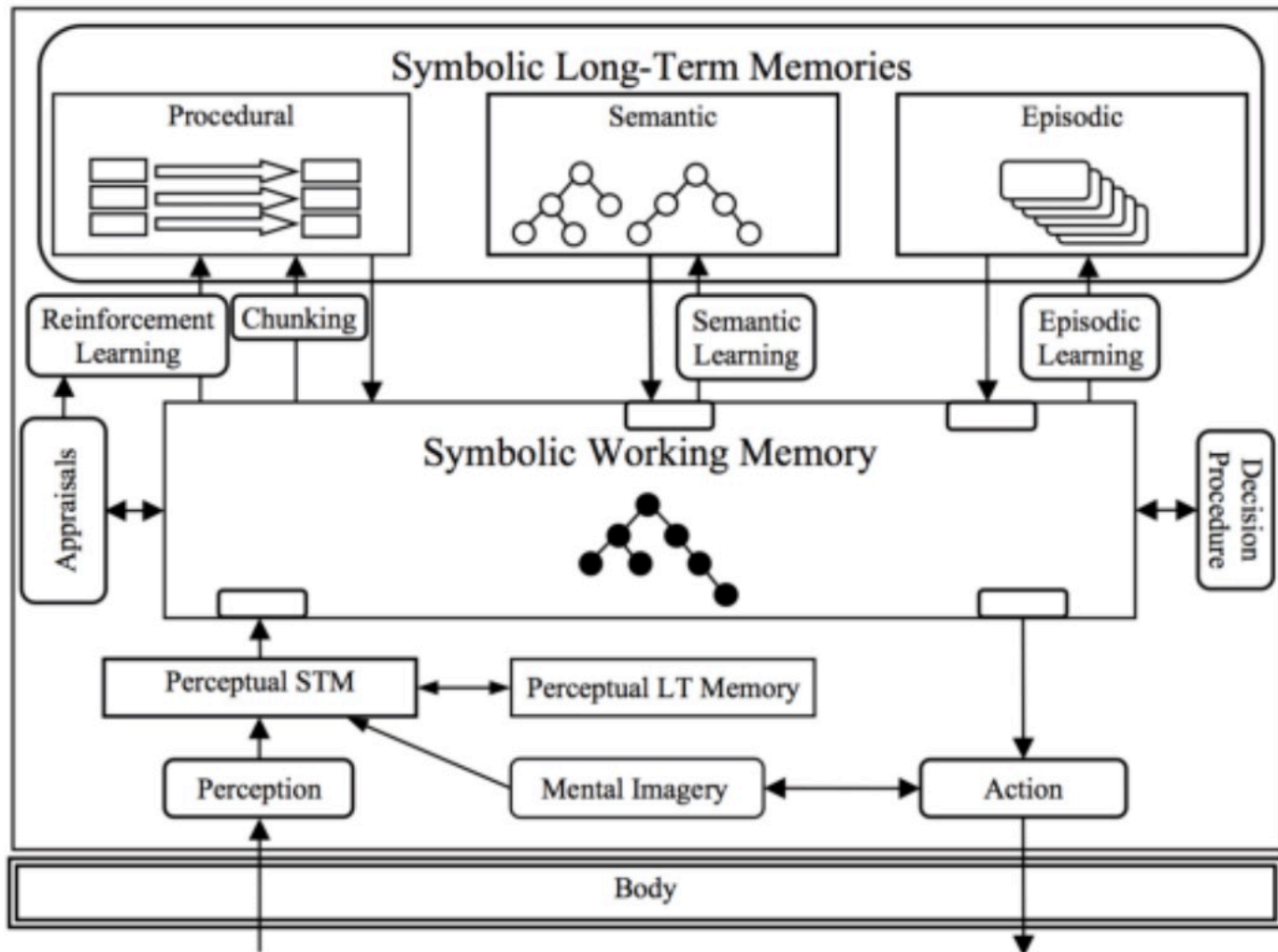
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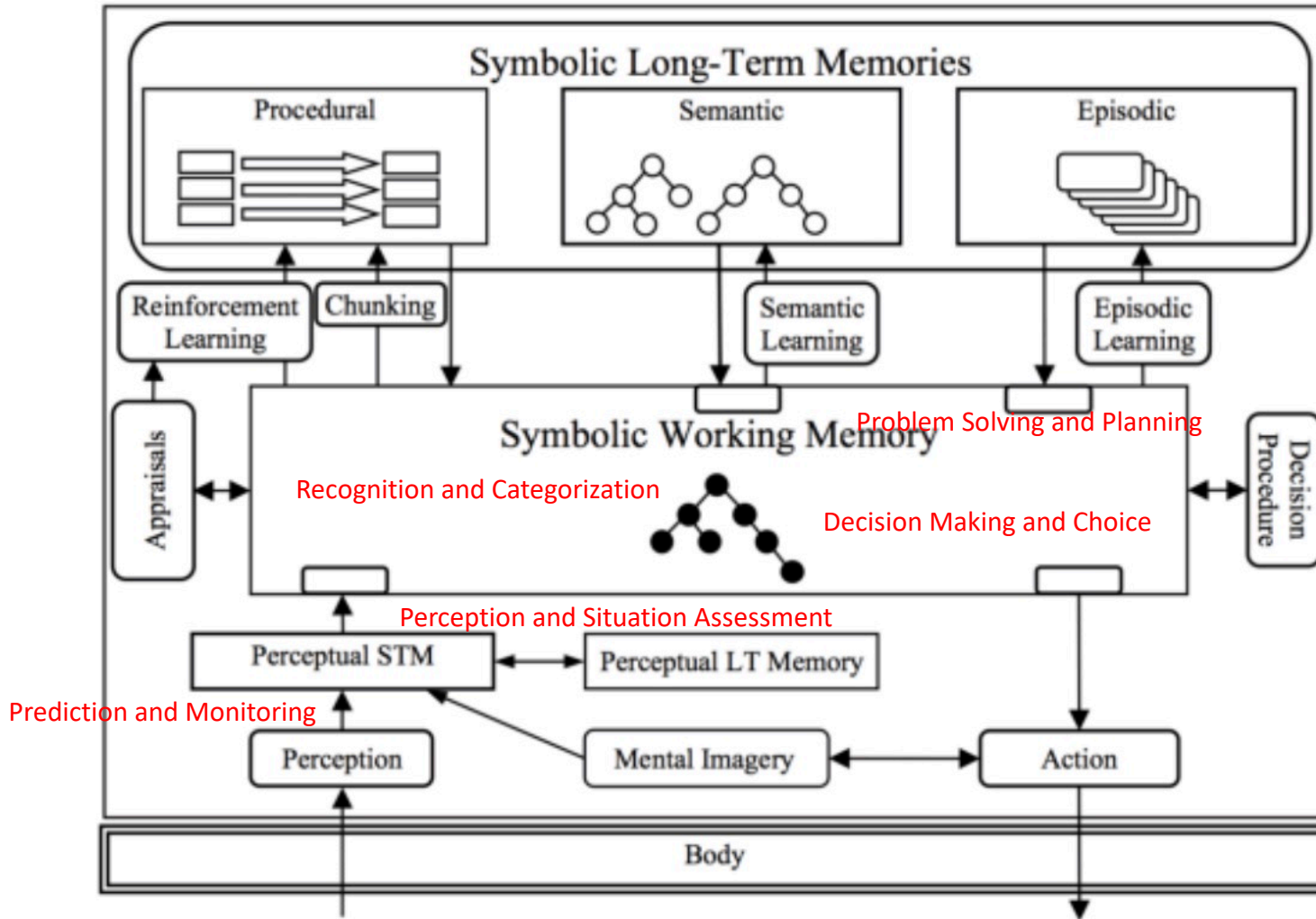
The SOAR Cognitive Architecture



The SOAR Cognitive Architecture

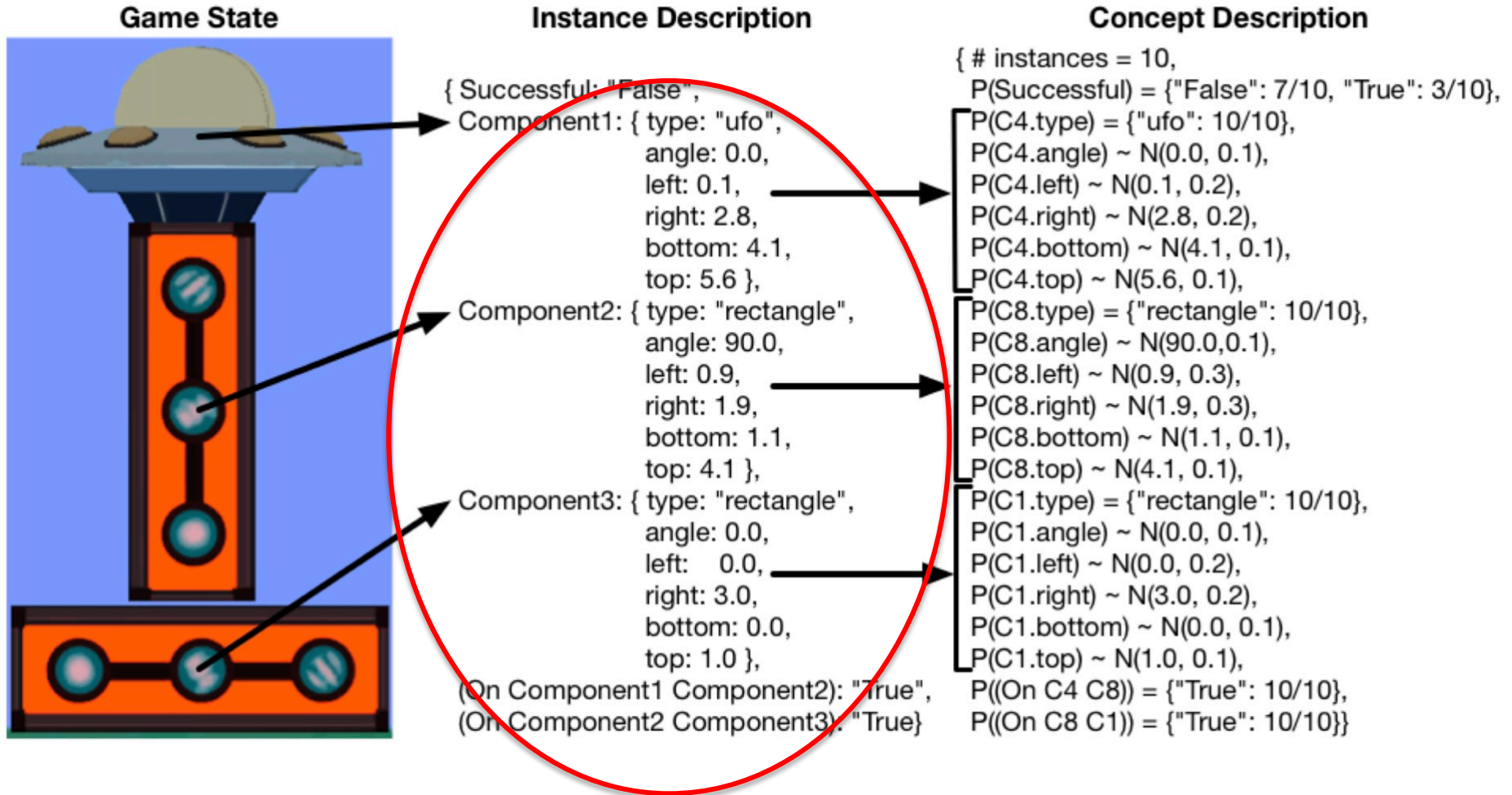
Can other memories, besides Semantic, be hierarchical?

Somehow these three memory types are translatable into a single type



Prediction and Monitoring

Can richer representation of concepts enable a simplification of a cognitive architecture?
 What is a minimalist architecture that is oriented towards optimal computational rather than natural cognition?



An episode?

From Trestle paper