

Designing Interactions for Two Minds with the *Real* Brain Model “MHP/RT”

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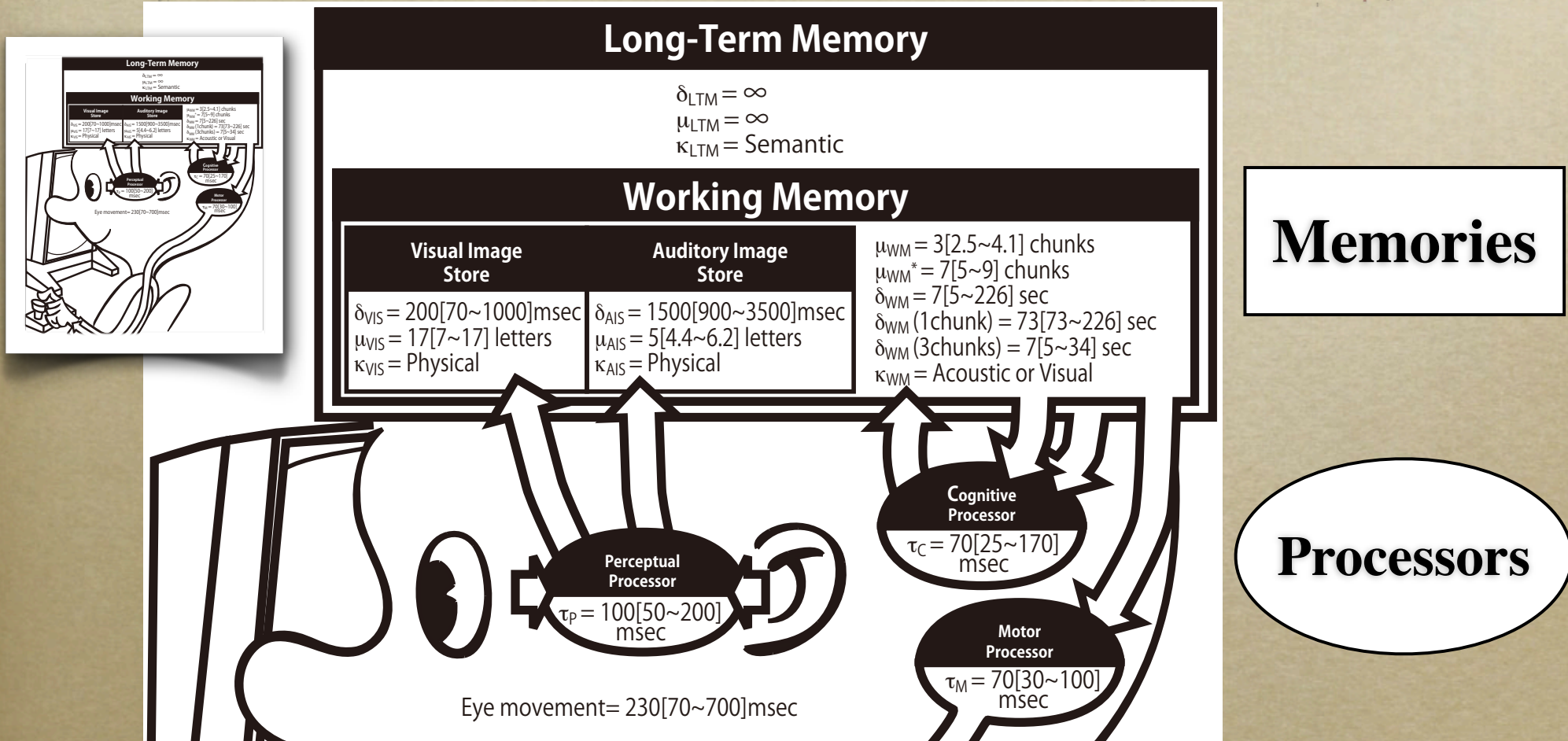
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T-Method

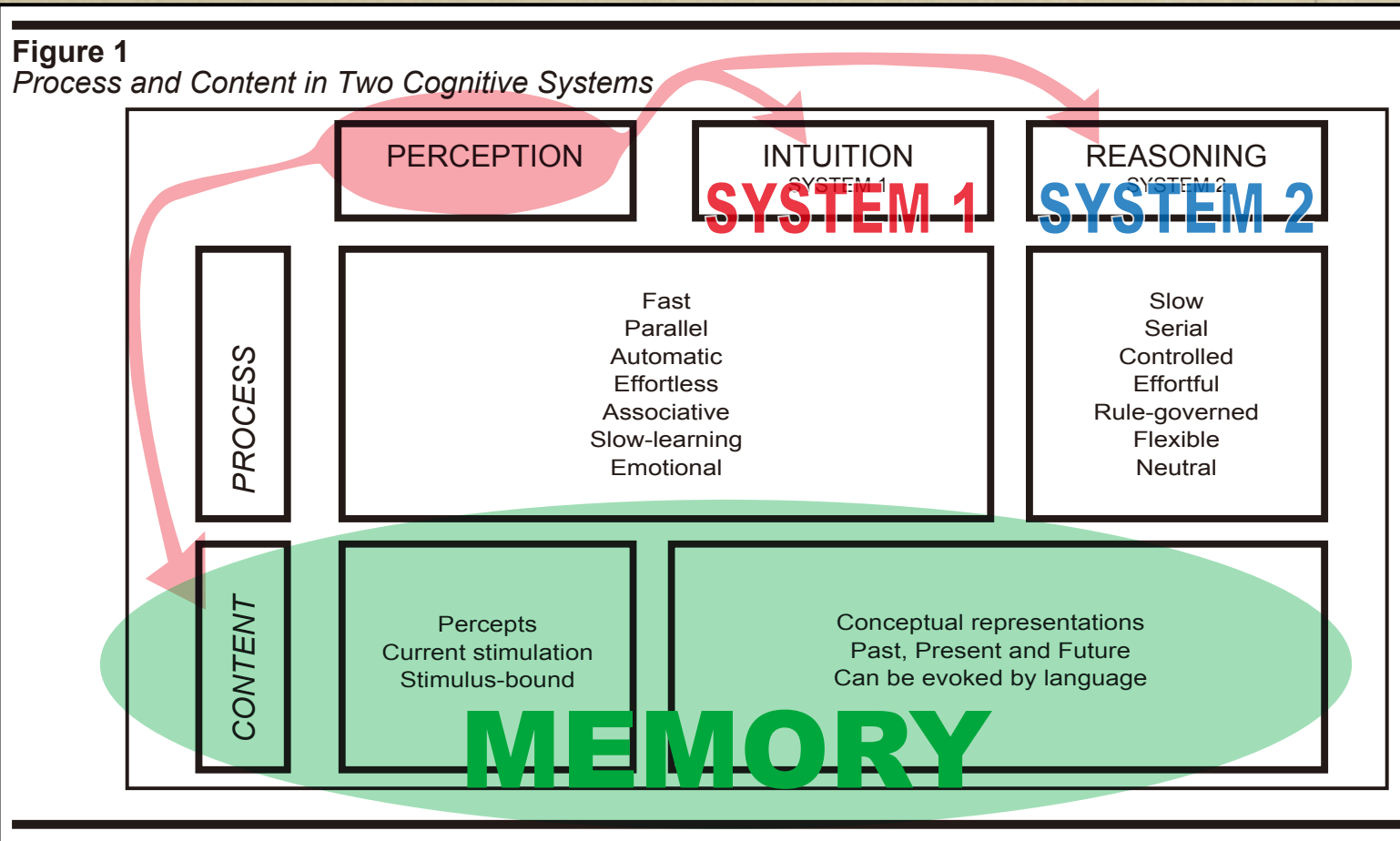
MHP: Model Human Processor

~ Excellent Approximation of IT Users ~



Card, Moran, & Newell, *The Psychology of Human-Computer Interaction*, Lawrence Erlbaum Associates, Hillsdale, NJ, 1983

Two Minds by Kahneman



Kahneman, A Perspective on Judgment and Choice, *American Psychologist*, **58** (2003), 697–720

Newell's time scale of action

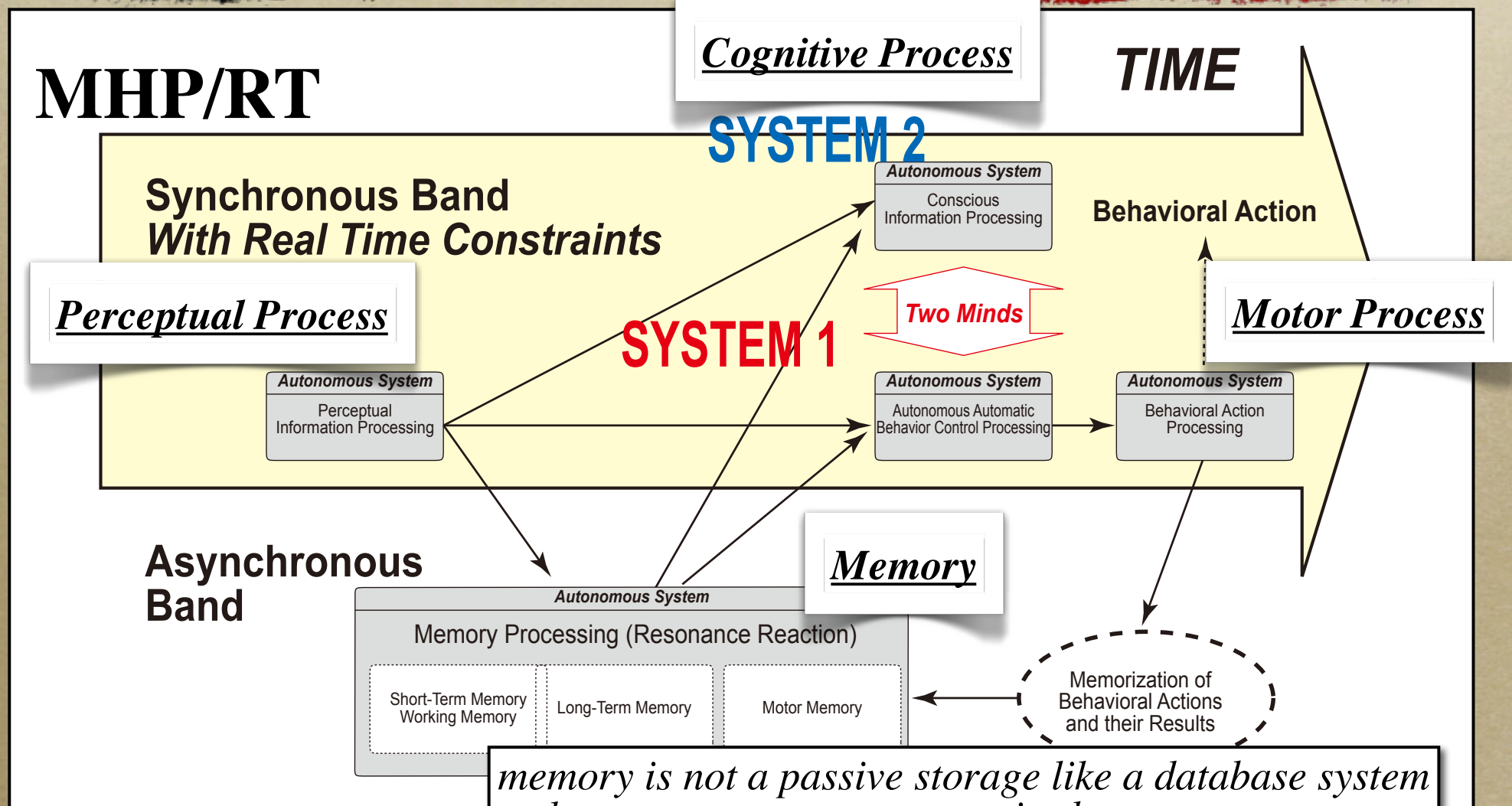
adapted from *Unified Theories of Cognition*, Harvard University Press, Cambridge, MA, 1990

<u>Time Scale of Human Action</u>			
<u>Scale (sec)</u>	<u>Time Units</u>	<u>System</u>	<u>World (Theory)</u>
10^7	months		Social Band
10^6	weeks		
10^5	days		
10^4	hours	Task	Rational Band
10^3	10 min	Task	
10^2	minutes	Task	
10^1	10 sec	Unit Task	Cognitive Band
10^0	1 sec	Operations	
10^{-1}	100 ms	Deliberate Act	
10^{-2}	10 ms	Neural Circuit	Biological Band
10^{-3}	1 ms	Neuron	
10^{-4}	100 μ s	Organelle	

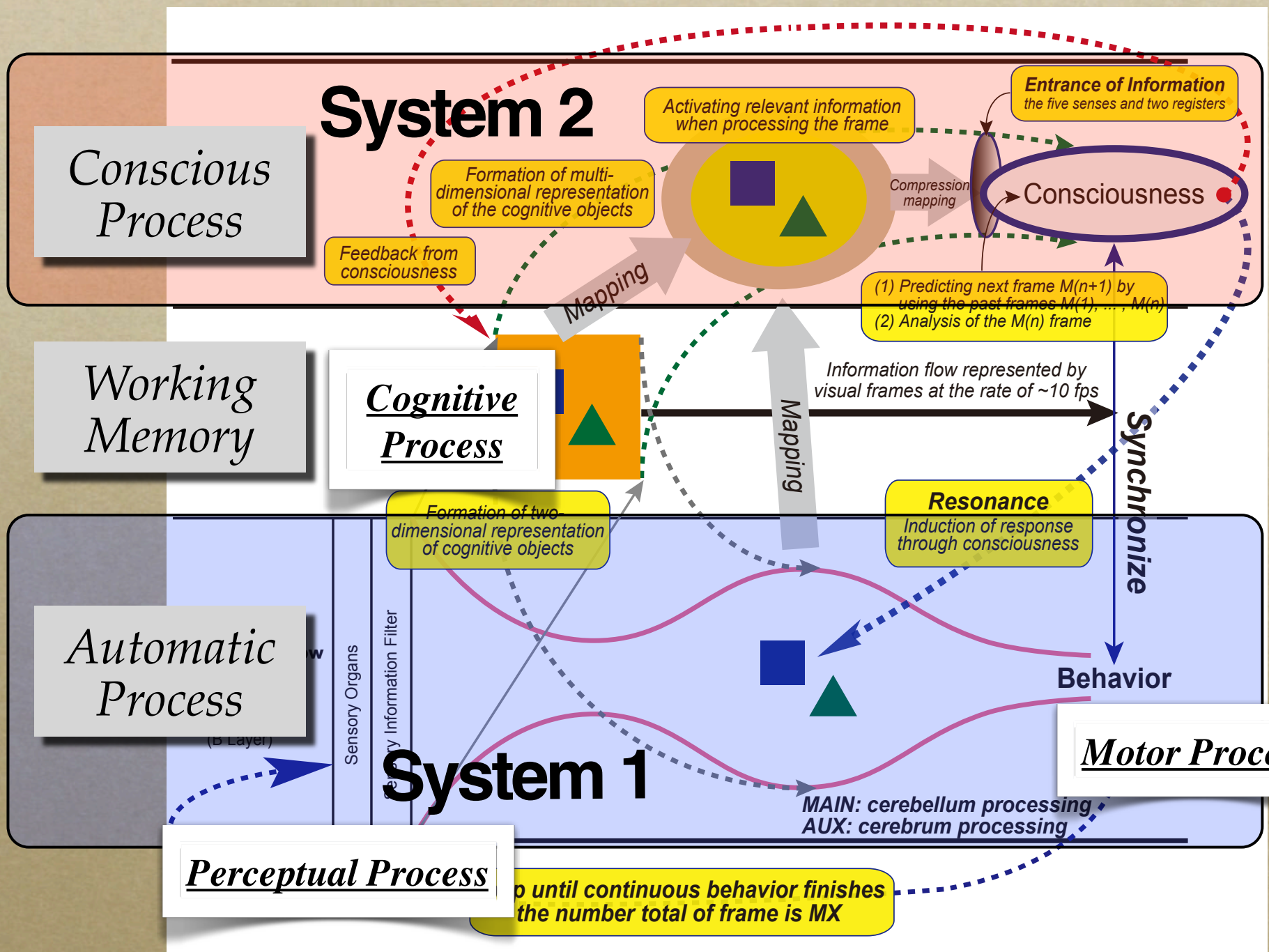
System 2

System 1

Kitajima and Toyota. (2012). Simulating navigation behaviour based on the architecture model Model Human Processor with Real-Time Constraints (MHP/RT). *Behaviour & Information Technology*, 31(1), 41-58.



*memory is not a passive storage like a database system that returns answers to queries but an autonomous system that returns answers as it likes -- **Resonance***



Four Processing Modes

Deliberate preparation for the future events by using mental models of the environment or past experience similar to the current situation.

Deliberate reflection of “the” experience of the event / making effort to integrate it into the current long-term memory

Decision Making

30% - Rational



Event at T



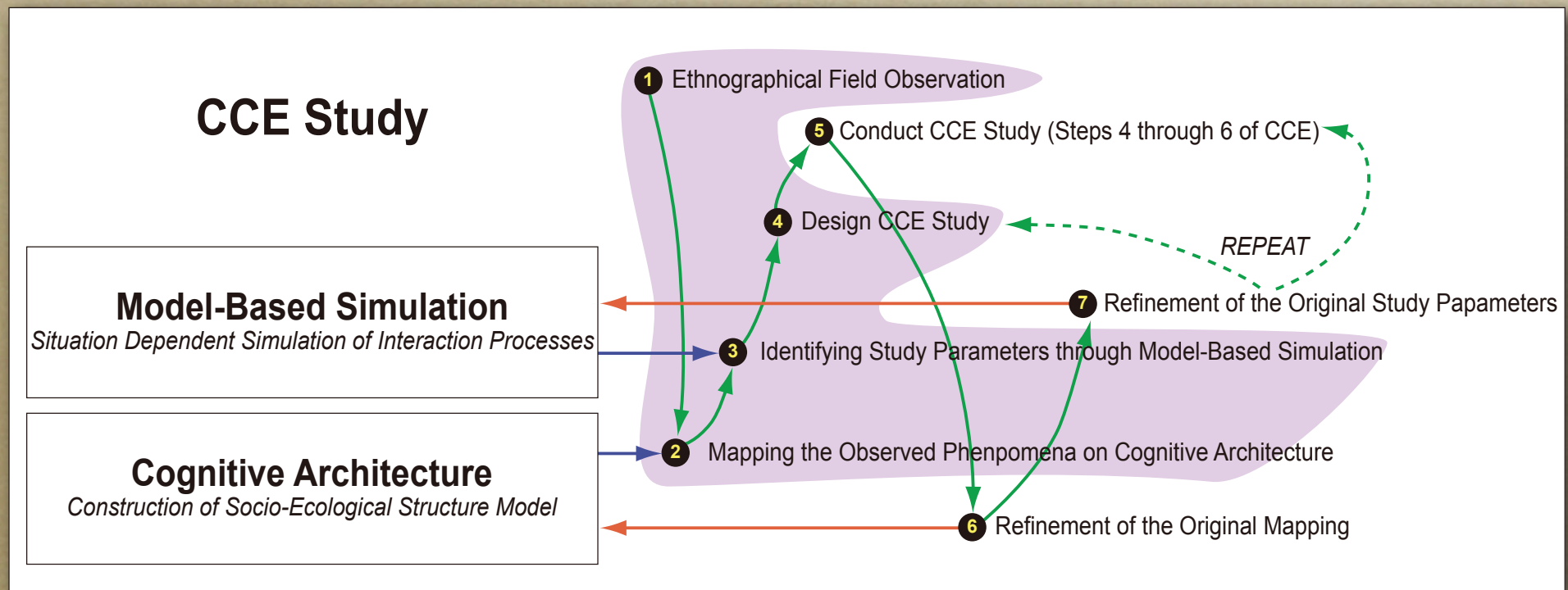
70% - Intuitive
Action Selection

Automatic activation of familiar/ routinized procedure for the future events

Automatic tuning of the memory by using the memory trace of the experience

CCE Steps and Brain Models

The purpose of a CCE study is to answer the study question in the form “what such-and-such people would do in such-and-such way in such-and-such circumstance?”



An Example of CCE study

~ Walking through Train Station by using Signs ~



Tokyo Station



CCE Studies We Have Done



- **Passengers who are trying to use signs to find their way at unfamiliar train stations**
 - Kitajima and Toyota. (2012). Simulating navigation behaviour based on the architecture model Model Human Processor with Real-Time Constraints (MHP/RT). *Behaviour & Information Technology*, **31**(1), 41-58. **Best Research Paper Award for its Japanese version**



- **Visitors' behavior at a hot-spa resort**
 - Kitajima, M., Tahira, H., Takahashi, S., & Midorikawa, T. (2012). Understanding Tourists' *in situ* Behavior: A Cognitive Chrono-Ethnography Study of Visitors to a Hot Spring Resort. *Journal of Quality Assurance in Hospitality & Tourism*, **13**, 247-270.
 - Kitajima, M., Tahira, H., & Takahashi, S. (2010) A Cognitive Chrono-Ethnography study of visitors to a hot-spring resort, Kinosaki-onsen. 5th World Conference for Graduate Research in Tourism, Hospitality and Leisure. **Best Research Paper Award**
- **Human navigators who are trying to provide useful information to drivers**
 - Kitajima, M., Akamatsu, M., Maruyama, Y., Kuroda, K., Katou, K., Kitazaki, S., Minowa, Y., Inagaki, K., & Kajikawa, T. (2009). Information for Helping Drivers Achieve Safe and Enjoyable Driving: An On-Road Observational Study. in *Proceedings of the Human Factors and Ergonomics Society 53rd Annual Meeting 2009 HFES2009*, 1801-1805.
- **Watching short films at a theater**
 - Kitajima, M., Toyota, M., Yoshino, K., Matsumoto, S., Tahira, H., & Miyaji, R. (2011). Relationship Between Episodic Memory Formation and Two Minds. in *Proceedings of the 33rd Annual Meeting of the Cognitive Science Society*, 2095.