

Self-Motivated Hierarchical Sequence Learning

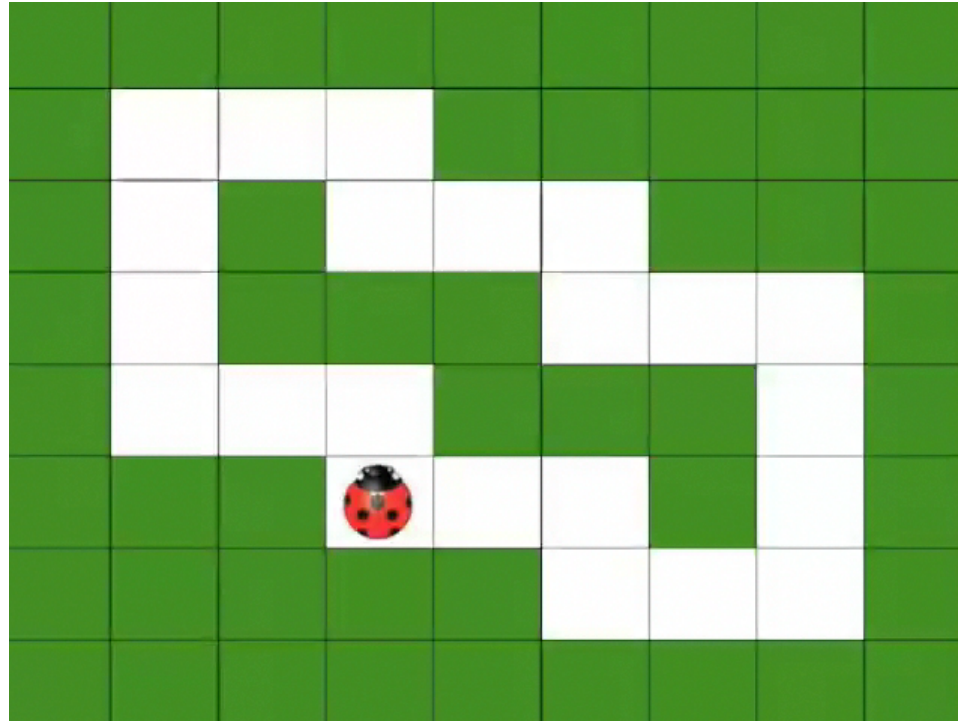
Soar Workshop
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Olivier L. Georgeon & Frank E. Ritter
olg1@psu.edu
Pennsylvania State University

Outline

- Update from Soar Workshop 2009
 - A Soar Model of Bottom-Up Learning from Activity
- Experiment
 - Demonstration
 - Algorithm
- Results
 - Developmental approach to cognition
 - Soar for something else than problem solving
 - Future work

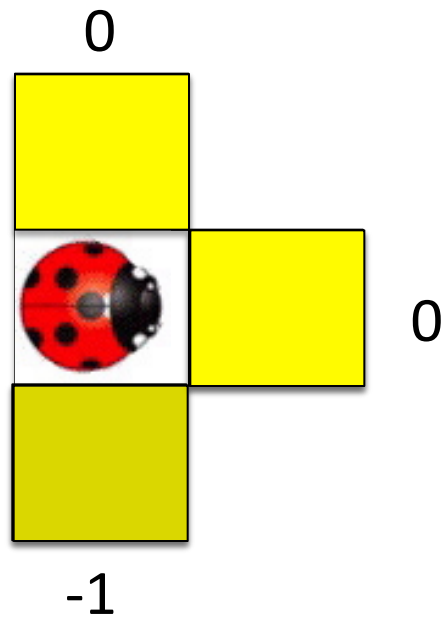
This is not a maze



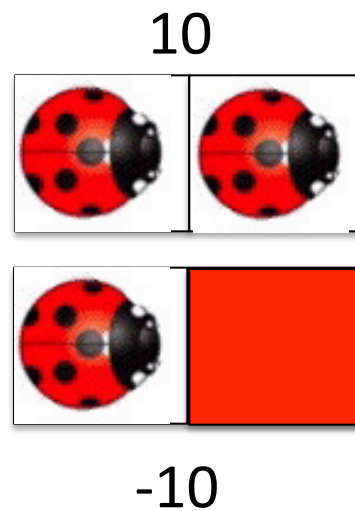
... this is a hierarchical sequence

This is not perception

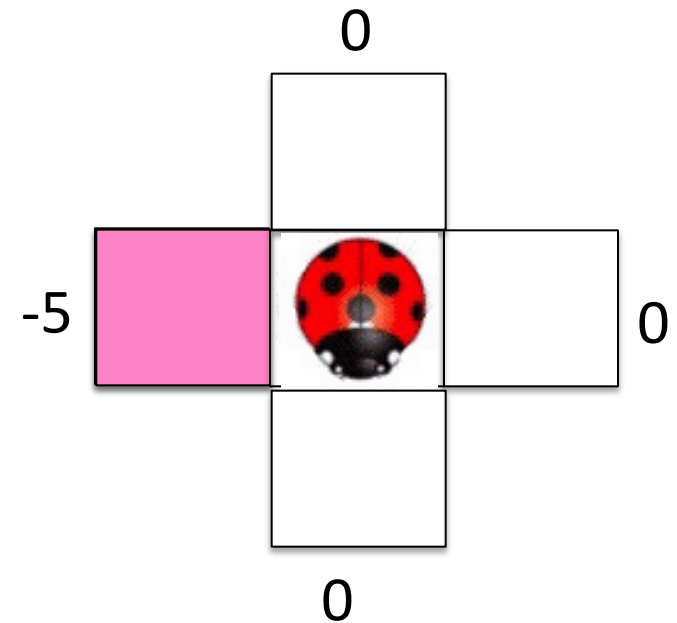
Touch:



Move:



Turn:

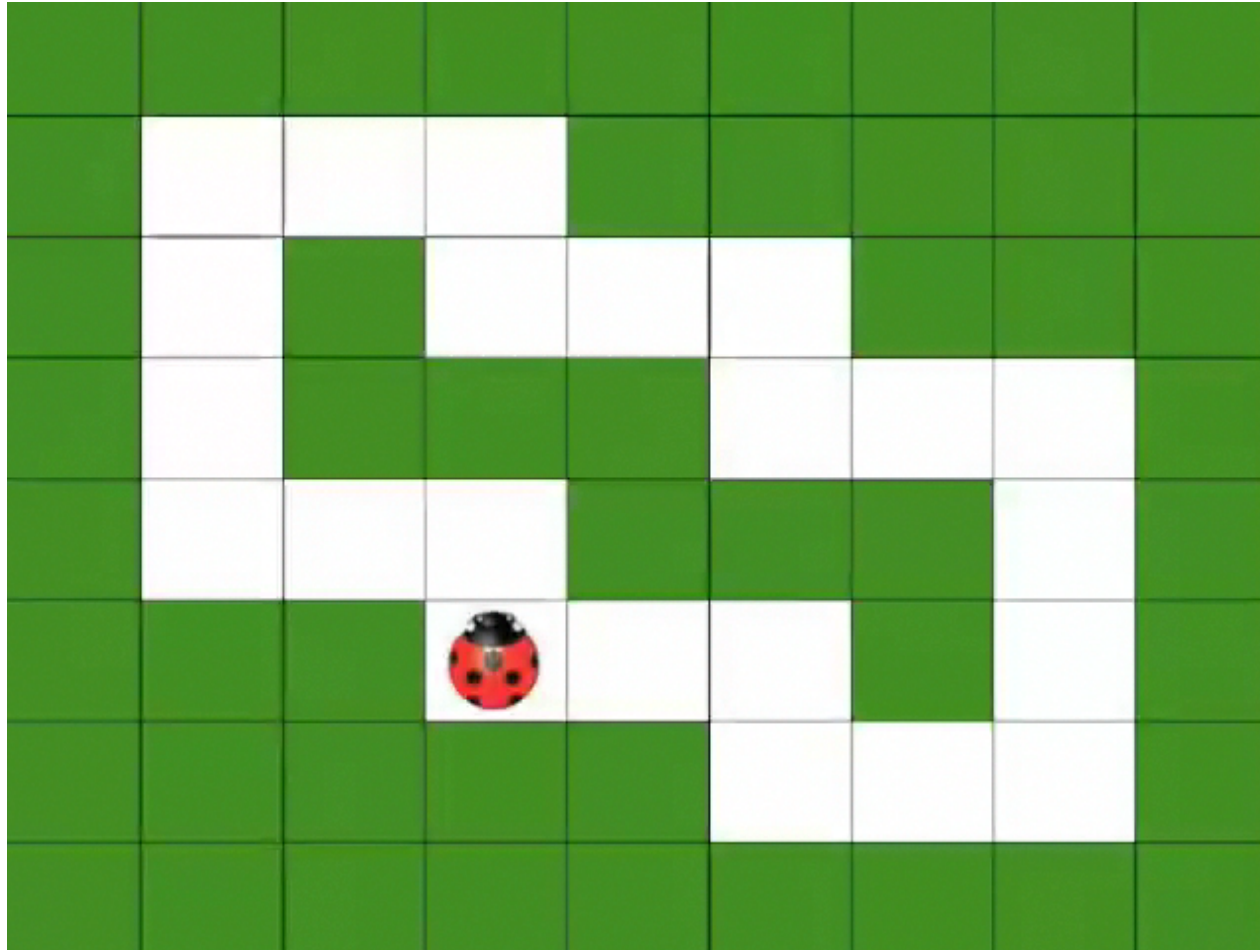


... this is sensorimotor schemes (Piaget, 1937)

This not about reward

- Impetus = expectations it works * Satisfaction
 - Bumped episodes (n) * Satisfaction bumping (-10)
 - + Moved episodes (m) * Satisfaction moving (10)
 - = impetus to try to move
- This is self-motivation
 - In-born predilection for sensorimotor schemes
 - Pre-defined impetus
 - Self-organization of behavior

Elaboration of behavior



Touch:

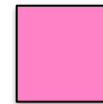


Bump:



Ouch!

Rub:

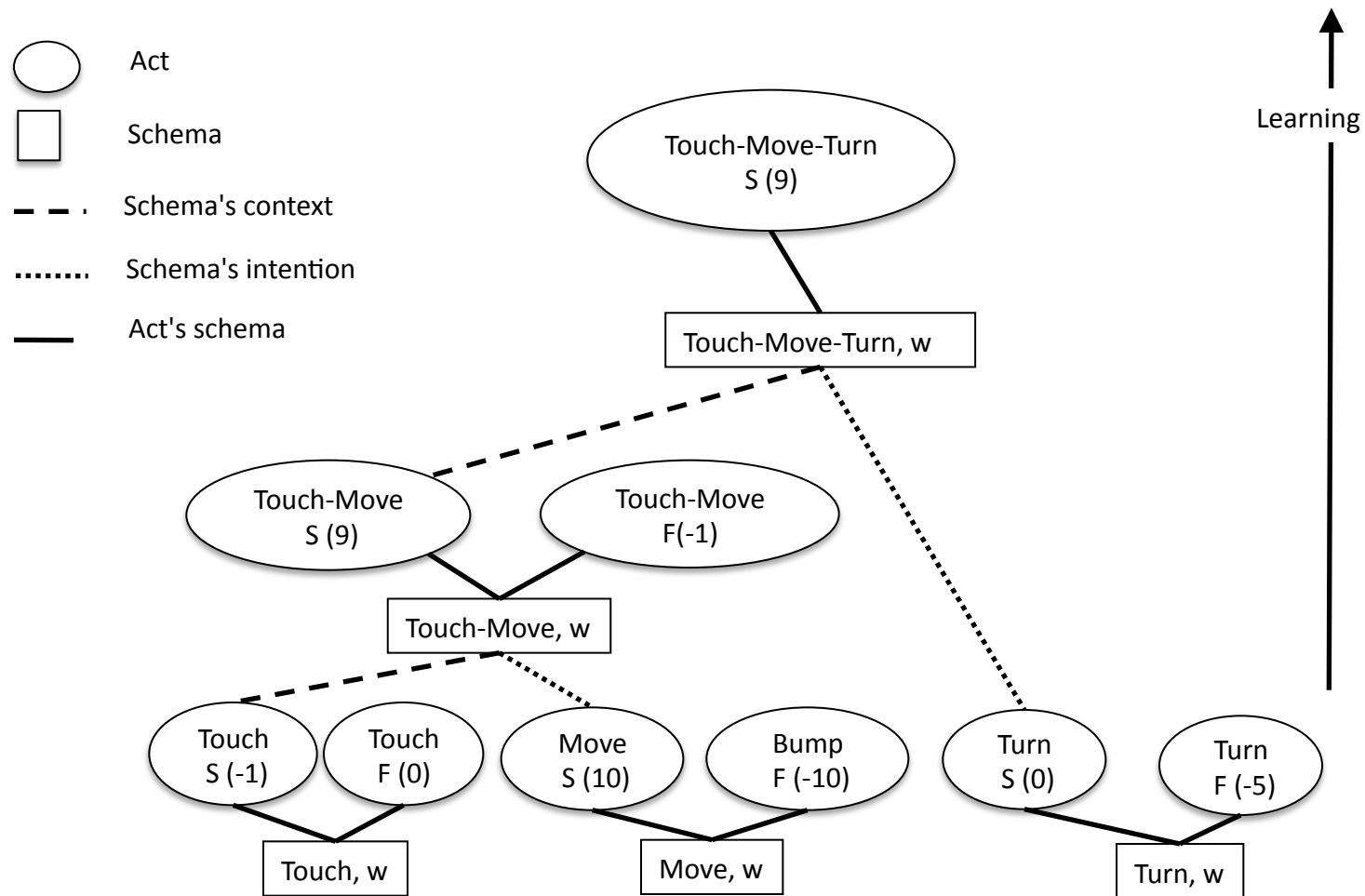


Surprise:

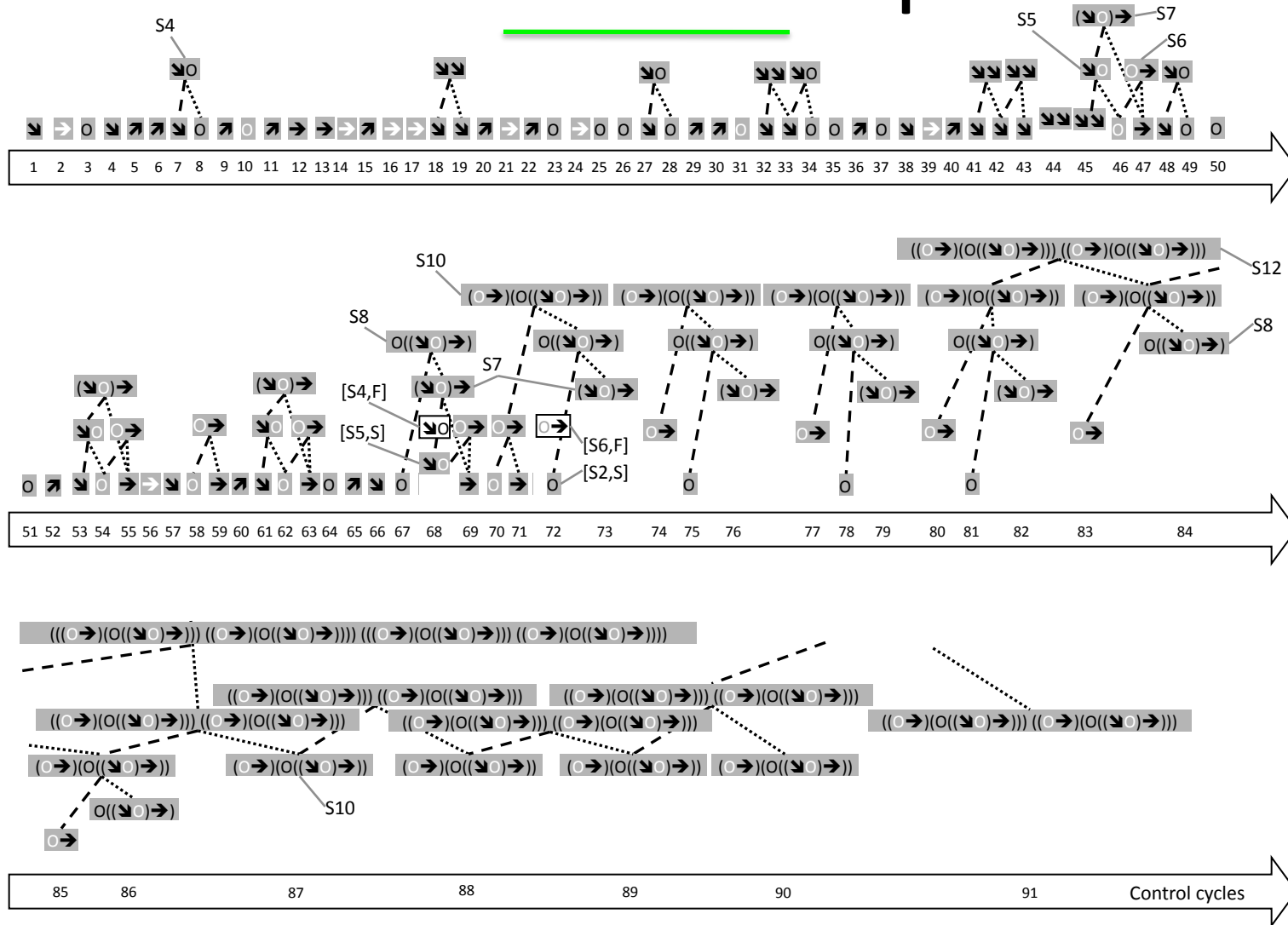
Oh!

[Link](#)

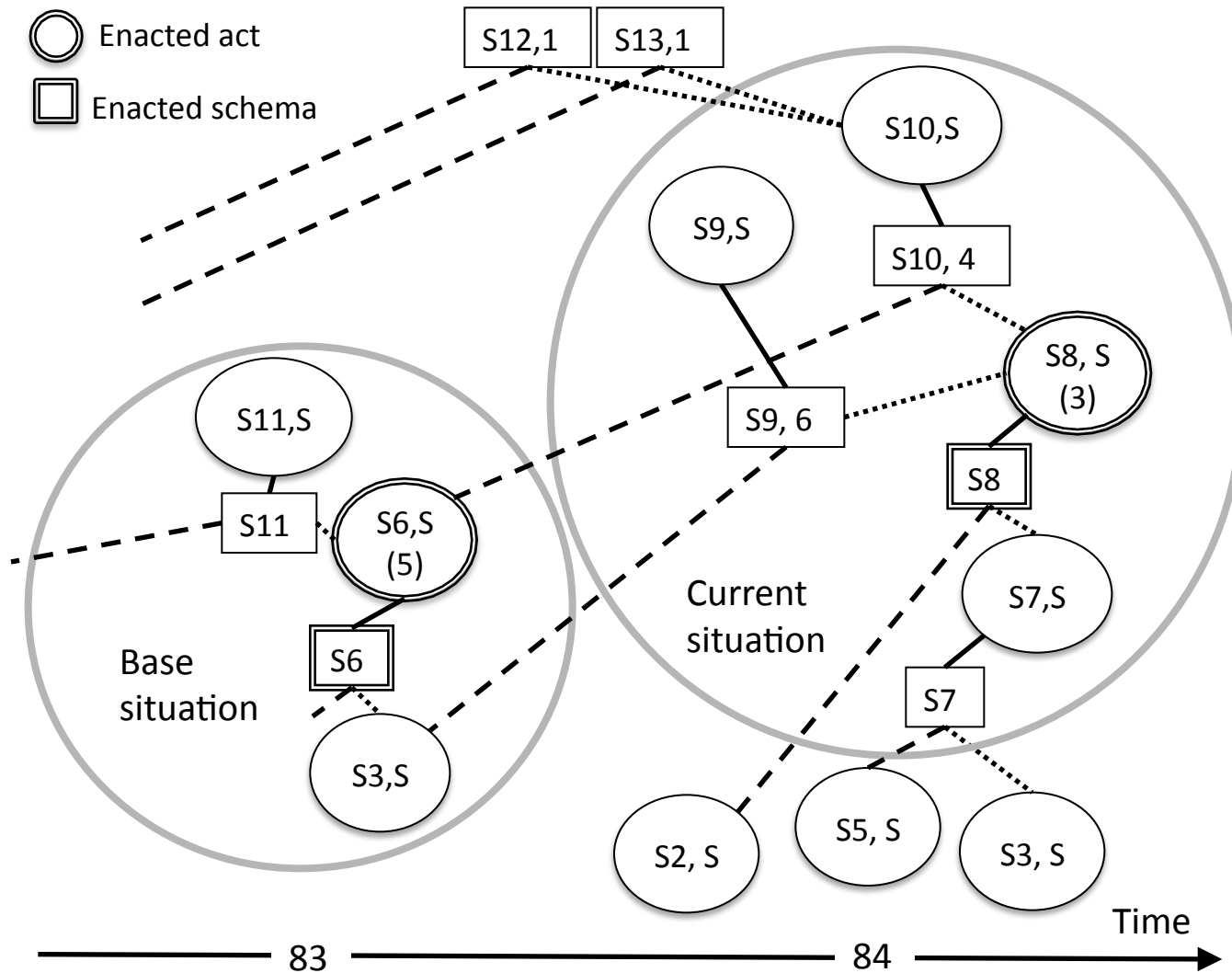
Learning Mechanism



Construct and test episodes



Anticipative Situation Awareness





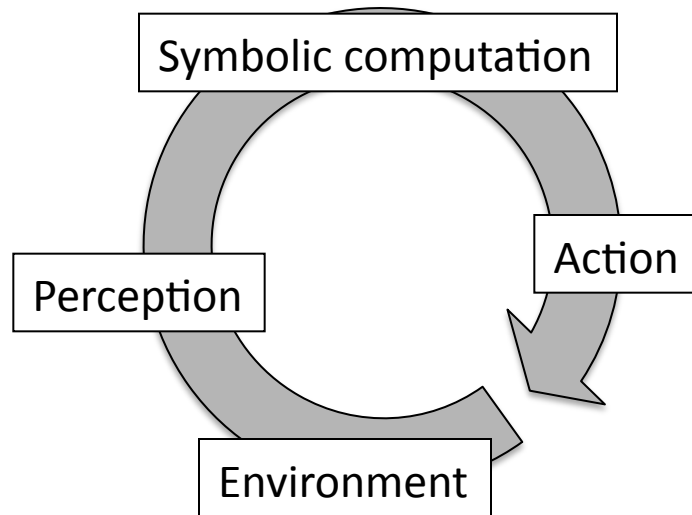
Results

- It learns to increase its satisfaction/step
- It learns to perceive its environment
 - No pre-defined perceptual buffer
 - Pragmatic understanding of perception
- It constructs a situation awareness
 - Includes anticipation and affordances
- It constructs temporal episodes
 - Episodic memory with temporal patterns

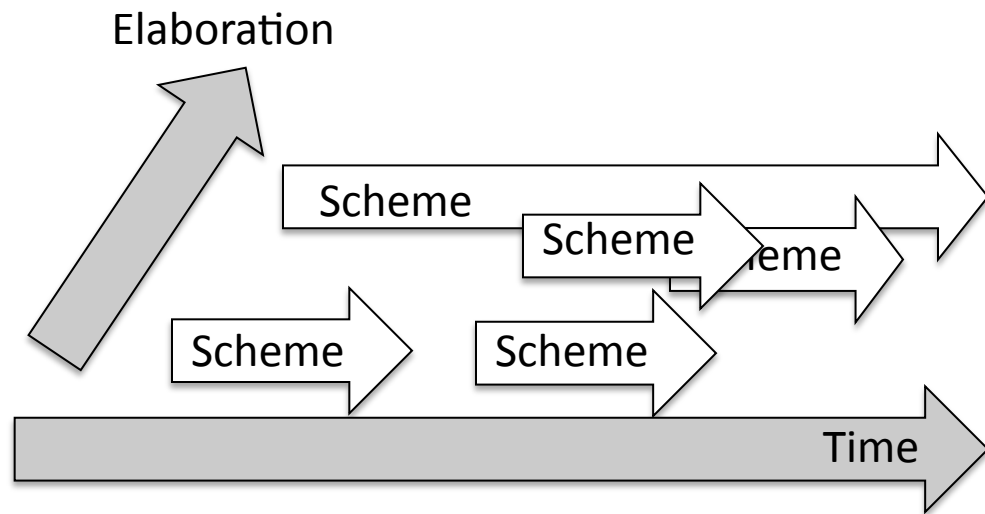


Alternative view of cognition

From:



To:



Keeps perception and action unified (plenty of authors)
Grounds meaning in activity (Harnad, 1990)
Opens the way to second-stage learning (Piaget, 1937)



Weaknesses

- It is very low level
- Long way to go
- Unusual usage of Soar
 - Soar helps a lot
 - Graph processing, valued preference mechanism...
 - But
 - Soar is optimized the other way around
 - Maybe use semantic memory to store episodes?

Future work

- Gradually increase complexity
- Support distal perception
- Support distal/spatial representations
- Support internal simulations of course of action
 - Based on learned ability to predict and on action inhibition
 - Would (we hope) lead to the emergent autonomous construction of symbols
- Blog: <http://e-ernest.blogspot.com/>