

T12

Cognitive Systems

2020 edition

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PSI 3560 – COGNITIVE SYSTEMS

class T12

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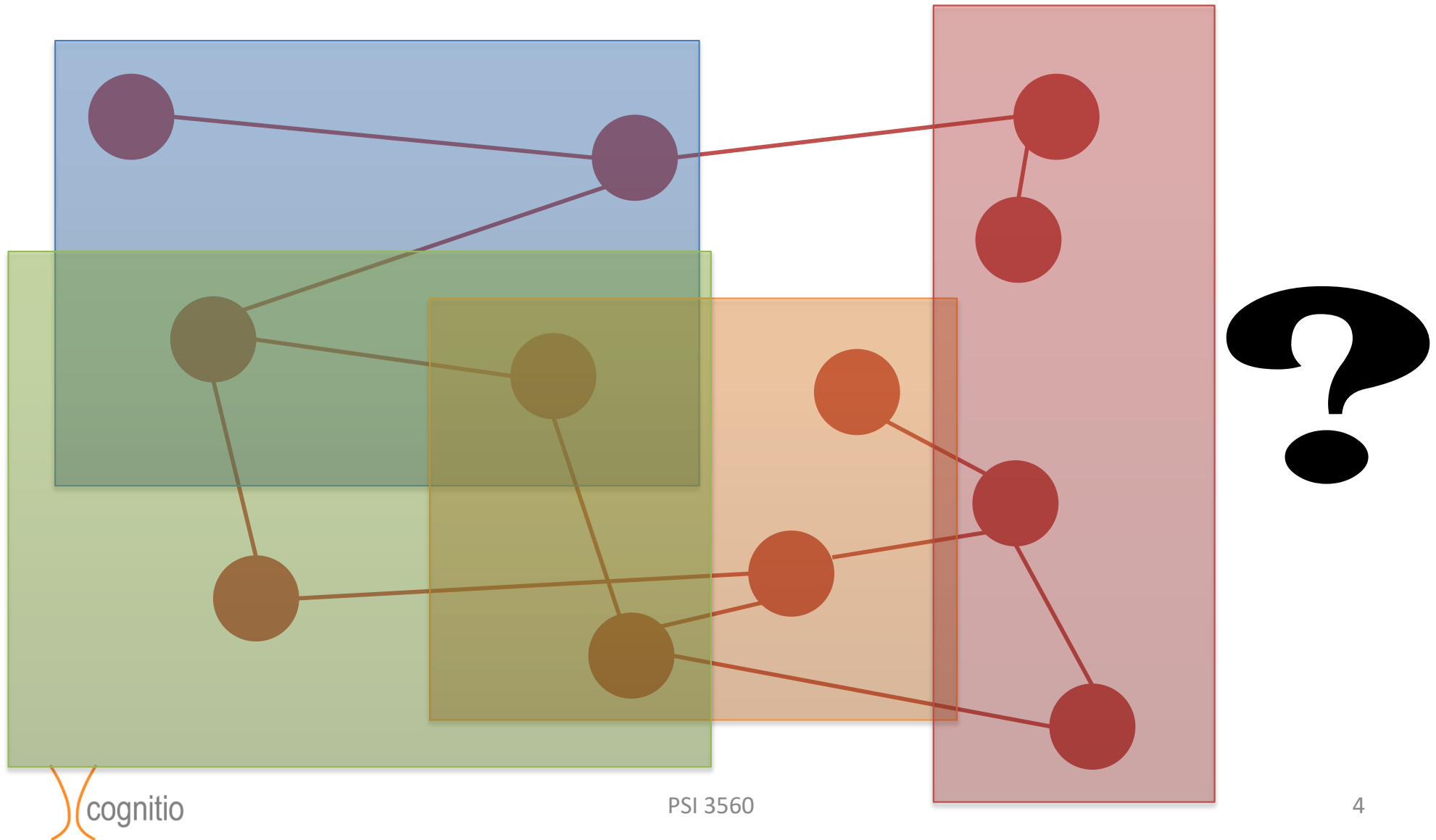
COGNITIVE ARCHITECTURES

Cognitive Architectures, Autonomy, Development, AMD

Session T12

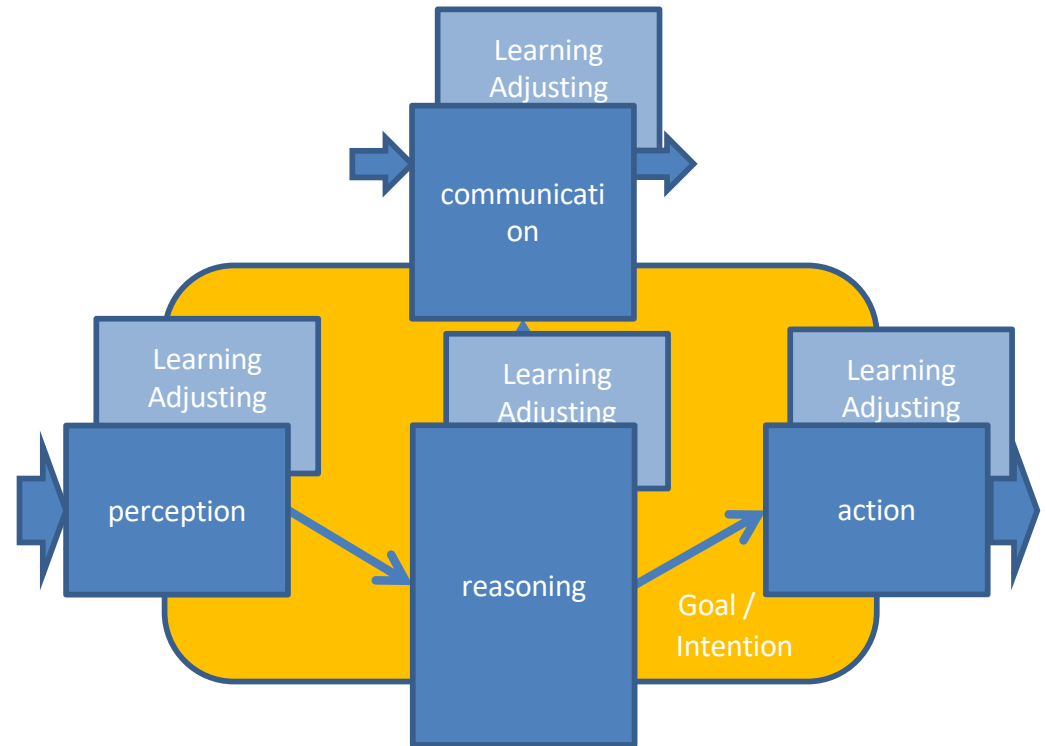
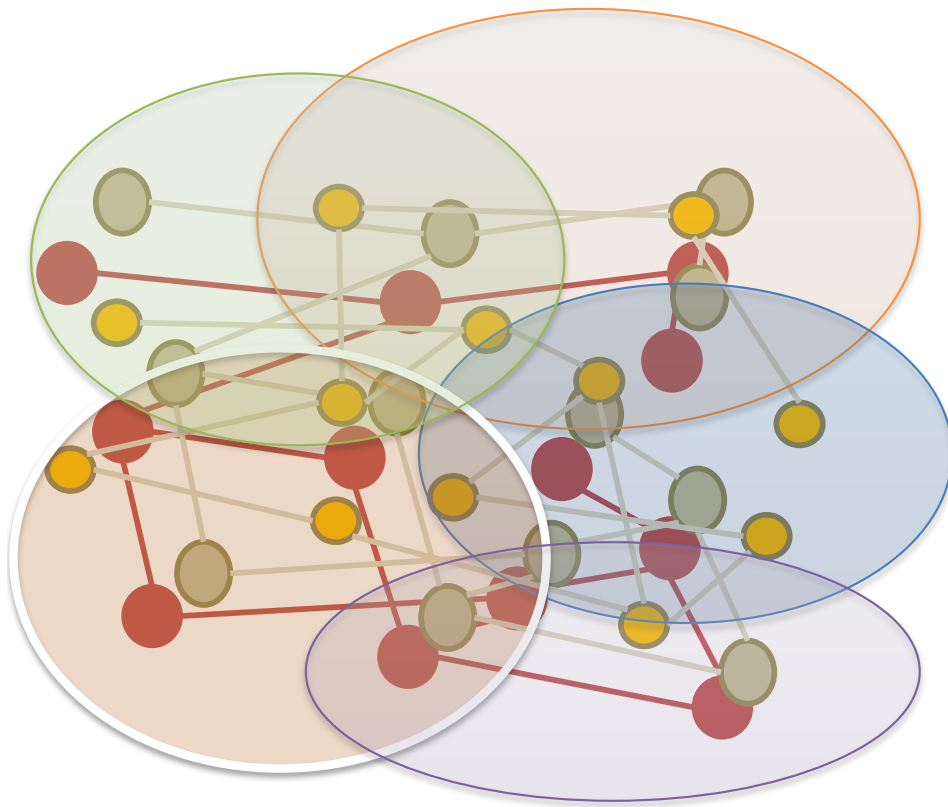
Cognitive Architecture

how are they clustered?



Cognitive Architecture

how are established the relationships?



Cognitive Architectures

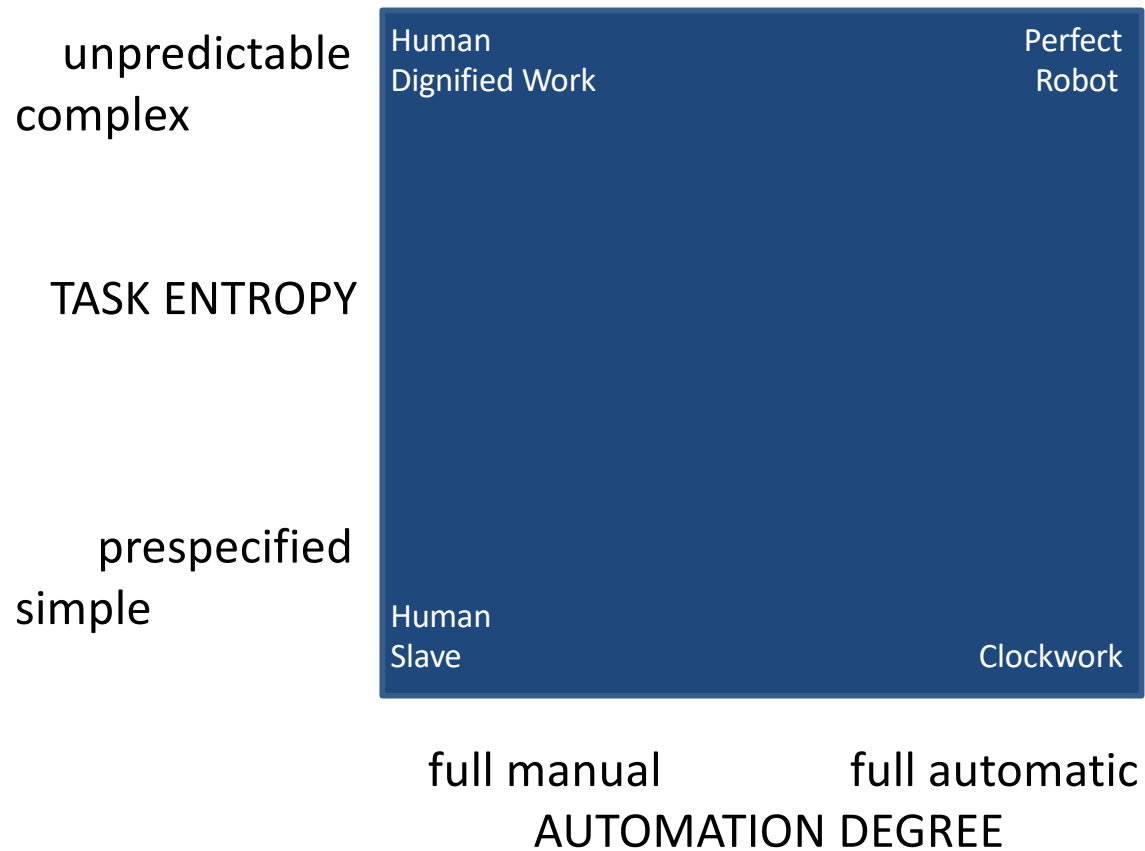
In the quest of proper ways to conceive and design cognitive architectures

It is not just creating one CogArch

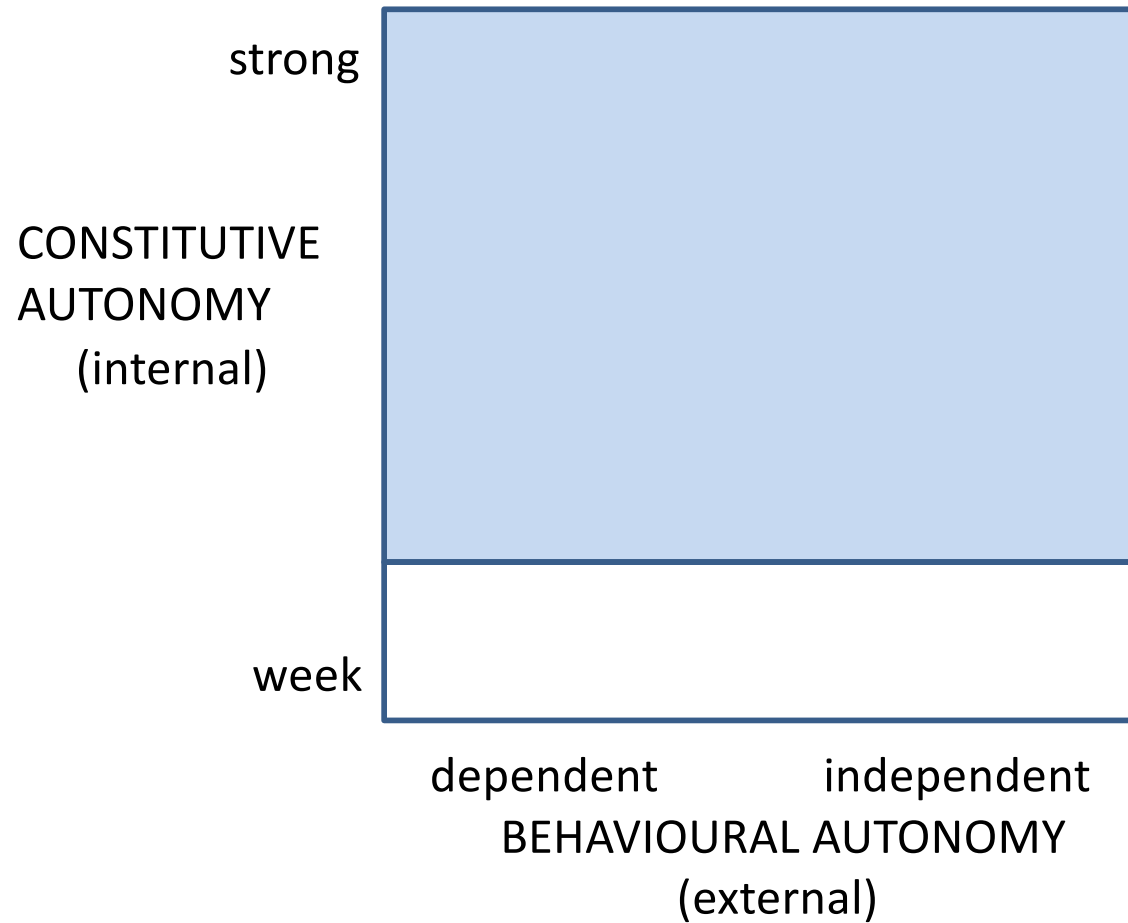
But trying to realize what should be addressed in this process

Autonomy is a key issue!

Autonomy



Autonomy



Autonomy

1. The human does the whole job up to the point of turning it over to the computer to implement.
2. The computer helps by determining the options.
3. The computer helps determine options and suggests one, which the human need | not follow.
4. The computer selects action and the human may or may not do it.
5. The computer selects action and implements it if the human approves.
6. The computer selects action, informs the human in plenty of time to stop it.
7. The computer does whole job and necessarily tells the human what it did.
8. The computer does whole job and tells the human what it did only if the human explicitly asks.
9. The computer does whole job and tells the human what it did and it, the computer, decides he should be told.
10. The computer does whole job if it decides it should be done, and if so tells the human, if it decides he should be told.

David Vernon. Artificial Cognitive Systems (MIT Press) Kindle.

Autonomous Mental Development

Development

Multi-layer / multi-step procedure

Hierarchical

as proposed by Piaget

Sensory-Motor development

Sensors & Actuators are available

We need to find out

how they can be connected (sensors & actuators)

how to use both in a meaningful way – identifying an identity

Finding some equilibrium?

Grounding problem

developing internal structures

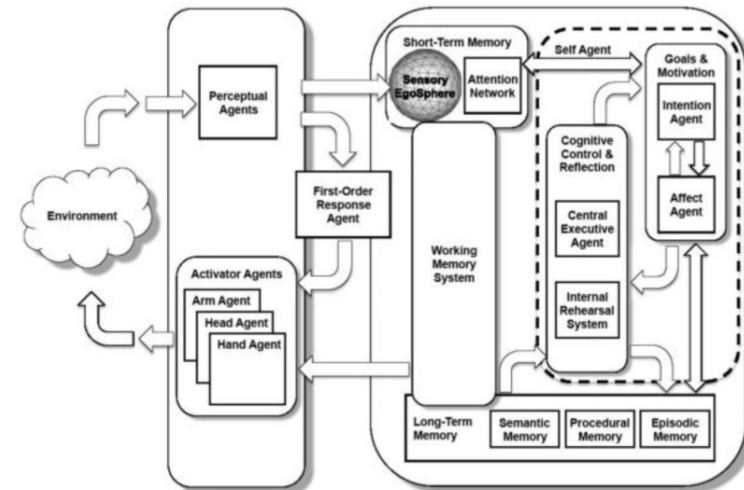
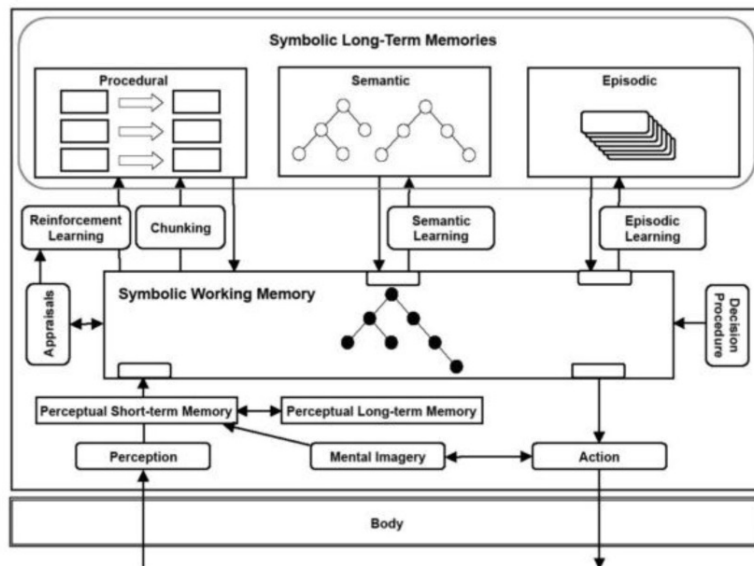
establishing contact with external world

Cognitive Architecture

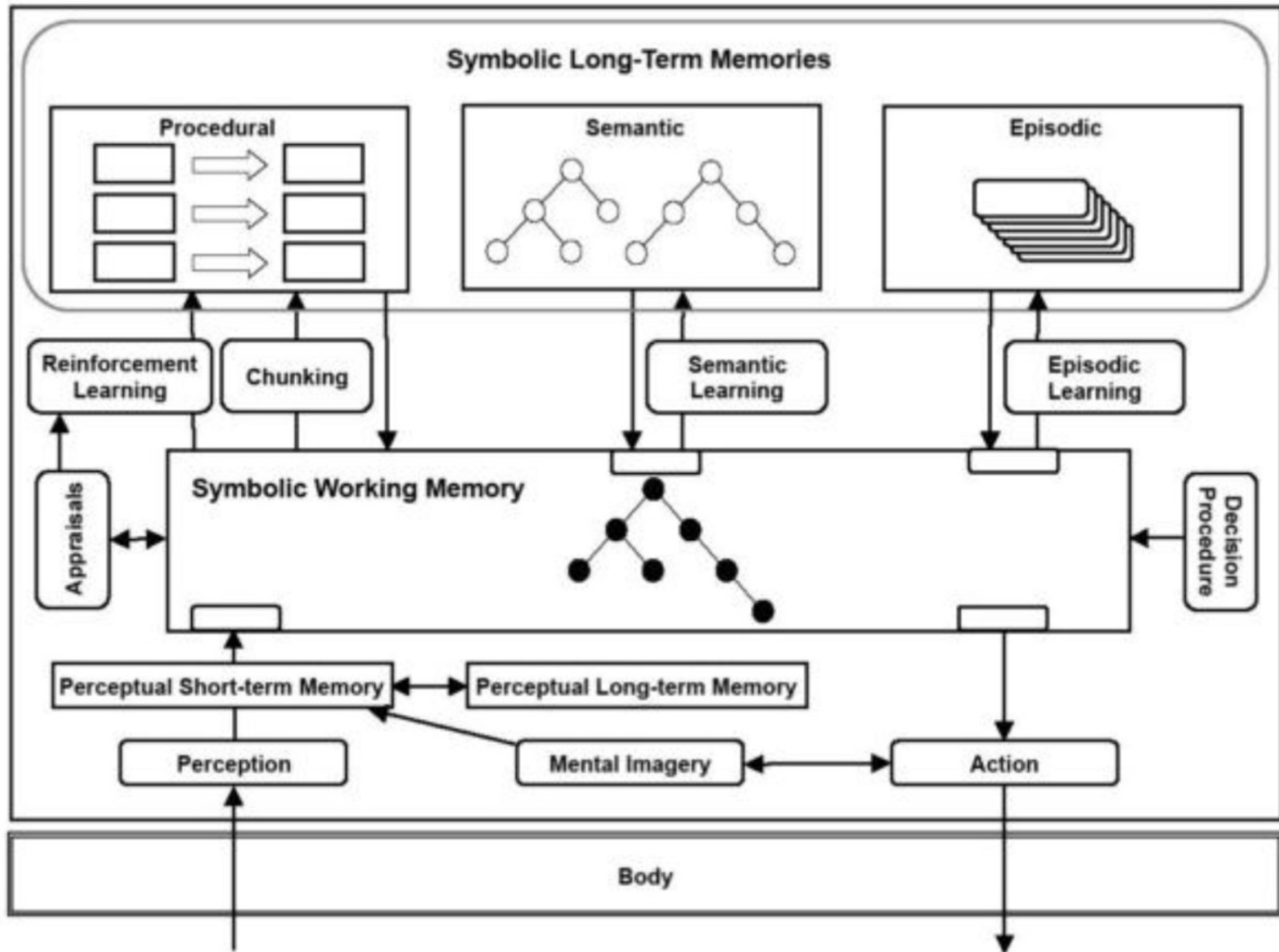
- A cognitive agent should be more than just able to reason
- Should it be able also to comprehend? to wish? to create? ...
- On which extension? how deeply?
- Do these properties appear in the CogArchs?

Cognitive Architectures

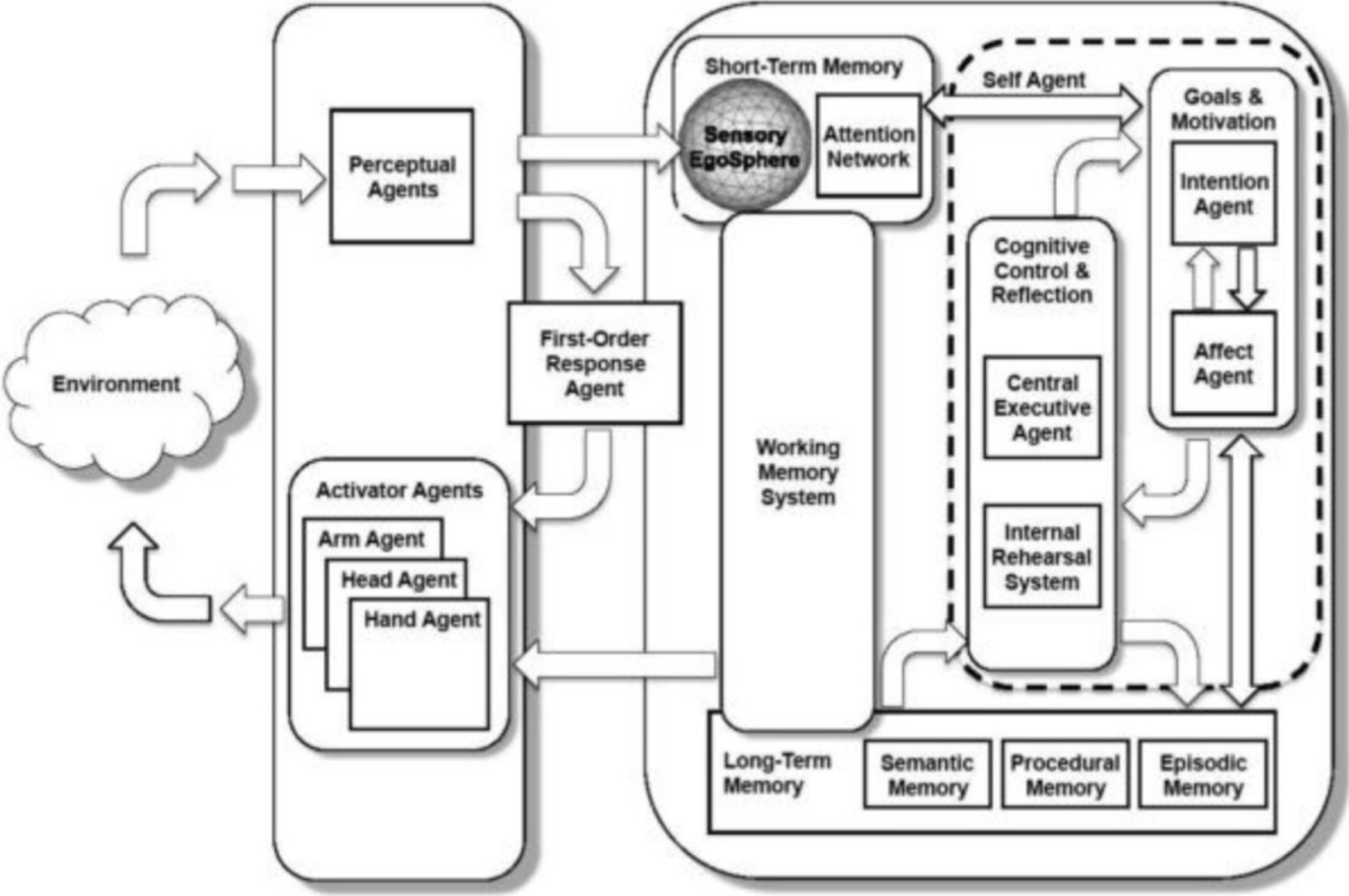
SOAR (cognitivism) & ISAC (hybrid)



Cognitive Architecture: Soar



Cognitive Architecture: ISAC



Cognitive Architecture

- Centralized versus Distributed Principles
 - On such complex systems multiple processes run simultaneously
- Orchestration (coordination): some way to handle and maintain the order among many distinct potential tasks
 - Struggling to emerge and to take control
 - But it should emerge as a natural way to handle disputes among them

Cognitive Architecture

- **Consciousness**
 - Just an impression?
 - Some experiments induced this
 - Decisions are taken by the central nervous system (our brain) before we become aware of them (notice them consciousness)
 - Multiple micro subliminal tasks are taking control
 - Some may need more processing power
 - Require stronger collaboration / solo control of brain tissues for some short period of time
 - When this happens we become aware of them
 - Subjective features – self

Cognitive Architecture

- Automated or Conscious
 - Automated processes run in background
 - Using different parts of the brain simultaneously
 - Parallel
 - Attention processes run in foreground (conscious)
 - Require larger parts of the brain (unity)
 - Sequential

Cognitive Architecture

- How should it be possible to be constructive?
 - Building concepts on top of simpler concepts
 - Refining structures (as woxbot FSM)?
- How to build / develop plans?
 - Testing / Evaluating combinations?
- Perhaps observing your own way of developing / refining ideas!
 - How to assign this into an artificial system?

Cognitive Architecture

- Let's design our own architecture?
- Let's discuss this process!
- A joint task!
- With contributions from all!

This is all for today.

See you next week !