COGNITIVE 2020

Symbiotic Thinking
… for Cognitive Modeling as well

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Topics of Interests:

- ❑ Cognitive and computation models
- ❑ Human reasoning mechanisms
- ❑ Modeling brain information processing mechanisms
- ❑ Design of complex recursive problem-solving systems
- ❑ Complex systems design methodologies and techniques
- ❑ Foundations for general systems science
- ❑ Program synthesis of recursive programs from formal specifications in incomplete domains

Goal

"Construct a scientific model of the human brain that solves all the questions and problems related to
a *formalization of the brain mental processes*"

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Impossible (?)

- Paradigm
- Tool
- Systemic Structure

Working hypothesis

human mental processes:

a problem-solving system

Paradigms

- **Modular**
- **Global**

Paradigms

- **Modular**

∀Problem ∃System
(The System solves the Problem). **(P1)**

- **Global**

Paradigms

- **Modular**

∀Problem ∃System
(The System solves the Problem). **(P1)**

- **Global**

∃System ∀Problem
(The System solves the Problem). **(P2)**

context: problem-solving systems

"The Simplexity"

(Alain Berthoz: "La Simplexité"; 2009)

"the separation of functions and modularity"

fundamental property of living organisms

Paradigms

- **Modular**

∀Problem ∃System
(The System solves the Problem). (P1)

- **Global**

∃System ∀Problem
(The System solves the Problem). (P2)

unique solution: **P2-system**

Cartesian Systemic Emergence

human creation of particular P2-systems

Symbiotic Thinking

suggesting and creating a relevant symbiotic relationship among the essential parts of the system designed

Symbiosis

a composition of several parts that is **vitally separation-sensitive**.

Symbiosis

Symbiosis

- Paradigm: (P2)
- Tool: symbiosis
- Systemic Structure:

deductive-like

Deductive Systems: **Peano's Axioms for N**

(P1): $0 \in N$

(P2): if $m \in N$ then $S(m) \in N$

(P3): if $m \in N$ then $S(m) \neq 0$.

(P4): if $m \in N$, $n \in N$ and $S(m) = S(n)$ then $m = n$.

(P5): if M is a set such that

- $0 \in N$
- for every $w \in N$, if $w \in M$ then $S(w) \in M$

then M contains every element of N.

in deductive-like problem-solving systems

the primitive notions are **symbiotic procedures**

Cartesian Systemic Emergence

- Symbiotic Thinking (COGNITIVE 2020)
- Pulsative Thinking (INTELLI 2017)
- Resonance Thinking (ICONS 2019)
- Metamorphic Thinking …. in preparation

Conclusion

- Opportunities
  - increasing human perception and creation capabilities
  - new scientific directions
- Obstacles
  - reliance capacity