The holonic Viable System Model as a path towards the connection of human and artificial cognition

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Foreword and context (by Massimiliano Pirani)

The main question to which the debate should provide food for thought is:

Can the Viable System Model constitute a general structure for the realization of hybrid-reality cognitive systems?

This question is framed in previous research that the author put forth recently about the role of holonic entities as key for operational models of hybrid-reality, intended as a still not well-covered phenomenon, under systemic and cybernetics point of views impinging on engineering aspects.

To this end, the following key sub-problems and concepts can be listed:

- Cognitive augmentation deals with behaviour in complex hybrid-reality worlds.
  - the object of study in "cognitive engineering", which aims to capture the major aspect in augmentation of cognition, can be said to be work systems, the performance of which is based on high cognitive requirements (Mühlbradt & Kuhlang 2017)
  - Cognitive systems engineering aims at analysing cognitive processes and structures within work systems, at designing them, if possible, prospectively, and at assessing them with the goal of augmenting personal and collective identity thus achieving security, productivity and a managing complexity (Buffet et al. 2013).
- Cognitive semantics cannot be solved in finite steps,
  - The VSM (Viable System Model) with its standard structure and recursion capacity provides a structure that could hold well for designing cyber-physical controllers at any semantic level and respective metalevel (see Raikov & Pirani 2022a, 2022b; Pirani et al. 2022).
- The VSM can capture the cybernetic essence of the hybrid reality phenomenon
  - In order to let the VSM be a natural structure for embodied intelligence, it should be able to capture the systemic structure of cognitive autopoiesis and autogenesis occurring in stable processes that feature the 3°-order cybernetics of the hybrid reality phenomenon.

The following bunch of methodologies and techniques are under investigation:

- Holonic VSM structured agents can be used as technology enablers for amplification and attenuation of varieties in systemic interactions.
- The "Janus effect" of holons is a useful symbolic handler for technologies that cope with the:
  - **Attenuation**: from parts to whole, *forgetful abstraction* of category theory
  - **Amplification**: from whole to parts, systemic structuring *functorial* transformation of category theory (see Pirani et al. 2021)
- Holarchy as Cyber-Physical System of Systems
  - A holarchy can map quite well at least the recursion and parallelism of systems no. 1 in the VSM (see Pirani et al. 2018)
  - Holarchies are purposeful entities prone to provide solutions to challenges in the cybernetics of the CPSoS (see Pirani et al. 2018).

A keen intention and idea is to use holonic architectures as the technological basis of an execution model of the VSM.

An execution model is searched for the implementation of the VSM at (near) real time.

Real time dynamics are fundamental for the embodiment effect and situatedness.

Summary:

- The VSM based structures must be able to capture the cybernetic essence of the hybrid reality phenomenon.
- Cognitive semantics grounding and so cognitive engineering cannot be solved in finite steps; the recursiveness of the VSM is a key.
- Holonic interpretations as technology enablers for amplification and attenuation of variety between systemic elements.
- Holarchy as Cyber-Physical System of Systems.
- Holonic architectures as the basis of an execution model of the VSM.

FAQ (to be discussed during interaction and debate)

1. If we invoke the VSM in Hybrid Reality, who will play the 5 subsystems? People? AI? Tech companies? IoT devices?, society, Governments?

2. In this vision of the VSM, who will work, who will govern, …?

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