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Comment

Nonlinear dynamics and higher cognitive mental functions Comment on "Information flow dynamics in the brain" by M.I. Rabinovich et al.

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In the target article [1] M. Rabinovich and co-authors reviewed a theory of nonlinear dynamic of information flow in the brain. They described how mental representations can be modeled in this theory. They addressed cognitive processes of top-down and bottom-up information flow, which are fundamental for relating information inside the brain to objects and events in the outside world. The article appropriately emphasizes that Shannon information is inadequate for characterizing conceptual contents of mental representations.

For example, a picture containing one million pixels with values (0, 1) contains 1 million bits of Shannon's information. However this value tells us nothing about presence or absence of food or predators, information essential for life. Not only Shannon's theory of information cannot measure presence or absence of life-essential information, it also contains no algorithms for learning such measures.

The target article states that Kolmogorov and Chaitin information measures are adequate for characterizing conceptual contents of mental representations. I am not convinced and would suggest that this statement requires further elaboration and likely remains a topic for future research.

Humans as well as higher animals can perceive objects (including food and predators), in other words can represent in their minds information content of objects. This is based partly on evolutionary evolved mental properties and partly on learning from objects that can be perceived in the surrounding world. This learning aspect seems to be absent from Shannon, Kolmogorov, or Chaitin theories.

Humans possess unique ability to learn abstract concepts-representations. This human ability has not been explained in previous cognitive research. A recent hypothesis attempting such an explanation [2] suggests that ability for abstract thinking is inextricably connected to language. The mental hierarchy is modeled in [2] as a dual hierarchy of language and cognition representations. Language representations are learned by human children at an early age throughout the entire hierarchy. This is possible because language representations exist in the surrounding language "ready-made" [3]. But cognitive representations for abstract concepts do not exist ready-made and require learning from real-life experience in correspondence to language contents. I am looking forward to further development of the nonlinear dynamic theory in the target article [1] toward modeling the dual hierarchy of language and cognition.

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