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On Computational Models of Interconnected Perception, Reasoning, and Action — in Dream Worlds

Selmer Bringsjord and Paul Bello and Antonio Chella and Naveen Sundar Govindarajulu

We distinguish between real versus unreal worlds, and include in the latter category fictional worlds and — perhaps the hardest type of unreal world to plumb — dream worlds. Dream worlds, from the standpoint of building computational cognitive models, present a number of acute challenges in at least three areas of human mentation that are for us as AI researchers and computational cognitive scientists deeply interconnected; these areas are: perception, reasoning, and action. We are attempting to specifically answer three tough questions, one in each of these three areas; the answers (for us) must be based upon robust computational models that are both theoretically well-founded, and brought to life in implemented simulations. (Such models are to our knowledge in very short supply.) Ultimately, we acknowledge that the research trajectory we summarize herein must arrive at a way to informatively model different modes of consciousness in the human mind, which, remarkably, is capable of sustaining utterly coherent consciousness across waking, imagining, and dreaming.

Abduction vs. Concept Refinement and Structural Preservation: Perspectives on Mathematical Heuristics

Otávio Bueno

Lorenzo Magnani [2001] has developed a rich framework to characterize abduction, its different kinds, and its role in mathematical discovery, especially in geometry. On his view, which combines Kantian and Peircean elements, abduction is crucial in the process of generation and evaluation of explanatory hypotheses. Some abductive inferences are based on models (model-based abduction), others involve the integration of new experiences into “previously existing systems of experimental and linguistic (theoretical) practices” (manipulative abduction; Magnani [2001], p. 160). In this paper, I contrast abduction with a different approach to mathematical heuristics: a thoroughly deductivist and empiricist stance that emphasizes the role of concept refinement (Lakatos [1976]) and structural preservation (da Costa and French [2003], Bueno [2000], and Bueno and French [2018]) in the formulation of new mathematical conjectures. I argue that the latter has independent plausibility and can overcome some of the former’s shortcomings.

Serendipity and Thought Experiment in Scientific Discovery

Marco Buzzoni

Method and creativity seem, at least at first glance, to be opposing concepts and give rise to what, in the discussion around the concept of serendipity - i.e. the phenomenon whereby a fortuitous and unexpected experience turns out to be an essential element leading to a discovery or invention - has been considered paradoxical and oxymoronic: Serendipity invokes chance and luck and at the same time presents itself as a kind of method, capable of leading to ever new discoveries or inventions. The solution I propose is based, on the one hand, on the rejection of the neo-Positivist (and Popperian) distinction between discovery and justification and, on the other, on the concepts of thought experiments that I have developed elsewhere. On the one hand, it is necessary to question both the neopositivist distinction between discovery and justification and its later and more recent rejection within the epistemological tradition. To this end, it is necessary to distinguish two different but complementary ways - one reflexive, the other genetic-methodological - of interpreting the discovery/justification dichotomy. This distinction makes it possible to resolve the paradoxical character of the concept of serendipity, understanding in what precise sense both the initial lucky chance and the unpredictable human discovery are entirely reconcilable with the principle of intersubjective testability of any scientific discovery worthy of the name. While the element of lucky chance and unpredictability of human discovery is to be explained on the basis of the typical capacity of human reason to formulate counterfactual scenarios or, in a very general sense, thought experiments, the consistent rejection of the dichotomy discovery/justification in a genetic-methodological sense explains why contingent and unpredictable events can be, so to speak, “redeemed” by making them an initial moment from which a series of steps follow that lead, in an intersubjectively reconstructible manner, to the discovery itself. It follows that the most widespread definition