

The Integrated Information Theory of Agency

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Abstract

We propose that measures of information integration can be more straightforwardly interpreted as measures of agency rather than of consciousness. This may be useful to the goals of consciousness research, given how agency and consciousness are “duals” in many (though not all) respects.

Once consciousness is analysed as efficient network activity, it is manifested across a broad range of systems, and its meaningfulness as a concept becomes diluted. That is, as Merker et al. successfully show, a fundamental challenge for the integrated information theory of consciousness (Tononi 2008; Tononi et al. 2016).

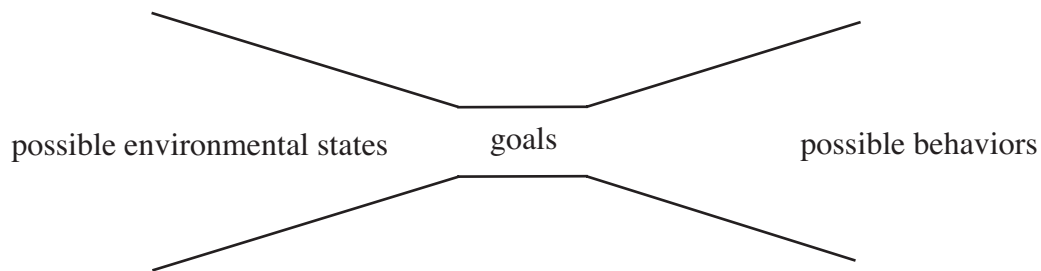
In this commentary we propose that measures of information integration can most directly be interpreted as measures of agency rather than of consciousness. As we will argue, since agency can be defined in terms of behavioural patterns, it avoids the problems arising from quantifying “first-person perspective” properties by means of “third-person perspective” measures. As the conceptual dual of consciousness, agency may deserve a more prominent place in consciousness research.

Agency and Integration. Agency is increasingly of interest to biologists, as many developmental patterns and behaviors (including those of plants) are characterized in agential terms. It is part of a trend to assign a greater theoretical role to organisms as such in our understanding of evolution: organisms not as passive targets of evolutionary processes as actively shaping their selective environment (Laland, Matthews, and Feldman 2016) and respond in a goal-directed manner to opportunities or “affordances” in their environment (Walsh 2015). At a very general level, “agency”

refers to how organisms exhibit goal-directed behaviours in response to environmental change.

Talking about goals in this way activates old worries about teleology and anthropomorphism (i.e., agency as human-like intentionality). However, in practise, the pay-off involved in explaining behaviors as goal-directed is that this helps account for patterns of behavioral robustness: an organism’s “goal” is what it attempts to achieve through various means, even when it is perturbed or challenged by an environmental change. In other words, agency refers to how a (1) small number of goals can account for patterns of connectivity between (2) a large number of possible environmental states, and (3) a large number of possible behaviors.

This explanatory structure describes a bow-tie architecture (see figure). environmental states and behaviors are integrated in virtue of the presence of “goals”. Agency can be manifested in different ways, and the figure does not illustrate any fine-grained connections between environmental states and behaviors. What it does illustrate is the explanatory general structure, where the “goals” are used to explain how environmental states and behaviors are informationally integrated (for an information-theoretic treatment of scientific explanation: see e.g. Desmond 2019).



When the issue is put in this way, suggestive parallels with theories of consciousness emerge. Not just the IIT posits consciousness as the integration of various experiential properties (Tononi 2008), but also global workspace theory (Dehaene and Changeux 2011, 11) posits a similar structure, where consciousness is a global broadcast mechanism, integrating input and output systems.

Unlike theories of consciousness, a theory of agency does not need further justification of why such bow-tie architectures should be identified with agency. Goal-directedness is a third-person concept and in this way it can be unproblematically

fleshed out in terms of input-output patterns. Agency as a concept just is a type pattern of connectivity between environmental states and behaviors. There is no need to posit a counterpart to “qualia” or some ineffable subjective quality.

The underlying reason for this is that agency is an explanatory concept rather than one with a reference to an empirical state-of-affairs. Informally, agency could be said to be more like “Newton’s law of inertia” rather than to “white snow”. If one is habituated to thinking of agency in terms of intentionality (or the presence of some form of mentality), this view of agency may require a gestalt-switch. The concept of agency imposes a structure on observed behavior, and if the observed behavioral patterns do not exhibit this general structure, there is simply no need to describe them as “agential” (see discussion in Desmond and Huneman 2020).

Agency and Consciousness as Duals. Whether or not the apparent isomorphism between theories of consciousness and the structure of agency is more than skin-deep is not something we can analyse in detail here. Instead, we offer a general rationale why the apparent isomorphism might be genuine: agency and consciousness can, at a fundamental level, be viewed as “duals”. In mathematics, dual concepts are used to integrate two different ways of looking at a same object (cf. e.g. Atiyah 2007). Similarly, if agency refers to the activity of the organism in relation to the environment, consciousness in its broadest sense denotes the “passivity” of the organism. A synonym for consciousness – sentience – makes this passivity clearer: the capacity of “feeling” refers to how an organism “undergoes” its environment (or think of “e-motion”: being moved). The duality follows from the fact that one cannot have activity without passivity, and vice versa: both are dimensions of an underlying organism-environment relationality.

Given this duality, it is not surprising that greater motor sensori-motor control has evolved in tandem with various proxies of consciousness such as cognitive systems (van Duijn, Keijzer, and Franken 2006; Godfrey-Smith 2020). Just as invoking the dual operator in mathematics may help solve otherwise intractable problems, understanding the evolution of agency may help understanding the evolution of consciousness.

Another major worry for consciousness research is the spectre of panpsychism – seemingly the unavoidable cost of naturalising and/or de-anthropomorphizing consciousness. In context of agency, the dual spectre would be that of

“panagentialism”. In other contexts, this has been called hyper-agency detection: seeing agency everywhere (cf. (Atran 2002)). However, panagentialism can be more easily defused, because of an asymmetry between agency and consciousness (at least as the latter is typically understood). Attributing agency is an explanatory strategy to make sense of behavioral complexity. Hence, explaining all behaviors as agential is not a statement about reality (as panpsychism is typically interpreted to be), but simply as a (poor) explanatory practise. In other words, it reflects methodological issues rather than facts of the matter. However, perhaps there are indeed “no facts of the matter” regarding consciousness (Carruthers 2020). In that case, agency and consciousness may be true duals.

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