Reasoning, representation and social practice (extended abstract)

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Abstract. The idea that human cognition essentially involves symbolic reasoning and the manipulation of representations which somehow stand for entities in the real world is central to "cognitivist" approaches to AI and cognitive science, but has been repeatedly challenged within these disciplines; while the very idea of representation has been problematised by philosophers such as Dreyfus, Davidson, McDowell and Rorty. This extended abstract discusses Robert Brandom's thesis that the representational function of language is a derivative outcome of social practices rather than a primary factor in mentation and communication, and raises some questions about the computational implications of his approach.

1 Introduction

"Where do correct ideas come from? Do they fall from the sky?
Are they innate? No, they come from social practice".
Mao Zedong, "On Practice".

What Varela et al [13] labelled "cognitivism" (also known as the Computational Theory of Mind or CTM) is an approach to AI and cognitive science that postulates symbolic representations as fundamental to cognition: representations are taken to be some kind of internal constructs that somehow stand for entities in the real world, and function as "arguments" for internal deductive reasoning. On this view, representations involve physical states of the organism, so cognitive processes must be associated with identifiable physical changes of state.

Some early critiques of the representational thesis from the standpoints of cognitive science and AI can be found in Varela et al [op cit] and Brooks [5]. Varela et al argue that the purported representations and operations that manipulate them are inaccessible to conscious (phenomenological) experience. Brooks reports on the development of systems which manifest intelligent behaviour but make no use of central representations; each layer or process in a

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system has access to relevant pieces of information, but it is only from a third-party observer's standpoint that the data can be interpreted as representing states of the real world. Varela et al class Brooks' work along with their own as belonging to the (then) new *enactivist* paradigm.

Representationalism has also taken a battering within 20th century analytic philosophy (see [8,11] for discussion). In this extended abstract we consider whether the "analytic pragmatism" of Robert Brandom [1,2,3,4] can offer a bridge between enactivist approaches and representational schemes. Brandom argues that while language does have an essentially representational dimension, this should not be considered as its primary function but can be best captured within the context of discursive social practices (see [6,11]). In the course of these practices, language users assume responsibility and authority for their various claimings while attributing and ascribing both doxastic (propositional) and practical commitments and entitlements to themselves and others. Representations and symbolic reasoning are not primary or causal, but are a means of characterising invariants in (material) inferential reasoning. Brandom sets out to show how one can develop accounts of linguistic meaning and purposeful action which are grounded in normative social practice, eschewing semantic or intentional concepts, and in particular how formal logic can be shown to be grounded in everyday linguistic practice

Brandom is classed by Joseph Rouse as a "practice theorist" ([12]; see [7] for discussion), and this aspect of his work seems to offer a good fit with the enactivist stance. Practice theory is a term that has been applied to a variety of approaches (or practices?) in the social sciences and humanities. What these approaches have in common is that they seek to study the behaviour of individuals in

social contexts by focussing on habitual performances classed as practices against a background of other practices, in place of such monolithic categories as culture, class, gender, rules, values, norms and so on. One motivation for this is that analysts can focus on observable events rather than postulating unobservable entities such as beliefs, values or traditions, or speculating about the psychology of the participants' motives. In fact, in the course of Brandom's works it turns out that his discursive practices are assumed to rely on a fair amount of behind-the-scenes cogitation, which we consider in some detail in section 3.

2. Some key themes from Brandom

The essentials of the framework presented in [1] and [2] can be cursorily sketched as follows. Brandom claims to follow Kant and Frege in insisting on the primacy of the propositional, as the smallest linguistic unit for which we can take *responsibility*. To assert a proposition is both to take on a commitment to defend that assertion if challenged, and to claim an authority to which others may defer when making the same assertion. A commitment is understood here not as a state of mind but as a social status, which is constituted by the normative attitudes of one's interlocutors. Participants in a dialogue are taken to maintain "deontic scoreboards" with a record of claims to which each participant has committed themself, consequential commitments which the scorekeeper derives by (material) inference, and commitments to which the scorekeeper judges the speaker to be entitled [1:190ff].

It is important to note that the commitments that a speaker will acknowledge may not match those that will be attributed by scorekeepers: in particular the scorekeepers may calculate *consequential* commitments of which the speaker is unaware. This is claimed to capture a difference between two senses of "belief": what one is aware of or will admit to believing, and what follows (logically or otherwise) from one's avowed beliefs. Levesque [9] sought to capture this distinction with a "logic of implicit and explicit belief", while Olsen [10] argues that Brandom's notion of consequential commitments enables us to handle these phenomena,

in particular the problem of "logical omniscience", without resorting to non-standard logics.

"Inference" here is meant as "material" or content-based inference as in: Edinburgh is to the East of Glasgow, so Glasgow is to the West of Edinburgh. According to Brandom these inferences are immediate, and do not rely on an enthymeme or hidden premise or meaning postulate "X is to the East of Y iff Y is to the West of X". Rather, this biconditional *makes explicit* the implicit basis of the inference which acculturated users of a language make unthinkingly. The argument is correct by virtue of the meanings or appropriate uses of the words, not because of some covert formal deduction. This leads up to Brandom's logical expressivism: logical reasoning supervenes on material inference, in that an argument is considered to be logically good just in case it is materially good, and cannot be made materially bad by any substitution of non-logical for non-logical vocabulary in its premises or conclusion [2:55].

Finally (for the purposes of this abstract) material inference has a role to play in analysing the semantic content of subsentential expressions:

> "Two subsentential expressions of the same grammatical category share a semantic content just in case substituting one for the other preserves the pragmatic potential of the sentences in which they occur… a pair of sentences may be said to have the same pragmatic potential if across the whole variety of possible contexts their utterance would be speech acts with the same pragmatic significance…" [2:128-9].

So for example, one might say that two terms have the same denotation ("representation") if replacing one with the other makes no difference to the appropriate circumstances in which a speech act may be uttered and its pragmatic consequences, in terms of the speaker's deontic score (see [8] for extended critical discussion of this approach). Much of the second half of [1] consists of elaborations of this substitutional technique to handle the traditional subject matter of formal semantics such as reference, anaphora, deixis, quantification and propositional attitudes.

3. Processing implications of background practices

Having briefly outlined some key elements of Brandom's inferentialism, we now turn to some of the assumptions that seem to be made about the processing capabalities of communicating agents.

3.1 Scorekeeping

Chapter 4, Section IV of *Making it Explicit* includes detailed instructions for deontic scorekeeping, including the requirement that if speaker *B* claims that *p*, scorekeeper *A must* add *p* to the list of commitments attributed to *B* and *should* also add "commitments to any claims *q* that are committive-inferential consequences of *p*…" (my emphases). It appears from this that agents are obligated to be "perfect reasoners" when scorekeeping even if they are not when speaking. This seems to threaten to revive the issue of "omniscience", displaced onto the "scorekeeper" rather than the speaker, and has implications for the computational complexity of scorekeeping. Levesque [9] shows that for his formal system, the time taken to calculate what an agent believes grows linearly with the size of the KB (in the propositional case), while the time taken to calculate the implications of the belief grows exponentially. Of course these results do not necessarily carry over to Brandom's setup, but they are certainly suggestive.

Furthermore, the status of scoreboards themselves and the practice of deontic scorekeeping seem somewhat uncertain. Scorekeeping is clearly not a directly observable practice, but is presumably meant to be manifest in the practical attitudes displayed towards utterances: one may for example **challenge** a speaker's entitlement to a commitment, or **endorse** it either explicitly (by repeating the claim) or implicitly (by remaining silent). The scoreboards themselves are only notional entities, with a troubling resemblance to *representations* within a quasi-formal system.

3.2 Substitution and expressivism

Kremer [8] questions Brandom's reading of Kant and Frege and offers a detailed examination of the decompositional strategy of analysing the content of subsentential expressions, and identifying different subcategories such as terms and predicates according to the contribution they make to the inferential potential of propositional utterances. For example: the fact that one can infer "Thora is a mammal" from "Thora is a dog", but not vice versa, indicates that *mammal* and *dog* are **predicates** which licence asymmetric substitution inferences, rather than **terms** which may license symmetric inferences [2:133ff]. Kremer argues that Brandom's account is plagued with circularity, since it claims to define syntactic categories in terms of substitution inferences but turns out (on Kremer's account) to assume a prior grasp of these very categories. One could add that the substitutional techniques are presented in rather general terms, using simple examples, and would constitute a formidable machine learning problem if applied to corpora of actual discourse. For one thing, it is unlikely that any corpus would provide instances of "all possible contexts" for any given sentence-pair (see above). This suggests some interesting directions for future applied research.

As noted above, the expressivist programme seeks to develop a notion of formal validity based on exhaustive substitution of nonlogical for nonlogical vocabulary. There is a persuasive argument that the ability to endorse material or content-based inferences such as "Brighton is to the east of Worthing, so Worthing is west of Brighton" does not necessarily presuppose a notion of "formally valid inference", as this threatens to set off a "regress of rules" of the kind depicted by Lewis Carroll in "Achilles and the Tortoise". However the substitutional approach also has its problems: no worked examples are presented, and the claimed parallels with other domains such as "theological vocabulary" are unconvincing [2:55]. Logical words like "if", so", "then" do not necessarily behave the same in all possible contexts, and a "fuzzy" or probabilistic approach may turn out to be more appropriate. The assumption that agents are capable of evaluating universal statements involving the entire non-logical vocabulary of a language is surely an idealisation.

4. Conclusion

  Brandom's practice-oriented approach to language and purposeful action appears at first to offer theoretical support for non-cognitivist approaches to AI and cognitive science. This extended abstract has highlighted some computational and processing issues which argue against adopting the inferentialist model wholesale. The practices ascribed to individual language users turn out to rely on a complex and sophisticated analytical machinery which appears to require the processing resources of a cognitivist agent and makes idealised, perhaps unrealistic assumptions about agents' processing capabilities. As [7] argues, Brandom [3] essentially offers a "competence" model of an ideal speaker-hearer/scorekeeper rather than an "anthropological" account of actual practice: "Brandom's automata appear to be rather unconstrained both in terms of their internal operations and in the range of entities that can be discriminated as inputs or generated as outputs." Any restrictions are labelled as "psychological" and thus extrinsic to the explanatory model, though it is precisely these psychological restrictions which must be confronted if Brandom's model is to be pressed into the service of AI and cognitive science.

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