

Access-consciousness as network structure in a system of fragmentable, recombining multi-modal exemplars

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Data-Oriented Parsing (DOP; Scha 1990, Bod 1992, 1998) is a method for statistical parsing employed in computational linguistics, whereby novel inputs may be analysed by directly exploiting the statistical regularities present in a parsed, labelled training corpus without any abstract representations being generated; rather, training corpus entries are stored as node-labelled trees, from which fragments (subtrees) may be extracted and recombined to produce multiple possible parses of a novel input, for which the most probable parse is computed by means of a Monte Carlo sample. It has been shown to produce state-of-the-art results for supervised (Bod 2005) and unsupervised (Bod 2006b) parsing tasks, and to be equally applicable to the analysis of musical structures (Bod 2002) and equational reasoning in physics (Bod 2004); it has furthermore been argued that it due to its interesting cognitive properties, it merits consideration as a potential model of human linguistic processing and cognition (Bod 2006a). While DOP's success in modelling structures in single cognitive modalities is well established, a novel development in DOP research is its application to the co-ordinated action of multiple cognitive modalities. Cochran (2006b) demonstrates the success of a Data-Oriented model of Natural Language Generation, Unmediated Data-Oriented Generation (UDOG), in which a system, provided with a training corpus of paired visual stimuli and their verbal descriptions, annotated with labelled tree-structures and joined at multiple nodes by "crossmodal" connections, when presented with novel visual stimuli, simultaneously parses the visual stimulus and produces a verbal description by extracting and recombining paired visual and verbal subtrees from the training corpus. Cochran (2006a) presents arguments that infant vocal babbling may be modelled as the epigenesis of crossmodal connections between corpora of acoustic and motory exemplars. One major direction for future UDOG research will be to expand the model to encompass multiple cognitive modalities, so that a single linguistic output can bind together meanings drawn from a diversity of modalities which approximates the "saturatedness" of real human language use in naturalistic conditions. The present paper draws out a possible consequence of such developments for the understanding of consciousness.

Block (1995) distinguishes two understandings of consciousness; "Access-Consciousness" (A-Consciousness), characterised as the availability of cognitive content for report, reasoning and the control of behaviour, and "Phenomenal Consciousness" (P-Consciousness); the qualitative "what-it's-like" of experience, which may well be, as Chalmers (1996) postulates, beyond the reach of scientific investigation altogether, or else is, as Dennett (1991) holds, strictly reducible to A-Consciousness. Disavowing any consideration of the reducibility or otherwise of P-Consciousness, it may be that "saturated" UDOG models of the type suggested above could offer a basis for a novel theory of A-Consciousness, and the role played therein by language, or rather, by particular exemplars in the language modality.

One of the most interesting developments in Graph Theory in the last decade, with applications in as diverse fields as Physics, Urban Planning, Genetics, Neuroscience and Sociology, is the theory of *Small World Networks* (Watts and Strogatz 1998). A Small World Network is a random graph in which the considerable majority of nodes have only local connections (which in network terms, means only having connections where, if x is connected to y and y is connected to z , there is a high probability that x will also be connected to z), but there exist a small number of “supernodes” that have very many non-local connections. The consequence of this network structure is that it is possible to go from any node in the network to any other in a small number of moves. This of course is not the first time that an application of Small World Networks to cognition and consciousness has been thought of; see Roxin, Reicke and Solla (2004), for example. What I do wish to offer as novel is the suggestion of a network specifically of exemplars, connected intramodally at potential substitution sites, but also crossmodally. Doubtless crossmodal connections also exist between non-linguistic exemplars (between vision and motor control for instance), but what is unique to human consciousness is the role played by linguistic exemplars as supernodes, giving us a more integrated form of A-Consciousness than any other species. What I am proposing here is not a psycholinguistics-style boxes-and-arrows diagram with the “language box” in the middle, but rather a decentralised network in which concrete exemplars across all modalities of cognition are joined up, mostly by local connections, but with a population of supernodes which join up exemplars from many modalities, and the majority of these supernodes happen to be situated in linguistic exemplars.

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