Ontology-Schmology[1]: in search of informal semantics

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Ontologies are currently the dominant method for representing the semantics of geographic concepts. These ontologies take the form of formal languages and structures that represent the concepts used by an information community, and have been defined as formal specifications of shared conceptualisations (Studer et al 1998). However, such ontologies are required to be highly specific and precise, do not give an accurate representation of the semantics that individuals hold in their minds and enforce a communal view of the world, thus diluting individuality. This paper argues against the use of formal and shared structures to represent semantics, and looks forward to a brave new world of semantic representation.

Historically, ontology languages used in computer science have their origins in mathematical structures, including logic, graphs, frames and most recently, description logics (Gomez-Perez et al 2004). These ontology languages have been applied to the representation of geographic concepts and require a precise and formal description of a concept. For example, description logics require the specification of which concepts relate to which other concepts, how many instances may participate in the relationship and whether a relationship applies to all instances, one or some, as well as a number of other details of the concept. However, in reality, such details are often not fixed. The precise definition of a concept is likely to depend on context, purpose, the individual concerned, and perhaps even the circumstances of that person at the time. Recent work has attempted to accommodate context by allowing additional context information to also be specified in similarly precise and formal ways (Cai 2007).

In contrast to this formal expression, human semantics can be informal in nature. While some individuals may argue strongly for a particular definition, others are quite flexible, and it is always possible for a person's definition of a concept to vary with time[2], living circumstances, location, recent activities or education[3]. For example, a person's immigration to another country may cause her geographical concepts to be modified, expanded and shifted sideways to reflect the new environment (for example, a mountain in Switzerland is quite different from a mountain in Australia). Another person's education as an ecologist may cause him to develop new understandings of old concepts or learn new concepts.

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[1] This is Yiddish rhyming slang, now part of American English and some other English dialects. It denotes tongue-in-cheek deprecation.

[2] 'One who is not a socialist at 20 has no heart, and one who remains a socialist at 40 has no head.' Attributed to various people, including George Bernard Shaw.

[3] 'I am not young enough to know everything' Oscar Wilde.

By definition, ontologies as currently used represent shared conceptualisations. That is, they are designed to hold the semantics of a group of people or information community. Members of such a community are likely to share some common semantics for the concepts concerned, hence their definition as an information community. However, an individual's cognitive model is a product of his or her background, language, culture, education and life experiences, so even within an information community, views of the world differ. The creation of a shared conceptualisation dilutes such individual variation and forces members of an information community to describe domain concepts using a single world view.

Furthermore, the large amount of effort required to build an ontology to represent a particular domain acts as a disincentive for groups to create new ontologies, and such groups are thus more likely to adopt existing ontologies unless the difference in the world view of the existing ontologies are so divergent that the group members cannot modify their world views to fit the existing ontology.

It may be argued that the adoption or use of an ontology does not change the world view of the users. The ontology is simply an exchange or alignment mechanism, and users may map their own concepts to that ontology and retain their own world view. However, in practise the use of a shared conceptualisation is likely to move a community towards a more homogeneous view. This is because members of the community are forced to interact with the ontology as 'the correct view', and use it as a point of discussion and mutual understanding. Furthermore, discovery tools may use the ontology to enable richer types of search (e.g. Klien et al 2006). Such interactions and the need for users to understand each other is likely to encourage conformity, in the same way as an individual might change her accent when she moves to a new country in order to be better understood.

It might also be argued that a more homogeneous set of world views would be a good thing. It might make communication easier and reduce arguments about how to define and categorise things, and the sharing of geographic information and development of information systems would certainly be easier. However, the homogenisation of ways of looking at the world may result in the loss of thoughts and ideas that come from unusual and innovative thinking, and that sometimes arise from the friction between different ways of thinking. This concern about ontologies is similar to the concern about domination of the English language at the expense of other languages and the resulting loss of intellectual diversity that might be considered an implication of the Sapir-Whorf hypothesis linking language and thought (Kay et al 1984).

Conformance to a particular way of looking at a geographic domain (including not only static concepts but also behaviour within that domain) may reduce the possibilities imagined by researchers in that area. Conformance to a foundational ontology is also likely to have implications for original thinking. Different ways of looking at the foundations of the world are fodder for the revolutionary thinking that can lead to Kuhnian paradigm shifts (Kuhn 1962). Discouragement of diversity is the enemy of scientific advancement.

In any case, humans do look at the world in different ways, and often the requirements of a particular task, the uniqueness of the concerns of individuals and different world views render existing ontologies inappropriate. Thus for new projects, new ontologies are created because the others did not represent the required concepts or categorise the world in the required way, and the quest for domain ontologies that can be used widely by a range of groups remains elusive.

So if not ontologies, then what? How can we represent semantics in ways that avoid these criticisms and more closely reflect the informal and dynamic semantics that humans hold? Furthermore, how can we create systems and approaches that do not require adherence to a particular world view? Humans can instinctively and subconsciously accommodate differences in world view (if they choose to). I know that when I talk to English people, they won't interpret the word bush in the same way as I do. They will think it odd when I describe a beck as a creek, but will make an automatic translation.

The brave new world of informal semantics accommodates individual world views, allowing each person to have her own unique way of categorising, defining and interpreting the world and its behaviour, allows semantics to be flexible, vague, dynamic and context-dependent, and allows different semantics to be translated dynamically.

The shape of the new world is not yet clear, but it requires a different approach from the formal, specific approaches that have been taken so far. I have recently started work using Natural Semantic Metalanguage (Wierzbecka 1972) to approach this problem in a different way (Stock 2008). This linguistics approach involves the use of semantic primitives that are found to exist across a range of languages. Individuals can use these primitives in an intuitive way to describe semantics, which can then be compared and translated. Further work is required in this area to develop these methods.

The shortcomings and requirements of ontologies are not new, and ontologies are a less than ideal way of partially addressing the issue of semantic representation in the short term. They are a stepping stone towards a better approach, but there is some danger in seeing them as the final destination and putting energy into their use rather than seeking better alternatives that will provide a solution that more closely reflects the way in which humans think about the world. The brave new world awaits!

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