Towards a feminist ethics of knowledge modeling for the future Web 3.0

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The term Web 3.0 is widely used to denote future developments of the internet. So far we have witnessed the emergence of Web 1.0 in the nineties and an increasing popularity of social software applications/ Web 2.0 during the last five years. There is, however, another hyped web future called Semantic Web. This rather formalist account was already proposed in 2001 by Tim Berners-Lee and his colleagues, but has not yet become established. The Semantic Web idea is currently interpreted as “Linked Open Data (LOD)” resulting in acquisitiveness of structured data. Simultaneously, it socio-technically converges with Web 2.0 technology. The specificities of Web 3.0 are thus still contested.

In this paper recent formal moves towards the semantic web and linked open data and its counter-shifts are discussed. I will exploit Karen Barad’s and Donna Haraway’s radically interdisciplinary concept of diffraction (Barad 2007, Haraway 1997, 1992) as a theoretical account of understanding the design and the production of knowledge in the course of these developments. Simultaneously, with the diffraction concept I seek to propose alternative notions of epistemology, ontology and accountability that can lay the ground for new ethics (and practice) of modeling knowledge for the databases of the Web 3.0.[1]

From the semantic web to the future web 3.0

The Semantic Web was first announced in 2001 – that is a few years before the hype of Web 2.0 - by Tim Berners-Lee, who counts as inventor of the original web, and his colleagues. As an approach to make Web content meaningful to computers, it invokes the vision of the intelligent, social machine.

One realization of this vision could be the transformation of search engines into answering machines that understand “natural language”. Another is the imagination of software agents as virtual servants that will always give us “the right information at the right time”. An essential prerequisite of making the meaning of text machine-understandable are classifications and ontologies, this means formal descriptions of “reality”, “the world” or certain domains. Ontologies aim to codify the world in an RDF scheme, more specific in triples of the form “subject, verb and object”, or in first order logic.

In their analysis of similar projects science and technology studies (STS) researchers, particularly feminist scholars, have already pointed out that such formal approaches have politics. They produce inclusions and exclusions (e.g. Bowers 1992, Bowker & Star 1999).

The anthropologist and STS researcher Diane Forsythe (1993) provided an excellent elaboration of the implicit assumptions in the knowledge engineering practices in the 1980ies. By that time knowledge engineers from the field of Artificial Intelligence assumed the knowledge is universal. They presupposed that knowledge is a structured, stable entity that can be aquired (by interviews with one representative expert) and transferred into computer systems.

Feminist scholars, moreover, criticized that formal ontologies cannot represent embodied, skilled or tacit knowledge. Ontologies ignore minority views and quieter voices and allow the majority view to speak for everyone. Epistemologically speaking these approaches assume a consensus reality and a consistent representation of knowledge. They often presuppose that the knowing subject is male, white, middle-class etc. (e.g. Adam 1995, Sherron 2000). Thus, formal ontologies which seem to be the core infrastructure of semantic technologies are suspected of transforming Cartesian epistemology into IT. The knowledge represented in by new generation of the internet is therefore in danger of socio-materially reproducing existing structures of inequality, particularly the structural-symbolic gender order.

Contextualized in this way, the semantic web represents typical modelling approaches of computer science and software development. A closer look, however, reveals that this research & development has changed since the first proclamation of the Semantic Web in 2001. Today at least three developments indicate an epistemological shift in the knowledge representation of Web 3.0 that leaves behind the naïve realism of the early knowledge experts: one is the turn to constructivist epistemologies, as exemplified by the modelling procedures in bio and geo-ontologies (cp. Leonelli 2008, Ribes & Bowker 2009), the second are influences from the web 2.0 culture (cp. Blumauer & Pellegrini 2009) and the third are influences from the open source culture that are reflected in Semantic Web knowledge representation (Bizer, Heath & Berners-Lee 2009). These three and the formalist approach are combined in the current Linked Open Data (LOD) cloud.

Diffraction as a figure and metaphor for the LOD knowledge representation

In daily life, we encounter diffraction patterns at many occasions, for instance, if we throw two stones into a pond and look at the interferences of the resulting waves. Diffraction also happens when sea waves or sound waves pass an opening of a barrier. While this seems to be common sense experience, unexpected patterns might appear, when monochromatic light is sent through a razor blade. As Karen Barad (2007, 75ff) points out, the fringes of the razor do not appear as clear as one would assume at first glance. Instead of seeing a clear-cut shadow that mirrors of the razor blade, diffraction patterns show up around the inner and outer edges of the object: dark lines in light regions and light lines in dark regions. Under

certain conditions we can see something, what is considered to be physical knowledge: that light behaves like waves. Here, the empirical apparatus reduces light as we usually experience it, i.e. light that is combined of several different wave lengths, to a one single wave length (which is called monochromatic light).

Both, the overlapping, combination and interference of different waves as well as the diffraction patterns that appear instead of clear-cut boundaries, to my mind, are phenomena helpful for understanding the modelling of knowledge for the linked open data cloud and its gendering. Since the knowledge represented in the LOD cloud has been coded in completely different ways–partly based on the idea of mirroring reality, partly as a result of negotiation processes between academic experts, partly permeates by vision of the web 2.0 culture or automatically processed from existing databases –it does not seem easy to identify (social or epistemic) inclusions and exclusions. Even when differentiating the coding procedures, when analysing linkages between ontologies or relating them to epistemologies of their underlying modelling processes, it is hard to make a critical or feminist judgement about what exactly is represented. Although some of the ontologies might be modelled according to naïve realism, the knowledge that the whole LOD cloud holds cannot be regarded just as an accumulation of certain copies of reality, since the ontologies in the LOD cloud interfere with each other. To get included into the linked open data cloud, it is not only required that an ontology consists of RDF triples, these triples, furthermore, need to be linked to the entities that are already part of the cloud. Diffractions seem to be a good figure for the modelling of ontologies and the interference of RDF triples and the different ontologies in the linked open data cloud.

Another phenomenon that has to be grasped in this context is automatic reasoning, i.e., drawing conclusions from RDF triples coded in the LOD cloud–by machines. Reading automatic reasoning through the example of the razor blade, new insights might appear that have not been thought of before (i.e. coded in the cloud). The razor blade example, however, reminds us that not only unexpected new insights might appear. It can also happen that through the apparatus of semantic knowledge modelling and automatic reasoning something that seems to be obvious (to some of us) may suddenly completely disappear in the LOD cloud. Diffraction patterns thus seem to be an adequate image of the linked open data cloud, in which the knowledge represented of different ontologies of different origin is combined and interferes with each other, in which new statements are produced by automatic reasoning.

Diffraction as onto-epistemo-logy

In physics diffraction does not only stand for wave phenomena, but the particle-wave dualism of light that was implicated by the double-slit experiment. When particles pass through a double-slit, they mostly gather around two centers at a wall behind the slits, while waves

result in a diffraction pattern. Interestingly, when light is sent through a double-slit, it depends on the observer, which pattern will appear: if it is measured, which slit is passed, light will behave as if it is made of particles, whereas wave-typical diffraction patterns appear, when the passing slit is not located, measured. Thus, the result of the experiment depends on the setting as a whole. In contrast to common objectivist epistemologies, the knowing subject, the apparatus/experimental setting and the object are closely entangled. They are not priori separated. Neither is there a pre-existing world "out there" that can be measured. Instead, subjects, objects and agencies of observation materialize "intra-actively" in concrete temporal-spatial arrangements. Moreover, this means that we – as "observers" or "non-observers" - are constantly intervening, and by these interventions producing a certain reality – and no other.

As for the "observing" part, the part that we as information scientist or designers can consciously decide on in the process of modeling knowledge for the linked open data cloud or we as (feminist) STS researchers intervening in this field, these insights should direct our attention away from the attempts to map 'real' objects to the LOD cloud (that necessarily fails). Instead of conceiving knowledge representation as some kind of mirroring of reality, we should focus the apparatuses and practices of knowledge coding and production. We need to reconstruct the database models used, the coding format, e.g. RDF, the language we use, the epistemological practices of modeling, the algorithms to extract knowledge from existing structured databases, the algorithms etc. – and possibly reformulate them.

For discussing the "non-observing" part, I would like to go back to different interpretations of quantum physics that the results of the double-slit and other experiments provoked. With his uncertainty principle Heisenberg emphasizes the epistemological implications: we can only make probabilistic predictions about energy/time and position/momentum. In contrast, Bohr's indeterminancy thesis emphasizes the ontological implications: particles do not *have* determinate values of position and momentum simultaneously. Bohr's philosophy, following Barad, goes beyond questions such as 'what can we know' or 'how can we know' shifting them towards 'how do we construct reality ontologically, not only socially' – by modeling/producing knowledge. According to Barad reality emerges and manifests in the process of making the world intelligible. She introduces the term 'onto-epistemo-logy' (or "epistem-onto-logy") in order to denote that ontology and epistemology cannot get separated. This means that ontology cannot be understood in the modern sense of something fixed. 'Onto-epistemo-logy' rather requires a fundamental redefinition of ontology (as well as reality) as fluid. Her crucial point, though, is that the processes of knowledge making include certain practices and excludes others. Therefore, "we are not only responsible for what exists, not

because it is an arbitrary construction of choosing, but because agential reality is sedimented out of particular practices that we have a role in shaping" (Barad 1996, 7).

Towards a feminist ethics of knowledge modeling

Coming back to knowledge representation practices on the web and the treatment of vast amounts of data, the semantic web practitioners seem to follow Bohr. Instead of a rather probabilistic notion of knowledge–as often used in Web 2.0 applications–, the semantic web/ LOD focusses on relationality, semantics and ontology. However, there is a fundamental difference between Barad's (Bohr's) understanding of these issues and those in the LOD community, since Barad reminds us that „the world out there" and we ourselves will always be partially opaque, unavailable, while LOD assumes that reality is "knowable" (and codable). To get this difference Haraway's and Min-ha's concept of „inappropriate/d others" (Haraway 1992, Min-ha 1986) might be useful, with which existence – according to Barad - can be conceived as fundamental relational, though, mostly related to „inappropriate/d others".

LOD research is currently facing a problem that, to my mind, can be understood better with Barad's and Haraway's thinking. The knowledge coded in the LOD cloud is partly inconsistent. In classical logic, however, anything – true or false – can be concluded from inconsistent statement. So, how to run automatic reasoning (usually based on classical logic) on the LOD cloud? Ironically, the LOD cloud was exactly built for the purpose of making automatic reasoning possible, because the latter need huge amounts of data/RDF triples. By definition, only automatic reasoning can make the semantic web work. Maybe the LOD community should start to take feminist STS, more precisely Barad, seriously, in order to solve their problems.

Notes

1. The Semantic Web and LOD cloud, my empirical data, the diffraction concept and their entanglements will be explored much deeper in an article to appear in Bath et al. 2011

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