How I Would Like Semantic Web To Be, For My Children

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Abstract. Semantic Web, since its inception, has gone through lot of developments in its relatively nascent existence; right from people's perception, to the standards and to its adoption by the industry and more importantly by the scientific community. This impressive growth only seems to increase. In this paper, we project this growth to the next 10 years and highlight some of the facets on which Semantic Web could have a major impact on. We also present the challenges that Semantic Web and its community has to deal with in order to get there.

In the following sections we discuss some of the aspects that could get influenced by Semantic Web in the next 10 years.

1 Abstractions

The amount of data available has always been on the rise and going ahead, there are no indications to the contrary. In order to glean meaning out of the data, it is important to have abstractions over the data. With the help of ontologies, there are already mechanisms to generate abstractions from static as well as streaming data [1]. But, with increasing amount of data, a single level of abstraction would not be sufficient. There would be a need to provide multiple (and higher) levels of abstractions and facilitate drill-down mechanisms. To achieve this, the background knowledge should also be represented at multiple levels which leads us to believe that the use of upper ontologies [3] would be on the rise. This would imply having multiple ontologies at different levels for a domain.

Building large ontologies requires huge effort and more so, if done by hand. Although there are some mechanisms to automate the process of building ontologies [4, 2], going ahead, it would be imperative to find better ways to differentiate between most general and specific concepts in order to build ontologies at different levels of detail. Also of importance would be to learn to build ontologies not only from text but also from heterogeneous mediums like voice and images.

The size of the Linked Open Data (LOD) cloud has been increasing and it would continue to increase. We can treat the current LOD as the lowest level of abstraction and build at least another layer of abstraction using upper ontologies. This can be considered as Meta Linked Open Data.

2 Connectivity and Personalization

Internet of Things and sharing of data would lead to all things (including humans) being connected. In this connected setup, if everyone have to communicate with each other, then they should understand each other's protocol. Semantic Web can play a major role in automatically mapping the protocol schemas and creating an illusion of having one universal schema. An example scenario is, in a connected community (like a house), where choices of multiple people have to be honored, automatic negotiations should occur and agreement should be reached in order to fulfill the contradictory choices automatically.

Although the concepts of ambient intelligence and Internet of Things have been around, it is yet to be fully realized. Combined with Semantic Web, a powerful network of connections can be realized.

Increased connectivity results in information overflow. Personalization of information is one of the ways to avoid the information overflow. Although there is work on personalization using Semantic Web techniques, it seems to be limited to one form of data such as Web, social networks, sensors etc. Going ahead, personalization over heterogeneous data is crucial. Another important factor to consider is, preferences of people change over time and this has to be considered (or learned automatically) while delivering personalized information.

3 Privacy

Apart from information overflow, the other potential problem with increased connectivity is privacy. Although there is prior work on privacy, a heterogeneous connected environment (as described in the previous section) brings in a set of unique privacy challenges.

- Privacy settings should be compatible across multiple environments i.e. the user should not bothered with using different privacy settings (all of them having the same meaning) in different environments. An ontology, with different abstraction levels, can act as a privacy mediator among all the different environments.
- Privacy settings should be dynamic and vary according to the context. For example, all the agents who come under the category of "Health Care" would have access to certain type of data which is different from agents of type "Entertainment". Here also, a multi-level ontology can be used to determine the context.

4 Environment

Environmental problems like pollution and adverse climatic changes such as global warming have been increasing with each passing year. These problems would be even more severe in the next 10 years. The only way to mitigate these adverse affects is for the people of the world to work together in controlling

them. Now, in a connected world this is possible and with the help of Semantic Web, it would even be possible for the connected citizens (living and non-living) to work towards this goal without them realizing it.

An example scenario is automatic traffic coordination. If the vehicles and their drivers are connected citizens then coordination can take place among themselves to automatically avoid/regulate traffic jams by rerouting or delaying. This would save gasoline and reduce pollution. Various factors like urgency in getting to the destination, distance, size of the vehicle etc can be considered in arriving at mutual agreement among the connected citizens.

From the Semantic Web perspective, the challenges are real time processing of streaming data, reasoning over it and arriving at conclusions by considering the various factors involved.

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