

Thesis: BiTRDF Extending RDF for BiTemporal Data

Abstract: Internet is not only a platform for communication, for processing transactions, and for cloud storage, but it is also a large knowledge store where people as well as machines can create, manipulate, infer and make use of data and knowledge. Semantic Web was developed for this purpose, and it aims at making machines to understand the meaning of data and knowledge and hence using them in decision making. Resource Description Framework (RDF) forms the foundation of the semantic web which is organized as Semantic Web Layer Cake. RDF is limited to express only a binary relationship with a format of <subject predicate object>. However, expressing higher order relationships requires reification which is very cumbersome. Naturally time varying data is very common and cannot be represented by only binary relationships.

We first surveyed approaches that use reification or extend RDF for higher order relationships and developed a taxonomy for their similarities and differences. Then we propose a new data model, BiTemporal RDF (BiTRDF) that incorporates both valid time and transaction time explicitly into standard RDF triples. We have defined BiTemporal Resources that are the basic elements in BiTRDF. Since a BiTemporal Resource is a compound object that carries a standard RDF resource, a valid time interval, and a transaction time interval. Hence, there is no need for additional triples to carry time-varying data. We also have defined basic operations on BiTemporal Resources such as Projection operators, Roll Back operators, etc. They are the foundations of the model we are developing in the dissertation research.

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