Semantic rules for generating SPARQL from semantic mark-up

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Abstract

Automated compliance checking depends on the capture of complex logical dependencies. This paper develops the detail of a methodology using semantic rules for mapping regulatory and requirements documents to SPARQL, by first annotating the document with a semantic mark-up called RASE. This demonstrates that knowledge can be captured and reviewed separately from execution tools and environments.

The methodology to map marked-up documents to SPARQL itself uses complex rules, which can be represented using tables with semantic mark-up added. Since there may well be improvements possible in the mapping, this paper presents how the knowledge about a mapping to SPARQL can be made explicit and improvable. This development abstracts the mapping knowledge into a context-free statement about knowledge and syntax equivalences. This allows for the review of the individual mappings and a comparison and contrast of the expressiveness of knowledge and rule languages.

RASE mark-up consists of eight tags. Tagging identifies individual metrics, which contain properties, comparators and targets so as to be testable against outside information, and also identifies objectives which group metrics and optionally other objectives. Both metrics and objectives serve four semantic roles, 'Requirements' for normative content, 'Application' for narrowing the scope of attention, 'Selection' for adding to the scope of attention and 'Exception' for excluding scope of attention.

Both HTML with RASE and RDF/OWL triples provide simple and accessible models for the representation of knowledge. In contrast, SPARQL compounds the complexity of SQL like languages with a multiple constructs which are not easily reviewed and checked. To move SPARQL authoring away from being a craft-based specialist skill, other representations of normative requirements need to be automatically mappable into SPARQL. This is particularly important if RDF/OWL is to have a role in automated code compliance, where an entire regulation or clause may involve multiple metrics and objectives.

The tabulation holds the HTML/RASE syntax and the tree traversal events in table 'headin'g cells. The SPARQL syntax in held in table 'data' cells. SPARQL syntax considerations necessitated that a distinction be made between 'type' based metrics and other metrics, as the SPARQL syntax addresses these triples differently.

This demonstration focuses on a simple example. The same process has successfully generated queries from textual and tabular regulations involving several dozen properties and logical relationships.

This work has shown that the mapping between knowledge representations can be held in a table which can be made machine operable with HTML/RASE semantic markup. This shows that the craft skills around SPARQL development can be automated and the potential for error eliminated.

Keywords

Rule/compliance checking

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