

Semantic Web Technologies

RDFS Entailment

Jos de Bruijn
debruijn@inf.unibz.it

KRDB Research Group
Free University of Bolzano, Italy

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RDFS Interpretations

- ▶ A simple interpretation is an **rdfs-interpretation** if it satisfies:
 - ▶ The RDF axiomatic triples
 - ▶ The RDF semantic conditions
 - ▶ The RDFS axiomatic triples
 - ▶ The RDFS semantic conditions
- ▶ Axiomatic triples
 - ▶ Statements which must **always** be true
 - ▶ Define certain relationships (e.g. typing or subclassing) within the RDF and RDFS vocabularies
- ▶ Semantic conditions
 - ▶ Define additional properties of RDF and RDFS vocabularies (e.g. typing commutes over subclass)

RDFS Entailments

S **rdfs-entails** E , denoted $S \models_{rdfs} E$, if every rdfs-interpretation which is a model of S is also a model of E .

RDFS Axiomatic Triples

$\langle \text{rdf:type}, \text{rdfs:domain}, \text{rdfs:Resource} \rangle$

$\langle \text{rdfs:domain}, \text{rdfs:domain}, \text{rdf:Property} \rangle$

$\langle \text{rdfs:range}, \text{rdfs:domain}, \text{rdf:Property} \rangle$

$\langle \text{rdfs:subPropertyOf}, \text{rdfs:domain}, \text{rdf:Property} \rangle$

$\langle \text{rdfs:subClassOf}, \text{rdfs:domain}, \text{rdfs:Class} \rangle$

$\langle \text{rdf:type}, \text{rdfs:range}, \text{rdfs:Class} \rangle$

$\langle \text{rdfs:domain}, \text{rdfs:range}, \text{rdfs:Class} \rangle$

$\langle \text{rdfs:range}, \text{rdfs:range}, \text{rdfs:Class} \rangle$

$\langle \text{rdfs:subPropertyOf}, \text{rdfs:range}, \text{rdf:Property} \rangle$

$\langle \text{rdfs:subClassOf}, \text{rdfs:range}, \text{rdfs:Class} \rangle$

RDFS Semantic Conditions on Ontology Vocabulary

Define class extension function $ICEXT$: $ICEXT(c) = \{i \mid \langle i, c \rangle \in IEXT_{\text{type}}\}$

1. $IR = ICEXT(IS(\text{Resource}))$
2. $LV = ICEXT(IS(\text{Literal}))$
3. x is in IP if and only if $\langle x, I(\text{Property}) \rangle$ is in $IEXT(I(\text{type}))$
 Informally: $\langle x, \text{rdf:type}, \text{rdf:Property} \rangle$
4. if $\langle x, y \rangle \in IEXT(IS(\text{domain}))$ and $\langle u, v \rangle \in IEXT(x)$, then $u \in ICEXT(y)$
5. if $\langle x, y \rangle \in IEXT(IS(\text{range}))$ and $\langle u, v \rangle \in IEXT(x)$, then $v \in ICEXT(y)$
6. $IEXT(IS(\text{subPropertyOf}))$ is transitive and reflexive on IP
7. if $\langle x, y \rangle \in IEXT(IS(\text{subPropertyOf}))$, then $IEXT(x) \subseteq IEXT(y)$
8. if $x \in ICEXT(\text{Class})$, then $\langle x, \text{Resource} \rangle \in IEXT(\text{subClassOf})$
9. if $\langle x, y \rangle \in IEXT(IS(\text{subClassOf}))$, then $ICEXT(x) \subseteq ICEXT(y)$
10. $IEXT(IS(\text{subClassOf}))$ is transitive and reflexive on $ICEXT(\text{Class})$

Required reading

- ▶ Document “Resource Description Framework” on website:
<http://www.debruijn.net/teaching/swt/rdf.pdf>
- ▶ RDF Semantics, Chapters 1, 2, 4: <http://www.w3.org/TR/rdf-mt/>

Further reading

- ▶ J. de Bruijn and S. Heymans. Logical foundations of (e)RDF(S): Complexity and reasoning. In *Proceedings of the 6th International Semantic Web Conference (ISWC2007)*.
- ▶ J. de Bruijn, E. Franconi, and S. Tessaris. Logical reconstruction of normative RDF. In *OWL: Experiences and Directions Workshop (OWLED-2005)*, Galway, Ireland, November 2005.
- ▶ H. J. ter Horst. Completeness, decidability and complexity of entailment for rdf schema and a semantic extension involving the owl vocabulary. *Journal of Web Semantics*, 3(23):79115, 2005.