

Reasoning in the Semantic Web Web Semântica

Test
Open book -- Duration: 2 hours

Group 1

The W3C has defined the SKOS vocabulary (Simple Knowledge Organization System) to express the basic structure and content of concept schemes such as thesauri. Below you can find an application for expressing agricultural knowledge. Present the following RDF graph as a list of triples and in graph format. In order to simplify the writing of triples and graph representations you can specify and use other namespace prefixes, besides the ones already declared in the document.

```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:aont="http://aims.fao.org/aos/agrontology#"
  xmlns:trix="http://www.w3.org/2004/03/trix/rdfg-1/"
  xmlns:pns="http://purl.org/net/provenance/ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  <rdf:Description rdf:about="http://aims.fao.org/aos/data/c_4825?output=xml">
    <rdfs:label>RDF description of c_4825</rdfs:label>
    <foaf:primaryTopic>
      <skos:Concept rdf:about="http://aims.fao.org/aos/agrovoc/c_4825">
        <skos:prefLabel xml:lang="pt">Míldio</skos:prefLabel>
        <skos:prefLabel xml:lang="en">Mildews</skos:prefLabel>
        <skos:narrower rdf:resource="http://aims.fao.org/aos/agrovoc/c_13557"/>
        <aont:hasStatus
rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Published</aont:hasStatus>
        <skos:exactMatch rdf:resource="http://lod.nal.usda.gov/nalt/34451"/>
        <skos:inScheme rdf:resource="http://aims.fao.org/aos/agrovoc"/>
      </skos:Concept>
    </foaf:primaryTopic>
  </rdf:Description>
  <trix:Graph rdf:nodeID="A0">
    <pns:createdBy>
      <pns:DataCreation>
        <pns:performedAt rdf:datatype="http://www.w3.org/2001/XMLSchema#dateTime"
>2013-04-01T10:34:58.967Z</pns:performedAt>
      </pns:DataCreation>
    </pns:createdBy>
    <foaf:topic rdf:nodeID="A0"/>
    <foaf:primaryTopic rdf:resource="http://aims.fao.org/aos/agrovoc/c_4825"/>
  </trix:Graph>
</rdf:RDF>
```

Group 2

Consider the following N3 data of the RDF graph **O**:

```
@base <http://aims.fao.org/aos/agrovoc/> .
@prefix : <http://aims.fao.org/aos/agrovoc/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .

[ :causedBy _:m1 ] skos:broader :c4 .
:c4 skos:prefLabel "Doença Fúngica"@pt ;
    skos:broader [ skos:altLabel "Doença das Plantas"@pt;
                  skos:prefLabel "Plant disease"@en ],
                  [ skos:prefLabel "Doença infecciosa"@pt] .
_:m1 a skos:Concept ; skos:prefLabel "Uncinula" ; skos:broader <c1234> .
<c1234> rdfs:label "Erysiphales" .
```

Consider the following four RDF graphs where the prefixes are declared as in the previous N3 document.

1. <code>_:x a skos:Concept .</code> <code>_:x skos:broader _:y .</code> <code>_:y a skos:Concept .</code>	2. <code>_:x skos:broader _:y .</code> <code>_:y skos:prefLabel _:z .</code> <code>_:y skos:prefLabel _:w .</code>
3. <code>_:w skos:broader _:x .</code> <code>_:x skos:broader _:y .</code> <code>_:z skos:broader _:y .</code>	4. <code>_:x skos:broader _:y .</code> <code>_:x skos:prefLabel _:z .</code> <code>_:y skos:prefLabel _:z .</code>

2a) From the graphs specified previously indicate the ones which are simply entailed by graph **O**. Justify in detail by using any of the methods studied for RDF simple entailment.

2b) The initial data in **O** is extended with the following information, where the `rdf` prefix is associated with the usual URI identifying RDF vocabulary:

```
_:b rdf:type <http://aims.fao.org/aos/agrovoc/c4> .
skos:prefLabel rdfs:subPropertyOf rdfs:label .
skos:altLabel rdfs:subPropertyOf rdfs:label .
skos:broader rdfs:subPropertyOf rdfs:subClassOf .
skos:broader rdfs:domain skos:Concept ; rdfs:range skos:Concept .
```

Using the inference rules for RDF Schema entailment, check whether the following graph is entailed by the initial RDF graph **O** when merged with the previous information. Justify your answer.

```
[ ] a [ a skos:Concept ; rdfs:label _:z ; skos:altLabel _:z ] .
```

2c) Construct a SPARQL query that retrieves the resources that do not have a relation to a broader concept (via `skos:broader`), as well as the preferred (`skos:prefLabel`) or alternate labels (`skos:altLabel`) whenever they exist (returned in the variable `?label`) of those resources. Assume that the graph has been previously closed with all RDFS entailed triples.

2d) Present the solutions of the following SPARQL query when applied to graph **O**, justifying the solutions with the studied SPARQL algebra. Treat blank nodes in **O** as different and distinct IRIs.

```
@prefix skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?x ?z
WHERE { { ?x skos:broader ?y .      ?y skos:prefLabel ?z . }
        MINUS
        { ?y skos:prefLabel ?w . FILTER( lang(?w) = "en" ) } }
```