Knowledge Representation and Semantic Technologies

Exercises on RDF and SPARQL

Riccardo Rosati

Corso di Laurea Magistrale in Ingegneria Informatica
Sapienza Università di Roma
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Exercise 1

Write an RDF model representing the following statements:

- Document 1 has been created by Paul
- Document 2 and document 3 have been created by the same author (who is unknown)
- Document 3 says that document 1 has been published by W3C

Use predicates `dc:Creator` and `dc:Publisher`, and assume that the three documents are represented by URIs `doc1`, `doc2`, `doc3`, respectively.

Exercise 1: Solution

```
@prefix rdf:
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix myns: <http://example.org/myVocabulary/> .

myns:doc1 dc:Creator "Paul".
myns:doc2 dc:Creator _:x.
myns:doc3 dc:Creator _:x.
myns:doc3 myns:says _:y.
_:y rdf:subject myns:doc1.
_:y rdf:predicate dc:Publisher.
_:y rdf:object "W3C".
_:y rdf:type rdf:statement.
```

Exercise 2

Write an RDF/RDFS model representing the following statements:

- URI1 and URI2 are classes
- URI3 and URI7 are properties
- URI1 is a subclass of URI2
- URI3 is a subproperty of URI7
- URI3 has domain URI1 and range URI2
- URI4 is an instance of class URI1
- URI5 and URI6 are instances of class URI2
- (URI6,URI4) is an instance of property URI3

Exercise 2: Solution

```
@prefix rdf:
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs:
  <http://www.w3.org/2000/01/rdf-schema#> .
@prefix myns: <http://example.org/myVocabulary/> .

myns:URI1 rdf:type rdfs:Class .
myns:URI2 rdf:type rdfs:Class .
myns:URI3 rdf:type rdf:Property .
myns:URI7 rdf:type rdf:Property .
myns:URI1 rdfs:subClassOf myns:URI2 .
myns:URI3 rdfs:subPropertyOf myns:URI7 .
myns:URI3 rdfs:domain myns:URI1 .
myns:URI3 rdfs:range myns:URI2 .
```

Exercise 2: Solution (cont'd)

```
myns:URI4 rdf:type myns:URI1 .
myns:URI5 rdf:type myns:URI2 .
myns:URI6 rdf:type myns:URI2 .
myns:URI6 myns:URI3 myns:URI4 .
```

Proposed exercise

Write an RDFS model that formalizes knowledge about the domain of people, in particular the classes `person`, `man`, `woman`, and the properties `parent`, `mother`, `father`.

Try to express all the knowledge you have about such classes and properties (e.g.: every man is a person, every woman is a person, every mother is a woman, etc.)

Exercise 3

Write a SPARQL query corresponding to the following requests:

1. “return all URIs having an author and a date of creation”
2. “return all predicates having as subject both URI1 and URI2”
3. “return all predicates having as subject either URI1 or URI2”
4. “return the name of the authors of any document having a date of creation”

Exercise 3: Solution

1)
```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
SELECT ?x
WHERE { ?x dc:creator ?y .
        ?x dc:date ?z . }
```

2)
```
PREFIX myns: <http://example.org/myVocabulary>
SELECT ?x
WHERE { myns:uri1 ?x ?y .
        myns:uri2 ?x ?z . }
```

Exercise 3: Solution (cont.)

```
3) PREFIX myns: <http://example.org/myVocabulary>
   SELECT ?x
   WHERE { { myns:uri1 ?x ?y . } UNION
           { myns:uri2 ?x ?z . } }

4) PREFIX dc: <http://purl.org/dc/elements/1.1/>
   SELECT ?z
   WHERE { ?x dc:creator ?y .
           ?y dc:name ?z .
           ?x dc:date ?w . }
```

Exercise 4

Write a SPARQL query corresponding to the following request: “return the name of authors and date of creation of any document having an author and, optionally, a date of creation”.

Exercise 4: Solution

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
SELECT ?z ?w
WHERE { ?x dc:creator ?y .
        ?y dc:name ?z .
        OPTIONAL { ?x dc:date ?w . } }
```

Exercise 5

Write a SPARQL query corresponding to the following request: “return all URIs corresponding to documents created by Paul”. Assume that the triples expressing creators of documents are reified.

Exercise 5: Solution

```
PREFIX rdf:
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
SELECT ?x
WHERE { ?b rdf:subject ?x .
        ?b rdf:predicate dc:creator .
        ?b rdf:object "Paul" .
        ?b rdf:type rdf:statement . }
```