EXERCISES WEEK 6 INF3580 SPRING 2012

Martin G. Skjæveland

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6 RDFS and reasoning

Read

- Semantic Web Programming: chapter 4, 5.
- Foundations of Semantic Web Technologies: chapter 2, 3.

6.1 Entailment

In these exercises we will learn about entailment and decide the logical consequences of RDFS statements.

Let `entailments.n3` be the file listed below, where `rdf` and `rdfs` are the usual namespaces.

```
 1:  :Person    a                  rdfs:Class .
 2:  :Man       a                  rdfs:Class ;
 3:             rdfs:subClassOf    :Person .
 4:  :Parent    a                  rdfs:Class ;
 5:             rdfs:subClassOf    :Person .
 6:  :Father    a                  rdfs:Class ;
 7:             rdfs:subClassOf    :Parent ;
 8:             rdfs:subClassOf    :Man .
 9:  :Child     a                  rdfs:Class ;
10:             rdfs:subClassOf    :Person .
11:  :hasParent a                  rdf:Property ;
12:             rdfs:domain        :Person ;
13:             rdfs:range         :Parent .
14:  :hasFather a                  rdf:Property ;
15:             rdfs:subPropertyOf :hasParent ;
16:             rdfs:range         :Father .
17:  :isChildOf a                  rdf:Property ;
18:             rdfs:domain        :Child ;
19:             rdfs:range         :Parent .
20:  :Ann       a                  :Person ;
21:             :hasFather         :Carl .
22:  :Carl      a                  :Man .
```

6.1.1 Exercise

Is `entailments.n3` syntactically correct RDF(S)?

6.1.2 Exercise

Assuming the RDFS statements in `entailments.n3` are syntactically correct, are they semantically correct, i.e., do they give an accurate description of "the real world"?

6.1.3 Exercise

Explain what it means for one set of statements to entail a (different) set of statements.

6.2 Manual entailment calculation

In the following exercises decide if `entailment.n3` entails the statement(s) given and explain why/why not? If the answer is "yes, the statement(s) is entailed by `entailments.n3`", then use the simple entailment rules (`se1`, `se2`) and the rdfs entailment rules (`rdfs1`, ..., `rdfs12`) found at RDFS entailment rules[1] to prove your answer. If the answer is "no", then explain, informally or formally, why this is so.

There are quite a few of these exercises, but many of them are quite easy so they should be quick to do. If they are too easy, then skip to the last ones, which are perhaps a bit harder.

6.2.1 Exercise

First, to get the an overview of the statements in `entailments.n3`, draw a diagram.

6.2.2 Tip exercise

```
:Father rdfs:subClassOf :Person .
```

Solution True. `:Father` is (transitively) a subclass of `:Person`. Rule rdfs11.

In the proof below each line is marked with "P" if the statement is a premise, i.e., exists in `entailments.n3`, or with the rule and the input statements to this rule by which the line in question is concluded.

Proof:

1. `:Father rdfs:subClassOf :Parent` — P
2. `:Parent rdfs:subClassOf :Person` — P
3. `:Father rdfs:subClassOf :Person` — 1, 2, rdfs11

Statements 1. and 2. are found in `entailments.n3` and are premises to the application of the entailment rule rdfs11 on line 3, which yields the statement we're after.

6.2.3 Exercise

```
:Man rdfs:subClassOf :Person .
```

[1] http://www.w3.org/TR/rdf-mt/

6.2.4 Exercise

```
:Carl a :Person .
```

6.2.5 Exercise

```
:Carl a :Parent .
```

6.2.6 Exercise

```
:Carl :hasChild :Ann .
```

6.2.7 Exercise

```
:Carl a :Man .
```

6.2.8 Exercise

```
:Carl a :Father .
```

6.2.9 Exercise

```
:Child rdf:type rdfs:Resource .
```

6.2.10 Exercise

```
:Ann a :Child .
```

6.2.11 Exercise

```
:Ann :isChildOf :Carl .
```

6.2.12 Exercise

```
:Ann :hasParent :Carl .
```

6.2.13 Exercise

```
:Ann :hasParent _:x .
```

6.2.14 Exercise

```
:Ann :hasParent [ rdf:type :Person ] .
```

6.2.15 Exercise

```
:hasFather rdfs:domain :Person .
```

6.2.16 Exercise

```
rdfs:range rdf:type rdfs:Resource .
```

6.2.17 Exercise

```
:hasFather rdfs:range :Father .
```

6.2.18 Exercise

```
:hasFather rdfs:domain [ rdfs:subClassOf :Person ] .
```

6.2.19 Exercise

```
:Father rdfs:subClassOf [ rdfs:subClassOf :Person ] .
```