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Data Models and Query Languages
Summerterm 2013

6. Exercise Sheet: RDF & SPARQL

Discussion: ~~02.07.2013~~   28.6.2013

Exercise 1 (Evaluating SPARQL Queries)
Consider the RDF database

D := { (_:P1,rdf:type,Person), (_:P1,name,"Pete"), (_:P1,age,"17"), (_:P1,email,"pete@abc.com"),
(_:P2,rdf:type,Person), (_:P2,name,"John"), (_:P2,email,"john@abc.com"),
(_:P3,rdf:type,Person), (_:P3,name,"Sue"), (_:P3,age,"21"),
(_:P1,knows,_:P2), (_:P1,knows,_P3), (_:P2,knows,_:P1), (_:P2,knows,_:P3) }.

Draw the RDF graph. Evaluate the following SPARQL graph patterns step by step according to the semantics introduced in the lecture and phrase their semantics in plain English.

Assume that every of the following queries is preceded by the necessary namespace definitions and the Select * solution format.

a) { ?p rdf:type Person. ?p age ?age. FILTER (?age>20) }

b) { { ?p rdf:type Person. ?p name ?name. } OPTIONAL { ?p age ?age . } }

c) { { ?p rdf:type Person. ?p age ?age. } UNION { ?p rdf:type Person. ?p email ?email. } }

d) { { ?p rdf:type Person. OPTIONAL ?p email ?email. } FILTER (!bound(?email)) }

Verify your results using the ARQ SPARQL engine. An installation instruction, the above RDF document D, and example query a) are provided at the exercise page of the lecture homepage.

Exercise 2 (SPARQL Queries)
Consider the RDF database D from the previous exercise. Specify the following requests as SPARQL queries and indicate the final results obtained when evaluating them on document D.

a) All pairs of distinct persons that have a common friend (i.e., it must hold that the intersection of persons they know is non-empty).

b) The names of all persons that know at least one person or are younger than 20 years. If present, the email address and, also if present, the age of this person should be included in the result.

c) Construct a new graph using the CONSTRUCT form that contains all persons (including their names) that know at least two persons.

d) All Persons, which are directly or indirectly connected via the knows-predicate.

e) All cyclic knows-relationships.

Verify your results using the ARQ engine.

Exercise 3 (Modelling in RDF)
Encode the following scenario in RDF.

The elementary school of Freiburg has three employees: the two teachers Mr. Maier and Mrs. Schmidt, and the schoolmaster Mrs. Koster. In addition to their administrative duties, Mrs. Koster also does some teaching. In particular, Mr. Maier is assigned to the first-graders, while Mrs. Schmidt and Mrs. Koster together teach the second-, third-, and fourth-graders. Mr. Maier has specialized in sports and therefore is assigned to physical education for all four grades of school. Each grade has a class representative and at least one pupil. Actually, Marie is a fourth-grader. Her favourite subjects in school are physical education, painting, and mathematics.

Use URIs, Blank Nodes, Literals, and RDF containers in your RDF graph. Whenever it makes sense, also use the rdfs vocabulary, in particular rdfs:subClassOf, rdfs:subPropertyOf, rdfs:domain, and rdfs:range. Finally list the facts that can be derived from your graph according to the RDFS semantics.