

Knowledge Representation and Semantic Technologies

Exercises on OWL

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Exercise 1

Write an OWL ontology representing the following statements:

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

Exercise 1: Solution

`Declaration (Class (myns:URI1))`

`Declaration (Class (myns:URI2))`

`Declaration (ObjectProperty (myns:URI3))`

`ClassAssertion (myns:URI1 myns:URI4)`

`ClassAssertion (myns:URI2 myns:URI5)`

`ClassAssertion (myns:URI2 myns:URI6)`

`SubClassOf (`

`ObjectSomeValuesFrom (myns:URI3 owl:Thing)`

`myns:URI1)`

Exercise 1: Solution (continued)

```
SubClassOf (  
  ObjectSomeValuesFrom (  
    ObjectInverseOf (myns:URI3)  
    owl:Thing)  
  myns:URI2)
```

```
ObjectPropertyAssertion (myns:URI3 myns:URI6  
  myns:URI4)
```

Exercise 2

Write an OWL ontology that formalizes knowledge about the domain of people, in particular the classes `person`, `man`, `woman`, and the properties `hasParent`, `hasMother`, `hasFather`.

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 2: Solution

SubClassOf (myns:man myns:person) (every man is a person)
SubClassOf (myns:woman myns:person) (every woman is a person)

SubObjectPropertyOf (myns:hasMother myns:hasParent)
 (hasMother is a subproperty of hasParent)

SubObjectPropertyOf (myns:hasFather myns:hasParent)
 (hasFather is a subproperty of hasParent)

SubClassOf (
 ObjectSomeValuesFrom (
 ObjectInverseOf (myns:hasMother)
 owl:Thing)
 myns:woman) (every mother is a woman)

Exercise 2: Solution (continued)

```
SubClassOf (  
  ObjectSomeValuesFrom (  
    ObjectInverseOf (myns:hasFather)  
    owl:Thing)  
  myns:man) (every father is a man)  
  
ClassAssertion (myns:man myns:Joe) (Joe is a man)  
  
ObjectPropertyAssertion (myns:hasMother myns:Joe  
  myns:Ann) (Ann is the mother of Joe)
```

Exercise 3

Add to the ontology of Exercise 2 the following information:

- Man and woman are disjoint classes
- Every person has a mother
- Every person has a father
- Every person has exactly two parents
- Every person has a father, who is a man
- Every person has a mother, who is a woman
- Every person has a father and a mother

Exercise 3: Solution

- 1) **DisjointClasses (myns:man myns:woman)** (man and woman are disjoint classes)

- 2) **SubClassOf (**
 myns:person
 ObjectSomeValuesFrom (myns:hasMother owl:Thing))
(every person has a mother)

- 3) **SubClassOf (**
 myns:person
 ObjectSomeValuesFrom (myns:hasFather owl:Thing))
(every person has a father)

Exercise 3: Solution (continued)

- 4) **SubClassOf (**
 myns:person
 ObjectExactCardinality (2 myns:hasParent))
(every person has exactly two parents)
- 5) **SubClassOf (**
 myns:person
 ObjectSomeValuesFrom (myns:hasFather myns:man))
(every person has a father who is a man)
- 6) **SubClassOf (**
 myns:person
 ObjectSomeValuesFrom (myns:hasMother myns:woman))
(every person has a mother who is a woman)

Exercise 3: Solution (continued)

```
7) SubClassOf (  
  myns:person  
  ObjectIntersectionOf (  
    ObjectSomeValuesFrom (myns:hasMother owl:Thing)  
    ObjectSomeValuesFrom (myns:hasFather owl:Thing) ) )  
(every person has a mother and a father)
```

Notice that axiom 7) is equivalent to the above pair of axioms 2) and 3)