Semantic Web Project

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SW course: 657AA - Academic Year: 2021/2022
Date: April 2022

Project outline

Given the narrative domain application ontology in Turtle format developed with Protégé framework, answer the following questions.
Ontology file reference: `Pisani_SW_Project.owl`
Clickable link to the Ontology file stored in Google Drive.

Question Q8

Identify two different assertions that would make the ontology inconsistent.

1° Assertion.

```
:PeterPan rdf:type :HumanCharacter
:PeterPan rdf:type :NotHumanCharacter
```

Putting the same individual into 2 disjoint classes generates inconsistency. In this case HumanCharacter and NotHumanCharacter are disjoint classes and putting the individual PeterPan into both classes generates inconsistency.

2° Assertion.

```
:PeterPanDefeatsCaptainHook :hasLocation :Neverland
:PeterPanDefeatsCaptainHook :hasLocation :London
```

Violating exact cardinality constraint generates inconsistency. In this case, relating an event - PeternPanDefeatsCaptainHook - with 2 different locations - London and Neverland - violates the constraint imposing that each event has exactly one location and generates inconsistency.

Question Q9

Define the complex role inclusion axiom capturing the fact that if a narrator creates a narrative that is reported in a book that is published by a publisher, then the narrator has a contract with that publisher.

```
(hasCreated o isNarrativeOf o hasPublisher) → hasContractWith
```

Question Q10

Verify if the created ontology (including the complex role inclusion axiom defined in Q9) satisfies the global restrictions on the axioms of an OWL 2 DL ontology.

The created ontology does not satisfy the global restriction on the axioms of an OWL 2 DL ontology because not all of the following restrictions are satisfied:

1. **Restriction on owl:topDataProperty** → Satisfied
   This restriction is satisfied because the ontology does not include any axiom on `owl:topDataProperty` and no super-property of `owl:topDataProperty` was defined.

2. **Restriction on Datatypes** → Satisfied
   This restriction is satisfied because each datatype employed in the ontology is contained in the OWL 2 Datatype Map and because the ontology does not define any data range (datatypes definitions are acyclic).

3. **Restriction on Simple Roles** → Not Satisfied
   This restriction is not satisfied because a composite object property (the one defined through the complex role inclusion axiom, `hasContractWith`) is used in an axiom of the type ObjectMinCardinality.

4. **Restriction on Property Hierarchy** → Satisfied
   This restriction is satisfied because the only one property chain present in the ontology does not introduce cycles: no object sub-property axioms with property chains depend to each other (i.e. are cyclic) in their definitions.

5. **Restriction on Anonymous Individuals** → Satisfied
   This restriction is satisfied because no anonymous individuals occur in the ontology.

Question Q11

Write the following queries in SPARQL:

Question Q11.1

Find how many events occurred in real locations, grouped by location.

```
PREFIX : <http://www.semanticweb.org/narrative-domain-application#>

SELECT ?location_name (COUNT(?event) AS ?count_event)
WHERE {
  ?location a :RealLocation;
              :hasLocationName ?location_name .
  ?event a :Event ;
           :hasLocation ?location.
  } GROUP BY ?location_name
```

If the location's IRI is preferred over the location's name then the following query is used.

```
PREFIX : <http://www.semanticweb.org/narrative-domain-application#>

SELECT ?location (COUNT(?event) AS ?count_event)
WHERE {
  ?location a :RealLocation.
  ?event a :Event ;
           :hasLocation ?location.
  } GROUP BY ?location
```

Question Q11.2

Find all the books with the ID of the publisher lower than 5000.

```
PREFIX : <http://www.semanticweb.org/narrative-domain-application#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>

SELECT ?book ?book_title
WHERE {
  ?publisher a :Publisher ;
               :hasID ?id .
  ?book a :Book ;
          :hasTitle ?book_title ;
          :hasPublisher ?publisher .
  FILTER (?id < "5000"^^xsd:positiveInteger)
  }
```

Question Q11.3

Find all the events that do not have any human participants.

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX : <http://www.semanticweb.org/narrative-domain-application#>

SELECT DISTINCT ?event ?event_label
WHERE {
  ?character a :Character .
  ?event :hasPartecipantCharacter ?character ;
         rdfs:label ?event_label .
  FILTER NOT EXISTS {?character a :Human}
  }
```