

Lab 6 – Land of the Rising OWL

CC7220-1 – September 23, 2024

We will use OWL to define some semantics for properties relating to places and use these definitions to infer new data in the RDF graph. Navigate to <http://rdfplayground.dcc.uchile.cl>. Copy and paste the following data into the text field on the left side of the page:

```
@prefix ex: <http://ex.org/>.
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.

ex:Japan ex:name "Japan"@en , "Japón"@es ; ex:capitalCity ex:TokyoCity ; ex:alpha2code "JP" .

ex:Kanto a ex:Region ; ex:country ex:Japan .

ex:Tokyo a ex:Prefecture ; ex:region ex:Kanto ; ex:capitalCity ex:TokyoCity .

ex:TokyoCity a ex:City ; ex:prefecture ex:Tokyo ; ex:replaced ex:Edo .

ex:Edo a ex:Prefecture , ex:FormerPrefecture ; ex:name "Edo" ; ex:region ex:Kanto ; ex:country ex:Japan .

ex:Saitama a ex:Prefecture ; ex:sharesBorderWith ex:Tokyo ; ex:region ex:Kanto .

ex:Musashimurayama a ex:City ; ex:prefecture ex:Tokyo .

ex:MasahiroSakurai ex:name "Masahiro Sakurai" ; ex:knownAs "Masa Sakurai" , "Sakurai" ;
    ex:placeOfBirth ex:Musashimurayama .

ex:Nippon ex:alpha2code "JP" ; ex:capitalCity ex:Tokyo .

ex:SupremeCourtOfJapan a ex:SupremeCourt ; ex:country ex:Japan .

ex:SaikoSai a ex:SupremeCourt ; ex:country ex:Japan .
```

Select the *OWL* tab on the right side and copy over the following to that side:

```
@prefix ex: <http://ex.org/>.
@prefix owl: <http://www.w3.org/2002/07/owl#>.
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.

ex:knownAs owl:equivalentProperty ex:alias .
```

Select the *OWL* reasoner. Append the necessary RDFS/OWL axioms in the right-hand side text field to answer the following questions (note that you cannot add the required data explicitly; it must be inferred through the requested OWL axioms; also note that OWL includes the most important features of RDFS). Press the *INFER OVER GRAPH* button to verify that the desired triples are correctly inferred. For the reasoner to work, the Turtle syntax be valid. The answer to each question should be kept and extended (some questions depend on previous answers). In the case of an inconsistency the world will implode the reasoner will add one or more messages of the following form to the output data (this is specific to this reasoner implementation).

```
[] a err:ErrorMessage ; err:error "..."
```

This lab will focus on (RDFS and) OWL property axioms. Let's start ...

1. [6 MARKS] Add four RDFS axioms to infer the triples:

```
ex:Japan ex:hasPart ex:TokyoCity .    ex:Tokyo ex:hasPart ex:TokyoCity .    ex:Nippon ex:hasPart ex:Tokyo .  
  
ex:Kanto ex:isPartOf ex:Japan .        ex:Edo ex:isPartOf ex:Japan .  
ex:SupremeCourtOfJapan ex:isPartOf ex:Japan .    ex:SaikoSai ex:isPartOf ex:Japan .  
  
ex:Tokyo ex:isPartOf ex:Kanto .    ex:Edo ex:isPartOf ex:Kanto .    ex:Saitama ex:isPartOf ex:Kanto .  
  
ex:TokyoCity ex:isPartOf ex:Tokyo .    ex:Musashimurayama ex:isPartOf ex:Tokyo .
```

2. [6 MARKS] Add one OWL axiom to infer the triples:

```
ex:TokyoCity ex:isPartOf ex:Japan .    ex:Tokyo ex:isPartOf ex:Nippon ; ex:hasPart ex:Musashimurayama .  
ex:Japan ex:hasPart ex:Kanto , ex:Edo , ex:SupremeCourtOfJapan , ex:SaikoSai .  
ex:Kanto ex:hasPart ex:Tokyo , ex:Edo , ex:Saitama .
```

3. [6 MARKS] Add one OWL axiom to infer triples of the following form:

```
ex:Japan ex:hasPart ex:Tokyo , ex:Saitama , ex:Musashimurayama .  
ex:Nippon ex:hasPart ex:Musashimurayama , ex:TokyoCity .    ex:Kanto ex:hasPart ex:Musashimurayama .  
ex:Tokyo ex:isPartOf ex:Japan .    ex:TokyoCity ex:isPartOf ex:Nippon .  
ex:Saitama ex:isPartOf ex:Japan .    ex:Musashimurayama ex:isPartOf ex:Japan , ex:Nippon , ex:Kanto .
```

4. [6 MARKS] Add one OWL axiom (not using inverse-of) to infer the following triples:

```
ex:Tokyo ex:sharesBorderWith ex:Saitama .
```

5. [6 MARKS] Add one OWL axiom to infer the following triple:

```
ex:TokyoCity ex:formerlyKnownAs "Edo" .
```

6. [6 MARKS] Add an OWL axiom to infer the following triple:

```
ex:MasahiroSakurai ex:countryOfBirth ex:Japan .
```

7. [6 MARKS] Add an OWL axiom (not using same-as) to infer the following triples:

```
ex:Japan owl:sameAs ex:Nippon .    ex:Nippon owl:sameAs ex:Japan .  
ex:Japan ex:capitalCity ex:Tokyo .    ex:Nippon ex:name "Japan"@en .  
# and so forth, duplicating all triples for ex:Japan to ex:Nippon and vice versa
```

8. [6 MARKS] Add an OWL axiom (not using same-as) to infer the following triples:

```
ex:Tokyo owl:sameAs ex:TokyoCity .    ex:TokyoCity owl:sameAs ex:Tokyo .  
ex:Tokyo ex:capitalCity ex:Tokyo ; ex:replaced ex:Edo .    ex:TokyoCity a ex:Prefecture .  
# and so forth, duplicating all triples for ex:Tokyo to ex:TokyoCity and vice versa
```

9. [6 MARKS] Add an OWL axiom (not using same-as) to infer the following triples:

```
ex:SupremeCourtOfJapan owl:sameAs ex:SaikoSai .    ex:SaikoSai owl:sameAs ex:SupremeCourtOfJapan .
```

10. [6 MARKS] Add one OWL axiom to state that something cannot have itself as a capital city. This should give two inconsistencies (look for `err:ErrorMessage`): one for `ex:Tokyo` and another for `ex:TokyoCity`.

SUBMIT: a single file `lab6.ttl` containing all RDFS/OWL axioms required to answer each question. Ensure to upload the *input* definitions only from the right-hand side, not the output of the reasoner. Clearly indicate the triples added for each question with a preceding comment line (e.g., `"# Q1"` without the quotes).