

Hands-On : Discovering the Semantic Web

Aim of the work : discover what an ontology is

- model a sample of an ontology
- describe data with an ontology
- infer new knowledge

This hands-on will need the use of Protege ¹. Tutorials on this software ² and on the semantic web formalisms are available on line.

During the hands-on, you will be guided in order to design an (simple) ontology on weather forecasts. The purpose of this ontology is to provide vocabulary for describing this kind of data semantically. More precisely, this ontology will represent knowledge dealing with weather phenomena (rain, storm, ...), measurable parameters which characterize them (temperature, humidity, ...) and sensors which can observe them.

I Lightweight ontology

Express the following knowledge.

I.1 Skeleton of the ontology

Create the following hierarchy of classes:

1. Nice weather and bad weather are 2 kinds of phenomena
2. Among bad weather phenomena are rain and fog
3. The Italian term “niebla” is a translation of the term fog
4. City, country and continent are kinds of locations
5. City and town are two synonyms
6. An instant can also be designated by the term “moment”
7. A weather observation is a specific observation
8. Another concept needed is “measurable parameter”

Add the following properties:

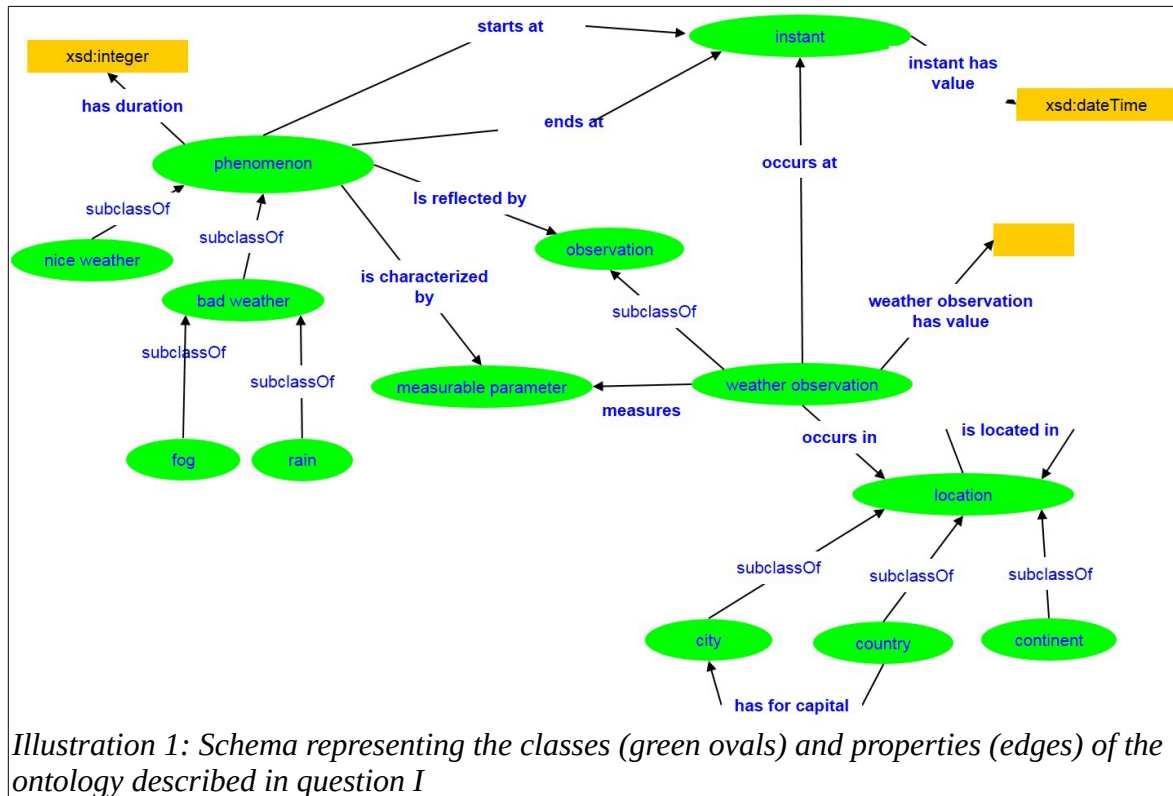
1. A phenomenon is characterized by measurable parameters
2. A phenomenon has a duration on the type xsd:integer.
3. A phenomenon starts at an instant
4. A country has a capital
5. A phenomenon is reflected by an observation

1 <http://protege.stanford.edu/>

2 <http://owl.cs.manchester.ac.uk/publications/talks-and-tutorials/protg-owl-tutorial/>

6. An instant is associated to a value defined by the type xsd:dateTime.
7. A weather observation is made at a specific instant
8. A weather observation is made in a location
9. A weather observation measures a measurable parameter
10. A weather observation has a value.
11. A location can be situated in another location

The schema of Illustration 1 summarizes the classes and properties that should be created.



I.2 Data description with the ontology

You will describe the following simple facts with the lightweight ontology you have designed. After representing each of the facts above, run the reasoner Hermit and analyze the deductions that were inferred. For each inferred fact, explain how the reasoner made this inference?

1. Ferrara is located in Italy
2. Italy has as capital Roma
3. Ferrara is a City
4. Temperature, hygrometry, pluviometry, atmospheric pressure and wind speed are measurable parameters
5. I1 has as dateTime value 2016-06-07T11:32:52
6. O1 measures (corresponding to the property “weather observation has value” in the figure) the value 3 of pluviometry in Ferrara at I1

7. P1 is reflected by O1

II Heavyweight ontology

II.1 Skeleton of the ontology

In the following, the Manchester syntax³ will be used for expressing new ontology axioms :

1. An instance of City can not be a Country
2. If a country has a capital city, this city is the capital of the country (use an inverse relation)
3. If a city is the capital of a country, this city is located in the country (define a sub-property)
4. A country has one and only one capital city (use the *Characteristics* of the property)
5. If location A is located in location B and B is located in the location C then A is located in C. (use the *Characteristics* of the property)
6. A short phenomenon is a phenomenon which lasts at most 15 minutes :
 1. create a sub-class of Phenomenon named ShortPhenomenon
 2. define that ShortPhenomenon is *EquivalentTo* : Phenomenon and (hasDuration⁴ some xsd:integer [<= 15])
7. A long phenomenon is a phenomenon which lasts at least 15 minutes
8. The rain is a phenomenon that is reflected by a pluviometry observation of whose value is greater than 0.

II.2 Ontology population

Add the following facts in the ontology that you have created above:

1. Italy is located in Europe
2. Italy has as capital the 'Capital of the World'
3. Monaco is a City and a Country
4. P1 has a duration of 10 minutes

Run the reasoner and indicate what facts were inferred :

- Is the ontology coherent? If not, remove the fact that introduces an incoherence.
- What does the reasoner know about Roma?
- What does the reasoner know about P1?

³ http://webont.org/owlled/2008dc/papers/owlled2008dc_paper_11.pdf

⁴ Name of the property defined in I.a.