Semantic Web

(KEN3140)

Assignment task overview

This assignment will assess your ability to construct an OWL ontology that captures knowledge about a domain of interest - A product Company. You can use Protege to build the ontology.

Learning objectives

1. How to construct an OWL 2 DL ontology (and to transfer what you have learned in this process within the "family relations" domain to another domain).
2. To assess which OWL features are suited to capture certain kinds of knowledge about a domain. I.e., to **accurately** capture knowledge about the domain using OWL semantics
3. To be able to judge whether two syntactically different axioms or class expressions represent the same knowledge (i.e., are semantically equivalent)
4. How to apply an ontology design pattern in the construction of ontologies
5. To be able to distinguish between classes, instances and object properties

Task description

Develop a product ontology for a car company.

Requirements of the ontology:

A. The ontology should have between 10-13 unique atomic classes, 7-10 unique atomic properties, and 7-10 unique individual names. Including:

 • Product (class representing company products)
 • Supplier (class representing product suppliers)
 • CarPart (class representing a certain kind of product that the company sells)
 • BelgianCity (class representing the set of cities in Belgium)
 • GermanCity (class representing the set of cities in Germany)
 • DutchCity (class representing the set of cities in the Netherlands)

- hasName (property enabling the assigning of names to entities e.g. products, suppliers..)
- hasPrice (property enabling the assigning of prices to products)
- hasSupplier (property enabling the assigning of suppliers to products)
- isLocatedIn (property enabling the assigning of geographic locations to suppliers)

While creating classes and properties, make sure you place them in the correct position in the hierarchy.

Some constraints that should be captured in the ontology:

1. Every product should have a unique name and a unique price

2. Every product has one or more suppliers, where each supplier can only be located in a city either in Belgium, the Netherlands or Germany

3. Each supplier has a unique name and is located in precisely one geographic location

4. Car parts are only sourced from Germany-based suppliers

Your task is to formulate OWL axioms to capture constraints 1 - 4 above. Try to represent each constraint using **one** OWL axiom if possible. If it is **not** possible to use a single axiom, state this and provide multiple axioms to capture the constraint. Assume for this task that all properties are **object** properties. You should use Protege syntax or Manchester OWL syntax.

B. **Define** the following additional classes using OWL axioms in Protege or Manchester syntax:
   - Chief Intelligence Officer (CIO),
   - Consultant,
   - Back-End Developer.

For **each** class, provide an English natural language definition of the term (you should put your natural language definition of each class in Annotation -> rdfs: comment), then the OWL axiom which captures the intended meaning of this definition. Create a new class and object property names as desired for the task. Your definitions should **satisfy the following criteria:**

- Each definition should make use of at least one object property
- At least one of the definitions should make use of conjunction
- At least one of the definitions should make use of negation

Material to Hand in

Your assignment is due on **16 October 2022 at 23:59**. Upload **only** the following file to Canvas under Assignments -> Assignment 3:

A single **.owl** file which is your ontology saved from your workspace. The **.owl** file has to be represented using valid Manchester OWL Syntax and again named with **your student ID only "your-student-id.owl".**

Grading criteria

We will assess the design of your ontology on a number of criteria directly related to the Learning Objectives of the assignment. I.e., we will assess to what extent you have demonstrated that you have achieved or mastered the learning objectives in the formulation of your OWL axioms, class expressions and constraints.

Please make sure to follow the assignment instructions carefully and meet all the requirements!

Helpful resources

1. KEN3140 Lectures 7 - 9 slides (Canvas/Github)
2. KEN3140 Labs 7 - 9 slides and materials (Canvas/Github)
3. Reading material: Semantic Web for the Working Ontologist (Chapters 1 - 7)
4. OWL W3C specification pages

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Important information

1. **Warning:** The assignment may look easy but it is not. If you start with the development of the ontology only the day or so before the deadline, there is a high probability that you will fail this assignment.
2. Your ontology will be of a higher quality if you start thinking about it at least a week before the deadline and you develop it over an extended period before the deadline
3. Think about what knowledge you want to capture first. Write out your axioms in plain English (or whatever your mother tongue is) and think about the semantics of OWL expressions and be careful about selecting the correct expressions to most accurately capture the meaning of the statements you need.