Towards a Methodology for Reusable Ontology Engineering: Application to the Process Engineering Domain

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Abstract

This work presents a methodological framework for re-using available ontologies as well as developing ontologies with reusability in mind. The presented methodology builds upon existing methodologies already proven in practice and systemise experience from developing ontologies in the domain of chemical engineering.

Keywords

Ontological Engineering, Methodology, Ontology Reuse

Methodology Outlook

Define Domain and Application

Most existing methodologies agree upon the first step. This might include:

- competency questions
- market research
- user interaction or
- simply input from domain experts and stakeholders

Competency questions are a useful tool for ontology engineering but can be replaced by user requirements.

Consider Re-Using Existing Ontologies

- Identify existing ontologies that define the same or similar domains.
- Existing ontologies are available in the literature and on libraries such as Watson and Swoogle.

- <http://watson.kmi.open.ac.uk/WatsonWUI/>
- <http://swoogle.umbc.edu/>

Identify Existing Sources

Even if there are not any available ontologies for reuse, there are other sources of that bear useful and most importantly structured information. These are:

- existing classifications
- domain vocabularies
- industrial standards and
- mark-up language specifications

Identify Terminology

- Commonly used step.
- Term identification is performed either manually or automatically.
- Automatic term extraction takes advantage of term extraction software such as TerMine.

<http://www.nactem.ac.uk/software/termine/>

Define the Classes

- Once terminology has been defined, terms representing classes should be organised into groups and also in a hierarchical manner.
- This step forms the initial structure of the ontology and also creates distinct modules.
- There are four suggested approaches for this step:

Define the Properties

- Derived from the identified terms.
- Dictated by the application requirements
- Starting from the top level of the ontology.
- Taking advantage of inheritance.

Re-Consider Re-Using Existing Ontologies

At this stage, reusing existing ontologies step is revisited, aiming to:

- Identify supplementary ontologies
- E.g. units of measurement, geographical information etc.

Create Namespaces

- Meaningful namespaces.
- Facilitates modularisation of ontology.
- Reduces effort for reusability.
- Facilitate sharing and reusing ontologies.

Namespace Prefix	URI
ex	http://www.watson.kmi.open.ac.uk/WatsonWUI/
owl	http://www.w3.org/2002/07/owl
geo	http://www.w3.org/2003/01/geo
unit	http://www.w3.org/2003/01/unit

ex:process	ex:process
ex:unit	ex:unit
ex:geo	ex:geo
ex:owl	ex:owl
ex:unit	ex:unit
ex:geo	ex:geo
ex:owl	ex:owl

Define Restrictions

Restrictions on properties are:

- application specific
- essential in applications that require inference of the ontology

ex:process	ex:process
ex:unit	ex:unit
ex:geo	ex:geo
ex:owl	ex:owl
ex:unit	ex:unit
ex:geo	ex:geo
ex:owl	ex:owl

Annotate the Ontology

Annotation of the ontology has a two-fold purpose.

- Enable the application – i.e. concept names and application information
- Enable reuse – i.e. by providing synonyms and explanations for concepts

Property	Value	Unit
ex:process	ex:process	ex:process
ex:unit	ex:unit	ex:unit
ex:geo	ex:geo	ex:geo
ex:owl	ex:owl	ex:owl
ex:unit	ex:unit	ex:unit
ex:geo	ex:geo	ex:geo
ex:owl	ex:owl	ex:owl

Conclusions

MetRon is a methodology for ontology engineering that focuses on developing ontologies that can be reused without compromising their usability