Linguistic Information for Multilinguality in the SEMbySEM Project

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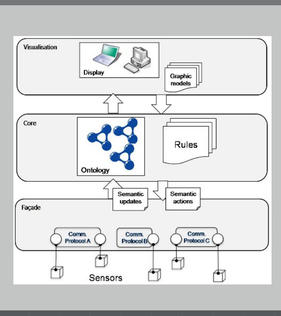
Motivation

What are the best practices for implementing the Ontology ↔ Lexicon interface?

Introducting the SEMbySEM project ...

- framework for universal sensor management using semantic representations.
- Knowledge representation and management:
  - MicroConcept semantic model: based on MOF 2 or OWL 2 metamodels (not fixed yet)
  - needs mulitingual linguistic information:
    - on the conceptual level (*Core Layer*)
    - on the GUI or visualisation level (*Visualisation Layer*)



Linguistic information for ontologies – 2 recent best practices:

- LIR, the Linguistic Information Repository.
  - developed within the NeOn project: http://www.neon-project.org/
- LexInfo
  - http://lexonto.ontoware.org/lexinfo

What LIR and LexInfo have in common:

- domain knowledge and linguistic information are clearly separated while ...
- articulation between language and ontological systems remains flexible.
- address multilingual aspects,
- linguistic information is represented as *lexical ontologies* in OWL,
- build on the LMF ISO standard (Lexical Markup Framework: http://www.lexicalmarkupframework.org/).

Linking domain and lexical knowledge with LIR and LexInfo

1. Starting from the domain ontology (in OWL) ...
2. the system builds an empty or default lexical ontology
   - main building blocks are *lexical entries* ∼ ontology components (classes and properties)
   - *ontology elements* are linked to *lexical entries*
   - *lexical entries* are associated to the corresponding ontology elements.
   - *lexical entries* are constructed based on linguistic analysis of the domain ontology labels, comments and/or identifiers.
3. The lexicon is enriched (semi-)automatically using domain relevant texts and/or external lexical resources (*eg.* WordNet, Wikipedia) to search for further information (*eg.* definitions, translations).
4. The lexical ontology is further completed manually.

Example: representing lexical information with LIR

Class oriented

xml representation of a class *train*:

```
<owl:Class rdf:about="ontologyNS#Train">
  <rdfs:label xml:lang="fr">Train</rdfs:label>
  <rdfs:comment xml:lang="en">Train</rdfs:comment>
</owl:Class>
```

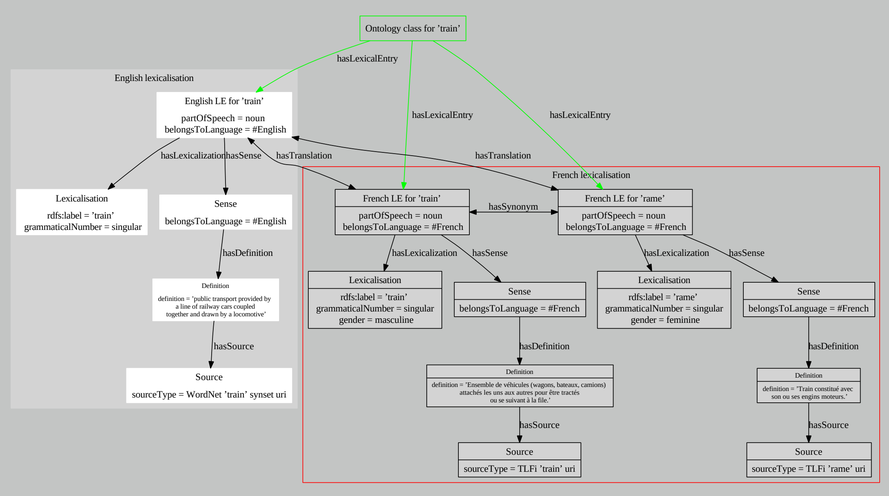
Example: representing lexical information with LexInfo

Property oriented

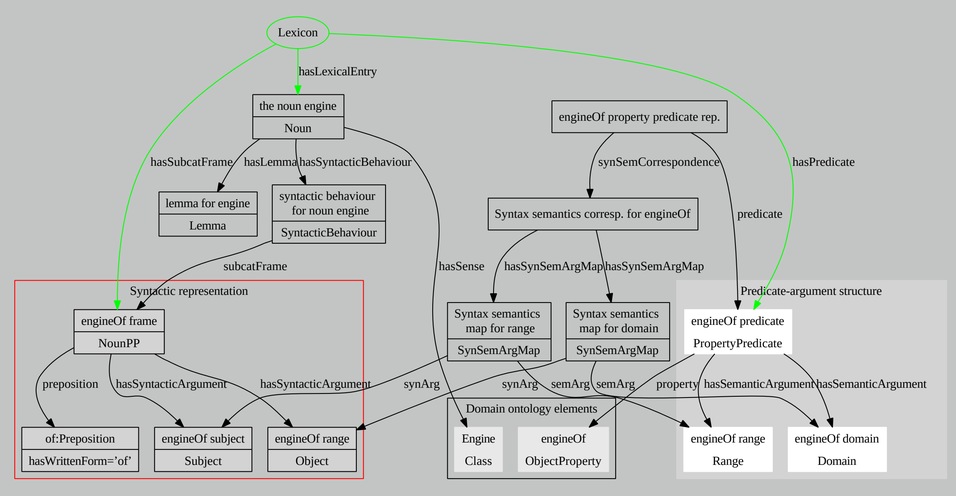
xml representation of a property *engineOf*:

```
<owl:ObjectProperty rdf:about="ontologyNS#engineOf">
  <rdfs:domain rdf:resource="ontologyNS#Engine"/>
  <rdfs:range rdf:resource="ontologyNS#Train"/>
</owl:ObjectProperty>
```

Linguistic representation with LIR



Linguistic representation with LexInfo



Localisation:

- on lexical entry (LE) level
- English and French LEs are connected through *hasTranslation* relation.

⇝ LEs for all languages in one lexicon.

Localisation:

1. build English lexicon as shown in example.
2. build lexica for other languages.

⇝ one lexicon for each language.

Summing up:

- more object/class oriented
- emphasis on traditional lexicographic representations
- can represent near-synonymy across languages
- can represent senses using external cross-language resources
- more suitable for human knowledge engineers

Summing up:

- more relation/property oriented,
- emphasis on syntax ↔ semantics interface
- more suitable for automatic approaches

Conclusions – What we learned

- domain and lexical ontology should be separated,
- LIR and LexInfo show different ways to do it,
- not yet completely operational, but many useful best practices.

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