How to represent cross-lingual LD links

This card explains the basic mechanisms to represent links between linked data in different natural languages.

Target audience

Data publishers and developers with basic acquaintance of RDF and LD who need to interlink data in different languages in the linked data cloud.

Scope

The card reviews the different types of cross-lingual LD links. It does not discuss the methods/techniques needed to infer the links, but deals with representation mechanisms only. This card extends the card "How to publish Linguistic Linked Data".

Core concepts

Cross-lingual mappings can be established at two different levels: **conceptual level** and **linguistic level**. In the first case, links are established between ontology entities (classes, properties or individuals) documented in different languages. In the second case, the relation is established directly between the lexical realisation of such entities. The two figures on the right show cross-lingual links on the two conceptual and linguistic levels, that we detail in the next page.
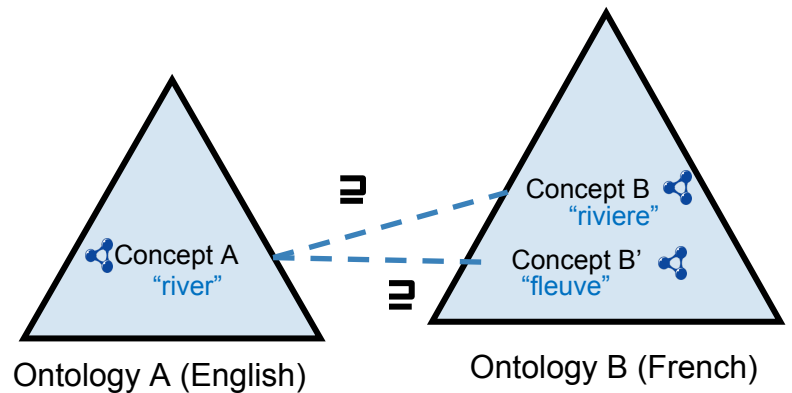

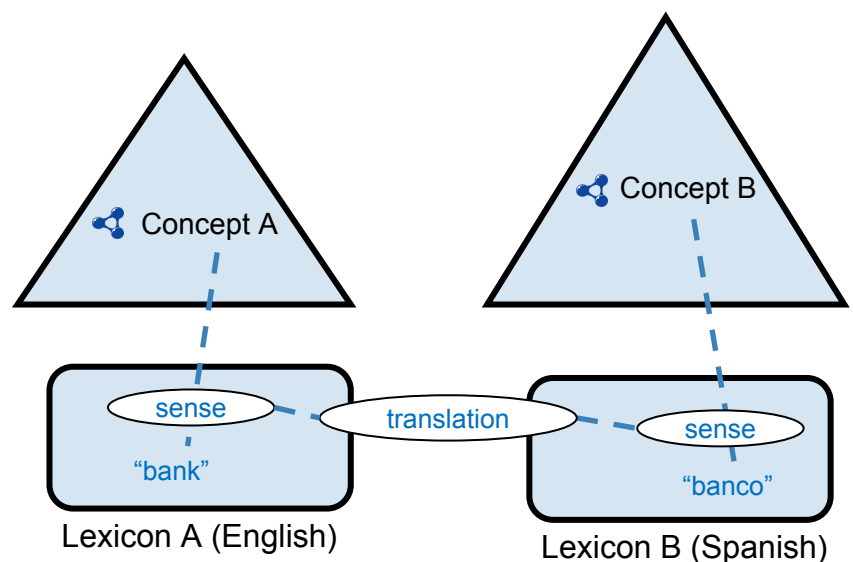*Fig.1: Example of cross-lingual mapping at the conceptual level*

Fig.2: Example of cross-lingual mapping at the lexical level

Cross-lingual links at the conceptual level

1. Identity links
USE: owl:sameAs
WHEN: The linked entities represent exactly the same thing
EXAMPLE:
```
ontology1:Banco rdfs:label "banco"@es ;
ontology2:Bank rdfs:label "bank"@en ;
ontology1:Banco owl:sameAs ontology2:Bank .
```

2. Soft links
USE: rdfs:seeAlso, skos:closeMatch, skos:exactMatch, …
WHEN: The linked entities are not exactly the same thing; or they are the same but dealing with the strong logical implications of owl:sameAs is not desired
EXAMPLE:
```
ontology1:Banco rdfs:label "banco"@es ;
ontology2:Banking rdfs:label "Banking"@en ;
ontology1:Banco rdfs:seeAlso ontology2:Banking .
```

3. Taxonomical relations
USE: rdfs:subClassOf, skos:broader, ...
WHEN: linked entities are related taxonomically (see Fig.1)
EXAMPLE:
```
ontology1:Riviere rdfs:label "riviere"@en .
ontology2:River rdfs:label "river"@en .
ontology1:Riviere
    rdfs:subClassOf ontology2:River .
```

4. Domain dependent relations
USE: properties coming from domain ontologies.
WHEN: languages for describing vocabularies (OWL, RDFS, SKOS, …) do not suffice for representing the particular relation.
EXAMPLE:
```
ontology1:Russia rdfs:label "Russia"@en .
ontology2:Москва rdfs:label "Москва"@ru .
ontology1:Russia
    dbpedia-owl:capital ontology2:Москва .
```

5. Linkage by using common background knowledge
USE: links to external sources of background knowledge (e.g., BabelNet, DBpedia, a common lemon lexicon, …)
WHEN: related ontology entities are linked to a common external ontology, dataset or lexicon, which can be used as pivot for inferring a relation between such ontology entities.
EXAMPLE:
```
:bench-en a lemon:LexicalEntry ;
    lemon:form [lemon:writtenrep "bench"@en] .
:bench-en-sense_1 a lemon:LexicalSense ;
    lemon:isSenseOf :bench-en ;
    lemon:reference ontology1:bench .
:bench-en-sense_2 a lemon:LexicalSense ;
    lemon:isSenseOf :bench-en ;
    lemon:reference ontology2:banco.
```

Cross-lingual links at the lexical level

6. Implicit translations
USE: *lemon*
WHEN: Entities in the ontology point to lexical entries in different monolingual lexicons. If lexical entries in different lexicons share the same (or equivalent) ontological referent, a translation can be inferred between them.
EXAMPLE:
```
:lexiconEN lemon:term :bench-en .
:bench-en a lemon:LexicalEntry ;
    lemon:form [lemon:writtenrep "bench"@en] .
:lexiconES lemon:term :banco-es .
:banco-es a lemon:LexicalEntry ;
    lemon:form [lemon:writtenrep "banco"@en] .


:bench-en-sense a lemon:LexicalSense ;
    lemon:isSenseOf :bench-en ;
    lemon:reference ontology1:bench .
:banco-es-sense a lemon:LexicalSense ;
    lemon:isSenseOf :banco-en ;
    lemon:reference ontology1:bench.
```

7. Explicit translations
USE: *lemon* and the *lemon* translation module
WHEN: lexical information of the ontologies is represented in external lexicons and explicitly declared translations want to be declared (e.g., to attach further information such as provenance, confidence degree, etc.) (see Fig. 2).
EXAMPLE:
```
:bench-en-sense a lemon:LexicalSense ;
    lemon:isSenseOf :bench-en ;
    lemon:reference ontology1:bench .
:bench-en a lemon:LexicalEntry ;
    lemon:form [lemon:writtenRep "bench"@en] .
:banco-es-sense a lemon:LexicalSense ;
    lemon:isSenseOf :banco-es ;
    lemon:reference ontology2:banco .
:banco-es a lemon:LexicalEntry ;
    lemon:form [lemon:writtenRep "banco"@es] .
:bench_banco-trans a tr:Translation ;
    tr:translationSource :bench-en-sense ;
    tr:translationTarget :banco-es-sense .
```

Links

lemon: http://lemon-model.net/
lemon translation module: http://purl.org/net/translation

Ontology Engineering Group

mylider