TEI and LEMON: a comparative study on the lexical encoding and interoperability

Jack Bowers, Thierry Declerck

TEI and LEMON: a comparative study on the lexical encoding and interoperability

Jack T. Bowers[1], Thierry Declerck[2]

1: Austrian Centre for Digital Humanities;
2: DFKI GmbH, Saarland University

Components Covered

2 Core
- **2.1 Lexical Entries**
- **2.2 Forms**
- **2.3 Semantics**
- **2.4 Lexical Sense & Reference**
- **2.5 Usage**
- **2.6 Lexical Concept**

3 Syntax and Semantics (synsem)
- *3.1 Syntactic Frames*
- *3.2 Ontology Mappings*
- *3.3 Complex ontology mappings / submappings*
- *3.4 Conditions*

4 Decomposition (decomp)
- **4.1 Subterms**
- **4.2 Components**
- *4.3 Phrase structure*

5 Variation & Translation (vartrans)
- ***5.1 Lexico-Semantic Relations***
- **5.2 Translation**
  - 5.2.1 Translation as shared reference
  - 5.2.2 Translation as a relation between lexical senses
  - 5.2.3 Translatable As

7 Linguistic Description
- 7.1 Morphosyntactic Description
- 7.2 Pragmatic & Paradigmatic Description
- 7.3 Arguments
- 7.4 Frames

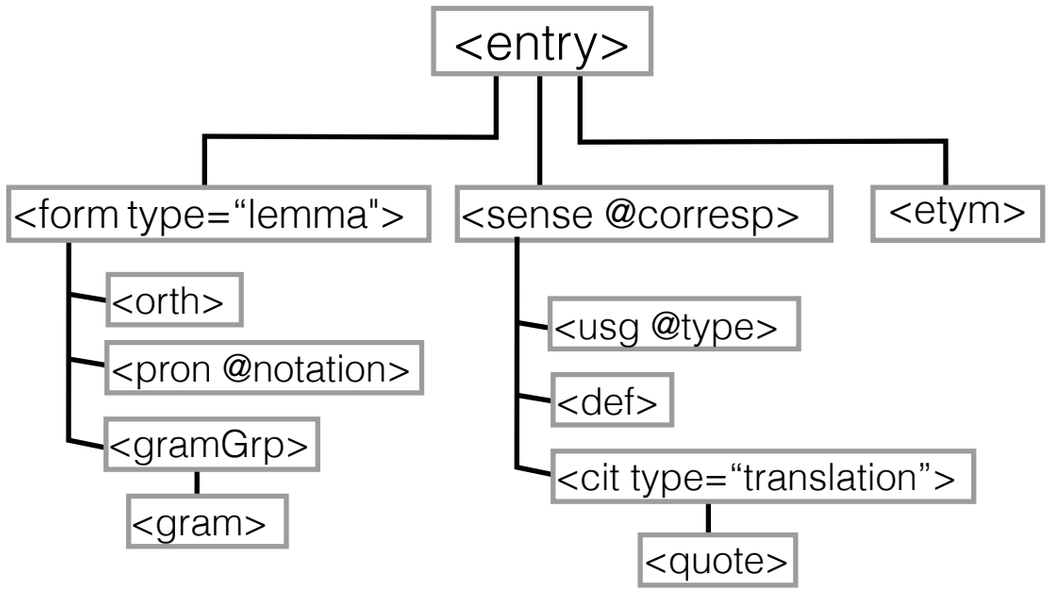
8 Lexical Nets
- 8.1 Lexical nets in lemon

-Core: (list specifics)
-Decomposition
-VarTrans
-(SynSem)
-Linguistic Description
- Not covering LIME:

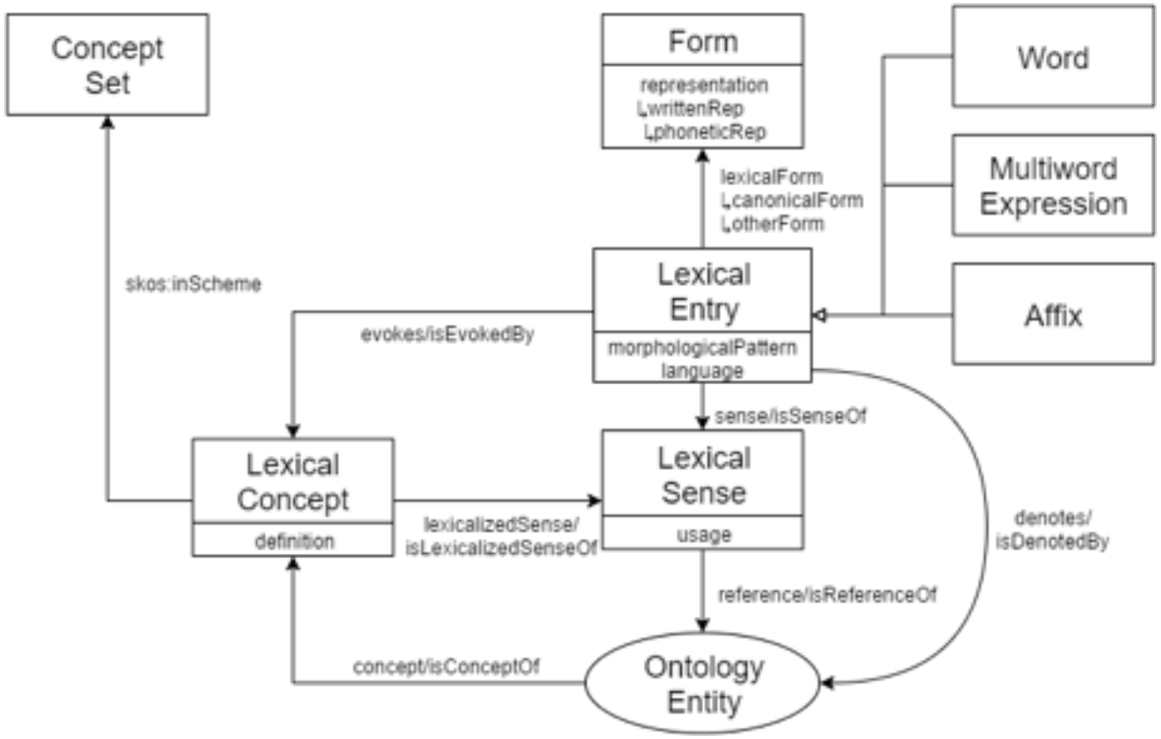
Fundamental Differences

- TEI is a hierarchical structure (reflecting XML basis)
- LEMON (Lexicon Model in Ontologies) is non-hierarchical, modular series of linked nodes/edges (*reflecting RDF basis*)
  - ONTOLEX (Core module)
  - Decomp
  - SynSem
  - VarTrans
  - Lime (Metadata)
- Whereas LEMON was originally made for LOD, TEI is adapting to it adhoc mostly within existing constructs

Fundamental Differences



LEMON/ONTOLEX Core Model



https://www.w3.org/community/ontolex/wiki/Final_Model_Specification

Basic Parallels

Cannonical Form:

```
<entry xml:id="rabenschwarz">
:Stachel_form
  rdf:type ontolex:Form ;
  ontolex:writtenRep "Stachel"^^rdf:langString ;
```

Lexical Entry type:

```
<form type="MultiWordExpression">
rdf:type ontolex:MultiWordExpression ;
```

ISO language tag:

```
xml:lang="de"
dcterms:language <http://id.loc.gov/vocabulary/iso639-2/de> ;
```

Definition:

```
<def>
skos:definition
```

Phonetic & Orthographic Representations

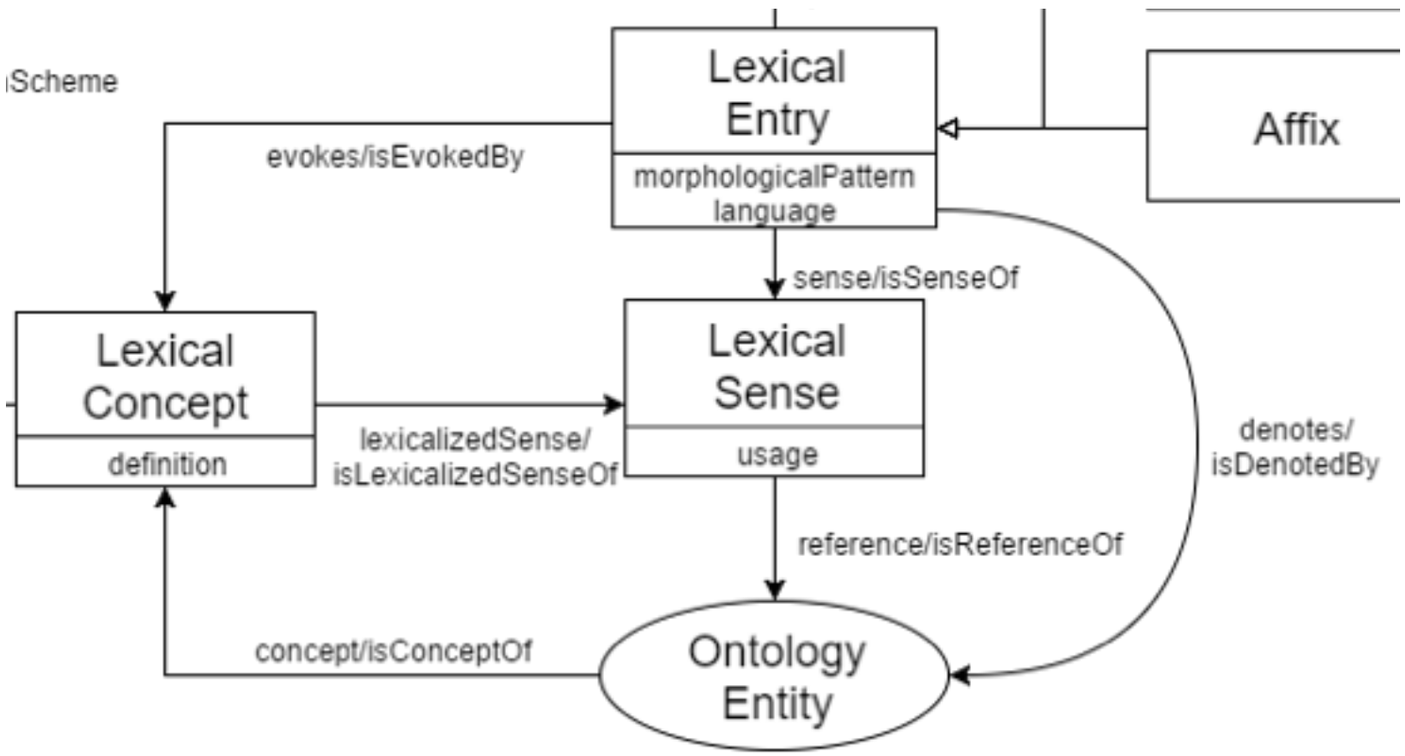
Ontolex/Lemon in .ttl syntax

```
:lex_privacy a ontolex:LexicalEntry;
ontolex:form :form_privacy.

:form_privacy a ontolex:Form;
ontolex:writtenRep "privacy"@en;
ontolex:phoneticRep "ˈpɹɪv.ə.si"@en-US-fonipa;
ontolex:phoneticRep "ˈpɹaɪ.və.si"@en-GB-fonipa.
```

```
<entry xml:id="privacy-id1">
  <form type="lemma">
    <pron xml:lang="en-US-fonipa">'pɹaɪ.və.si</pron>
    <pron xml:lang="en-GB-fonipa">'pɹɪv.ə.si</pron>
    <orth xml:lang="en">privacy</orth>
  </form>
</entry>

<!-- TEI option 2 -->
<entry xml:id="privacy-id2">
  <form type="lemma">
    <pron xml:lang="en-US" notation="ipa">'pɹaɪ.və.si</pron>
    <pron xml:lang="en-GB" notation="ipa">'pɹɪv.ə.si</pron>
    <orth>privacy</orth>
  </form>
</entry>
```

Linking Sense to Ontologies: Lemon/Ontolex

One of the most usefull aspects of the system is the dynamic ability to represent semantic information with regard to a ontology



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Linking to Ontologies in TEI

Defining the lexical sense in terms of an external ontology can be done in several ways:

- <sense @corresp>, <ref @target>, <usg type="dom" @corresp>

e.g.

```
<sense corresp="http://dbpedia.org/resource/Porcupine">
<usg type="dom" corresp="http://dbpedia.org/resource/Animal">Tier</usg>
<ref type="sense" corresp="http://dbpedia.org/resource/Pig"/>
```

- OR using feature structures as external URI concept repository, can be referenced using tag defined in <prefixDef>

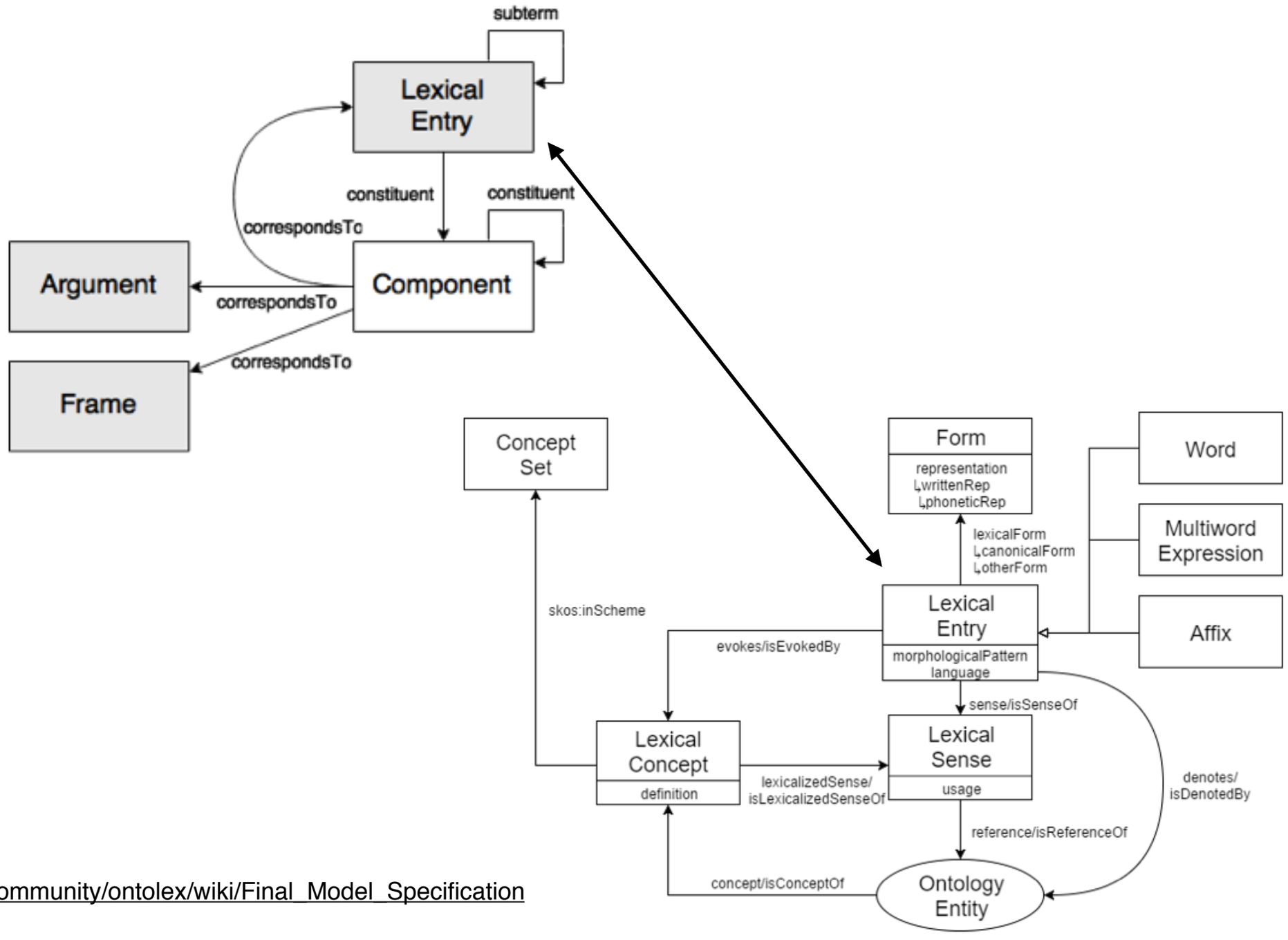
e.g.

```
<encodingDesc>
  <listPrefixDef>
  <prefixDef ident="concept"
        matchPattern="([A-Z]+)"
        replacementPattern="concept-features-tei.xml#$1">
    ....
  </prefixDef>
```

```
<fs type="concept" xml:id="Schwein">
  <f name="term">
    <string xml:lang="de">Schwein</string>
  </f>
  <f name="conceptURL" corresp="http://dbpedia.org/resource/Pig"/>
</fs>
```

```
<sense corresp="concept:Schwein">
```

Decomposition: ONTOLEX & DECOMP



https://www.w3.org/community/ontolex/wiki/Final_Model_Specification

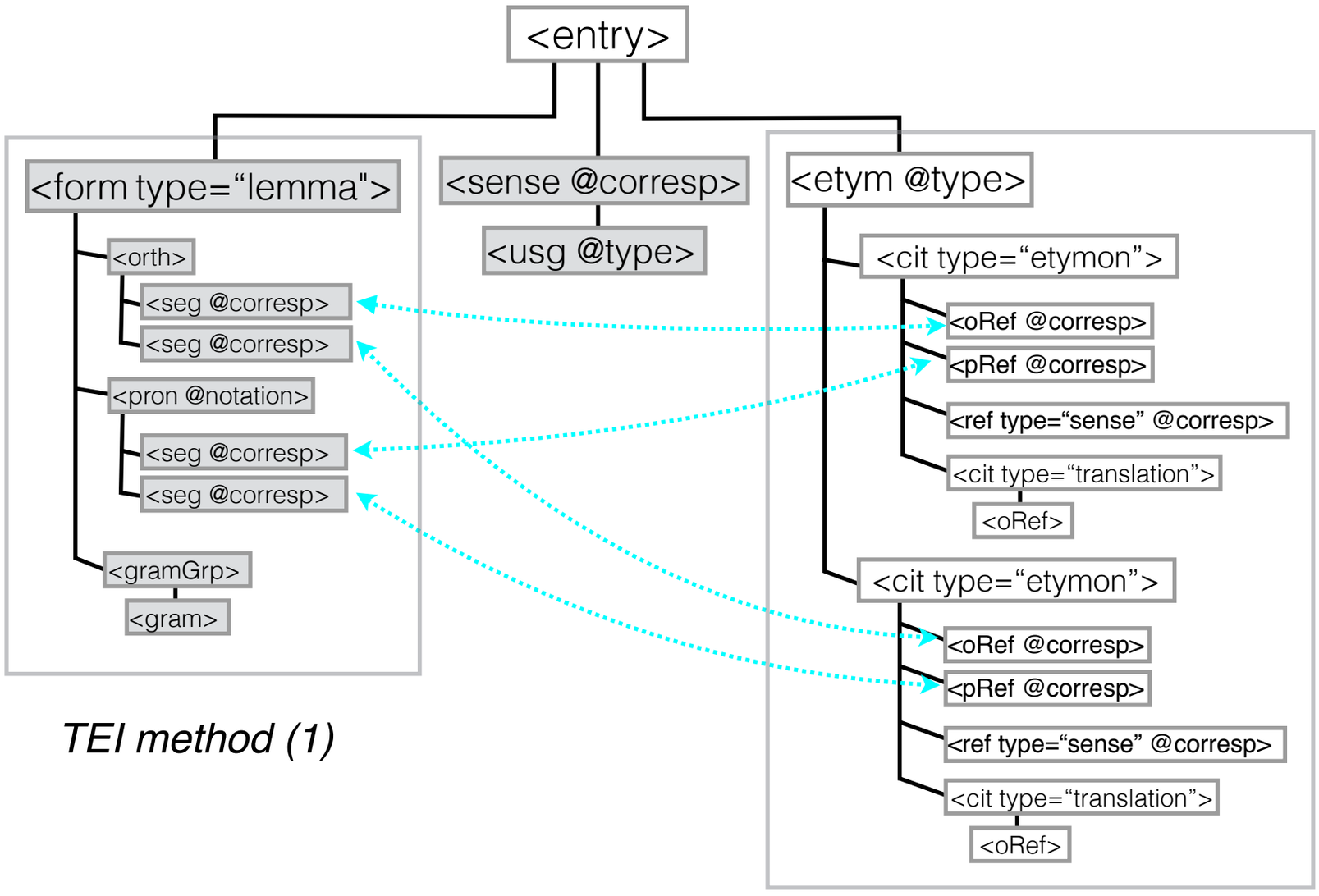
Decompositon of Compounds LEMON/DECOMP

Each component of compound identified and linked to individual lexical entry and sense

```
:Stachelschwein_lex
  rdf:type ontolex:MultiWordExpression ;
  dcterms:language <http://id.loc.gov/vocabulary/iso639-2/de> ;
  lexinfo:gender lexinfo:neuter ;
  lexinfo:partOfSpeech lexinfo:noun ;
  rdf:_1 :Stachel_comp ;
  rdf:_2 :schwein_comp ;
  <http://www.w3.org/ns/lemon/decomp#constituent> :Stachel_comp ;
  <http://www.w3.org/ns/lemon/decomp#constituent> :schwein_comp ;
  <http://www.w3.org/ns/lemon/decomp#subterm> :Schwein_lex ;
  <http://www.w3.org/ns/lemon/decomp#subterm> :Stachel_lex ;
  ontolex:canonicalForm :Stachelschwein_form ;
  ontolex:sense :Porcupine_sense_1 ;
.
:Stachel_comp
  rdf:type <http://www.w3.org/ns/lemon/decomp#Component> ;
  lemon:sense :Spine_sense_1 ;
  <http://www.w3.org/ns/lemon/decomp#correspondsTo> :Stachel_lex ;
.
:schwein_comp
rdf:type <http://www.w3.org/ns/lemon/decomp#Component> ;
  lemon:sense :Pig_sense_1 ;
  <http://www.w3.org/ns/lemon/decomp#correspondsTo> :Schwein_lex ;
```

Decomposition of Compounds in TEI

**etymology structure according to proposals from Bowers & Romary (2016)*



TEI method (1)

TEI method (2)

<p/oRef> @corresp points to entry of etymon/compound component

<ref type="sense"> @target points to ontological entry corresponding to conceptual sense of etymon

Decomposition of Compounds in TEI

TEI: 2 ways

1) Segmentation of <orth> or <pron>;
e.g. using <seg>

```
<form type="lemma">
  <orth>
    <seg xml:id="d1e155" corresp="#Stachel">Stachel</seg>
    <seg xml:id="d1e157" corresp="#Schwein">schwein</seg>
  </orth>
  <gramGrp>
    <pos>noun</pos>
    <gen>neut</gen>
  </gramGrp>
</form>
```

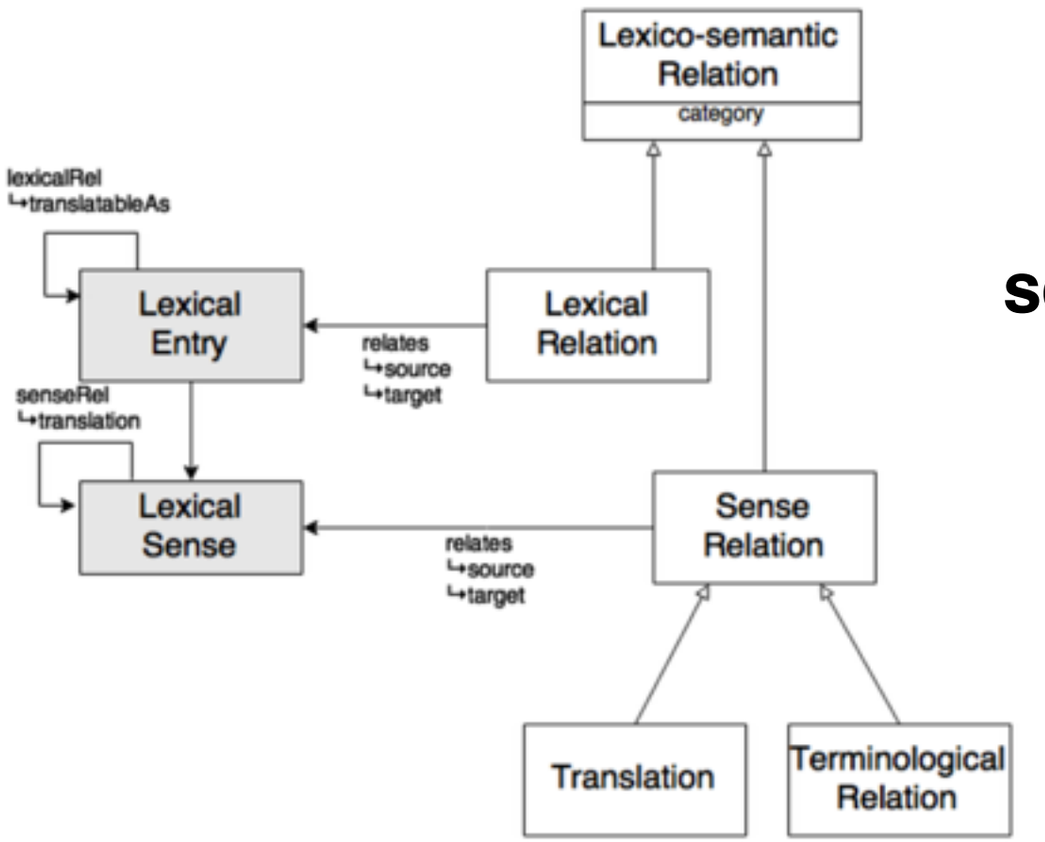
./entry[@xml:id="Stachel"]

./entry[@xml:id="Schwein"]

2) Within <etym>; *Bowers & Romary (2016)*

```
....
<etym type="compounding">
  <etym type="metonymy">
    <cit type="etymon" corresp="#d1e155">
      <oRef>Stachel</oRef>
      <cit type="translation" xml:lang="en">
        <oRef>spike</oRef>
      </cit>
      <ref type="sense" corresp="http://dbpedia.org/page/Spine_(zoology)"/>
    </cit>
    <note xml:lang="en">salient feature of their physical anatomy is their spikes</note>
  </etym>
  <etym type="metaphor">
    <cit type="etymon" corresp="#d1e157">
      <oRef corresp="#Schwein">Schwein</oRef>
      <cit type="translation" xml:lang="en">
        <oRef>pig</oRef>
      </cit>
      <ref type="sense" corresp="http://dbpedia.org/resource/Pig"/>
    </cit>
  </etym></etym>
```

Lemon:Variation & Translation (VarTrans)



lexicalRelation:
e.g. initialisms, derivational, morphosyntactic…

senseRelation:

TerminologicalRelation:
e.g. hypernymy and hyponymy relations, synonymy, antonymy,

```
:Porcupine_sense_1
  rdf:type ontolex:LexicalSense ;
  lexinfo:hypernym :Animal_sense_1 ;
  ontolex:isSenseOf :Stachelschwein_lex ;
  ontolex:reference <http://dbpedia.org/page/Porcupine> ;
```

TranslationRelation:
e.g. translations

https://www.w3.org/community/ontolex/wiki/Final_Model_Specification

Variation & Translation (VarTrans)

How to express **sense relations** in TEI?

<usg @type="synonym" corresp="#entryid">
<usg @type="antonym" corresp="#entryid">
<usg @type="holonym" corresp="#entryid">
<usg @type="meronym" corresp="#entryid">

Summary / Comparisson

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- TEI better for encoding and annotation
- Extended etymological classification
- Better for/closer to scholars

Advantages to ONTOLEX?

- ONTOLEX better for interlinking
- easier reuse of other existing vocabularies
- Better for/closer to programmers/data scientists