Compound dictionary extraction and Wordnet A dangerous liaison?

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PARSEME WG3

Object of study

- We focus on ways of automatically retrieving compound dictionaries from sentence-aligned corpora using WordNet for the pair of languages German→Spanish.
- German→Spanish compound correspondences are of the type 1:n:

(1)

Warm	*Wasser*	*Bereitung*
caliente	agua	preparación
warm	water	production

[ES]: ‘Preparación de agua caliente’

[EN]: ‘Warm water production’

(2)

Wärme	*Rückgewinnung*	*s*	*Systeme*
calor	recuperación	Ø	sistemas
heat	recovery	Ø	Systems

[ES]: ‘sistemas de recuperación de calor’

[EN]: ‘heat recovery systems’

- The ultimate aim is to integrate the extracted compound dictionaries in Statistical Machine Translation (SMT) tasks.

Gold Standard

Our Gold Standard consists of 168 compounds and their translations:

- They were extracted from the TRIS corpus [1], a specialised German→Spanish corpus.
- All compounds were split and tagged with their corresponding Part-of-Speech (PoS) tags [2].
- All translation correspondences were also PoS tagged [2].
- If a compound had several translation correspondences, each was stored as a different entry in the Gold Standard.

Compound-phrase matching

1. Given a split German compound C, there is a list of lemmas $C = [c_0, ..., c_n]$.
2. Given a Spanish sentence aligned to the German sentence that contains C, there is a list of lemmas $S = [s_0, ..., s_n]$.
3. Be $type(x)$ a function that retrieves the semantic type of a word, obtained from Wordnet.
4. For each German compound, Spanish sentence pair (C,S):
   (a) Locate the translated root of C in S by finding a lemma s_x in S with a semantic type that matches the root of the compound, i.e. $type(s_x) = type(c_n)$.
   (b) Locate the rightmost word in the Spanish phrase that translates C by finding a lemma s_y in S with a semantic type that matches the first lemma of the compound, i.e. $type(s_y) = type(c_0)$.
   (c) The candidate Spanish phrase that translates C is the span of words defined as $[s_x, ..., s_y]$.

Challenges faced

- PoS taggers: More damaging on the Spanish side when not locating phrase roots.
- WordNet coverage.
- Manual semantic matching:
  GermaNet has a potentially useful adjective classification that maps unevenly to the Spanish WordNet.

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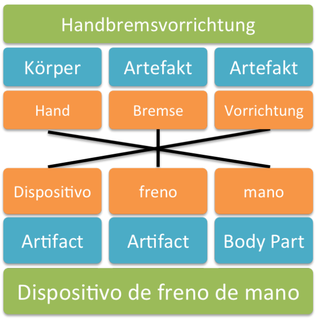
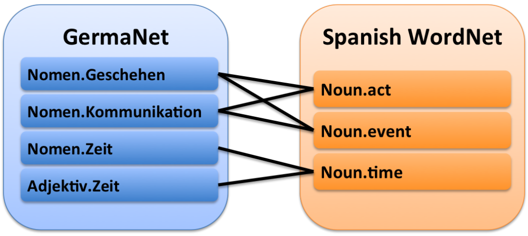
Working hypothesis: semantic types mapping

Our working hypothesis is that different formants of a compositional compound will share semantic features with their corresponding translational equivalents:



DE → ES semantic matching

- The semantic type matching had to be done manually.
- There are n:n and n:1 correspondences because GermaNet and the Spanish Wordnet do not share a common list of semantic types:



Matching metrics

We tested whether our hypothesis held for our Gold Standard:

	Number of items	Percentage
Total Pairs	168	100%
Perfect coverage pairs	93	55%
Perfect coverage German	46	27%
Perfect coverage Spanish	13	8%
WN coverage error on both	16	10%
Missing German roots	18	11%
Missing Spanish roots	19	11%

Conclusion and future work

- Expand the Gold Standard.
- Evaluate the PoS tagger and identify sources of error that might be avoided. Eventually test other PoS taggers.
- Redefine the $type(x)$ function to make it not only dependent on the first listed sense of each WordNet.
- Align semantic classes automatically using word-alignment techniques, or using the English WordNet as a pivot.
- Use supervised machine learning to predict Spanish phrase spans from the German compounds.

References

[1] Carla Parra Escartín, *Design and compilation of a specialized Spanish-German parallel corpus*, Proceedings of the Eight International Conference on Language Resources and Evaluation (LREC'12) (Istanbul, Turkey), European Language Resources Association (ELRA), May 2012, pp. 2199–2206 (English).

[2] Helmut Schmid, *Probabilistic Part-of-Speech Tagging Using Decision Trees*, International Conference on New Methods in Language Processing (Manchester, UK), 1994, pp. 44–49.