Is there a way to represent metaphors in WordNets? Insights from the Hamburg Metaphor Database

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Abstract

This paper addresses the question whether metaphors can be represented in WordNets. For this purpose, domain-centered data is collected from the Hamburg Metaphor Database, an online source created for the study of possible metaphor representations in WordNets. Based on the results of the analyses of French and German corpus data and EuroWordNet, the implementation problem is discussed. It can be shown that a much more complete representation of synsets and relations between synsets in the source domain as well as a clearer indication of the level of figurativity for individual synsets are needed before global conceptual metaphors can be dealt with in WordNets.

1 Introduction

Based on corpus analyses of the Italian lexemes *colpire* and *colpo* (Alonge and Castelli, 2002a) and *arrivare* and *separarsi* (Alonge and Castelli, 2002b), Alonge and Castelli note that some important metaphorical senses of these lexemes are not covered by ItalWordNet, a further development of the Italian part of the lexical database EuroWordNet (EWN) (Vossen, 1999). They claim that metaphorical data should be added to WordNets on two different levels, or in two different ways:

1. Missing figurative senses, which turn out from the corpus analyses, can be added directly as new synsets (sets of semantically equivalent words, cf. Vossen (1999, 18)).
2. "Pre-existent knowledge which constrains our possibility to produce and/or understand novel metaphoric expressions" (Alonge and Castelli, 2002b, 1951) should be encoded at a higher level, because this knowledge concerns not only single synsets, but whole conceptual domains.

Alonge and Castelli work in the framework of conceptual metaphors introduced by Lakoff and Johnson (1980). They think that the most appropriate level for representing conceptual knowledge which underlies systematic metaphors is a level similar to the Inter-Lingual-Index (ILI) in EuroWordNet (EWN). This index is an unstructured fund of concepts providing the mapping across languages (cf. Vossen (1999, 39)). A special case of an ILI entry is a so-called composite ILI-record, by which regular polysemy can be covered (cf. Vossen (1999, 40–43)). For example, the fact that the lexeme *university* can refer to a building as well as to an organization is represented by a composite ILI, and this polysemy extends to all other lexemes ("literals" in EWN terminology) which are members of the respective synsets. During the construction of EWN, language-independent composite ILIs were used, and overgenerated polysemic relations had to be deleted for each individual language. In order to reduce such overgeneration, Alonge and Castelli propose to add composite indexes similar to composite ILIs to each individual WordNet instead of defining general ILIs for WordNets in all languages, and to use this composite index also for representing regular polysemy caused by conceptual metaphors (cf. Alonge and Castelli (2002b, 1952)).

In this paper, we present some broader analyses using the current online data of the Hamburg Metaphor Database[1] described in (Eilts and Lönneker, 2002). The Hamburg Metaphor Database (HMD) contains corpus examples in French and German as well as synsets from EWN to which the metaphorically used lexemes belong, and labels for source and target domains of the metaphors in two different naming systems. EWN synsets are split into two groups in HMD: Those that already have a figurative meaning in the respective WordNet (French or German EWN), and those that contain the metaphorically used lexeme in its literal meaning. Query parameters include the synsets and the annotated source and target domains of the metaphor as well as the language of the corpus example. The aim of HMD is to study the possibility of systematically representing information on metaphors and potential metaphorical mappings in WordNets (cf. Eilts and Lönneker (2002, 100–101)).

Taking advantage of the domain based view of HMD data, we focus on two domains represented in the database, POLITICS and SPORTS (Section 2). Based on the results of the analyses, we discuss the implementation issue in more depth (Section 3). Section 4 is the conclusion.

2 Insights from the Hamburg Metaphor Database

This section contains analyses of material gathered from the Hamburg Metaphor Database. Subsection 2.1 presents some main metaphorical mapping lines in the field of POLITICS, Subsection 2.2 analyses a conceptual metaphor for the target domain SPORTS.

2.1 Mappings in the POLITICS domain

The data for the analyses are defined by those entries in the Hamburg Metaphor Database that have as their target domain **1.** POLITIK (POLITICS) and **2.** PARTEI (POLITICAL PARTY). The first query yields 25 results, the second one 26.

POLITICS IS FIGHT. Having a closer look at the source domains for the target domain POLITICS, we find that the main source is the FIGHT domain ("KAMPF"), which is encoded in 20 out of the 25 entries.[2] In what follows, we will concentrate on the 16 examples in French language that instantiate the POLITICS IS FIGHT conceptual metaphor.

Considering the synset level, we note that some synsets are represented by more than one of their lexemes ("literals") in the corpus text: These are {combat:2 bagar[r]e:1 bataille:4 lutte:1} 'the act of fighting; any contest or struggle' – represented by *bataille*, *combat* and *lutte* in political context –, {triomphe:1 victoire:1} 'a successful ending of a contest' – represented by both *triomphe* and *victoire* – and {vainqueur:1 triomphateur:1 gagnant:1} 'the contestant who wins the contest' – represented by *triomphateur* and *vainqueur* –.[3] This fact shows that the conceptual view, which is reflected by the synsets insofar as every synset can be seen as a concept, is an appropriate way of approaching metaphorical mappings.

In contrast to the results of Alonge and Castelli, who find a lot of missing metaphorical senses in ItalWordNet (cf. Section 1), most of the metaphorically used lexemes in POLITICS IS FIGHT as collected from HMD are actually represented in synsets which already have a metaphorical sense in EWN, or at least have been interpreted as such by HMD encoders. Only three lexemes out of 13, *guerre* 'war', *revanche* 'revenge', and *bataillon* 'battalion', do not correspond to figurative synsets. While *guerre* and *bataillon* can be found in their "literal" meaning in the French EWN (cf. synsets {guerre:1} 'the waging of an armed conflict against an enemy' and {revanche:1} 'the act of taking revenge'), *bataillon*, a collective participant of FIGHT, is completely missing from the French EWN.

The conceptual metaphor POLITICS IS FIGHT is only one of several possible metaphorical con-

[1] http://www.rrz.uni-hamburg.de/metaphern/index_en.html [27 April 2003].

[2] In terms of the Berkeley metaphor list (Lakoff et al., 1991), this mapping can be seen either as THEORETICAL DEBATE IS COMPETITION or as COMPETITION IS FIGHT. If a MENTAL EVENT (like THEORETICAL DEBATE) is a specialisation of an EVENT (like COMPETITION), then the first metaphor can be interpreted as a specialisation of the second one.

[3] In this paper, each synset is followed by its English gloss when it is mentioned for the first time.

ceptualisations of POLITICS. Examples of other source domains encoded for this target in HMD are SPORTS, THEATER, and STUDY. The POLITICS IS FIGHT metaphor will thus highlight the competitive aspects of politics: POLITICS in this metaphor is narrowed down to POLITICAL COMPETITION. This COMPETING scene has physical aspects or at least physical "roots" and is an example of a conventional metaphor, "a metaphor we are hardly ever conscious of", because it is one of the *ordinary* ways of talking about politics (cf. Lakoff and Johnson (1980, 5)). The metaphorically used lexemes of the HMD example sentences and their EWN synsets show that several elements of a FIGHT scene, as well as the name of the event itself, are present in the mapping:

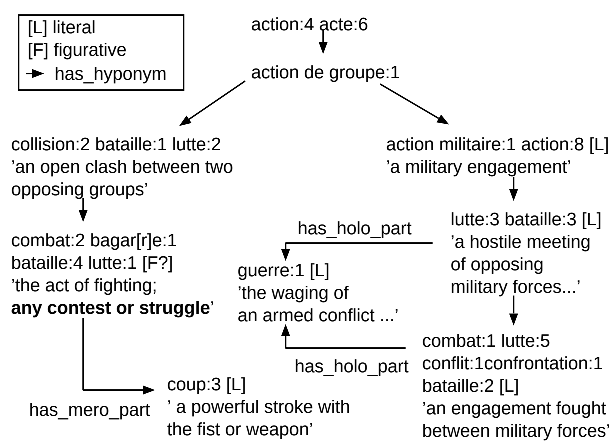
- Names for the whole event are {combat:2 bagar[r]e:1 bataille:4 lutte:1} and {guerre:1}.
- Names for events or scenes seen from the perspective of one of the participants are {défendre:3 lutter pour:2} '[argue in defense] of causes, principles, or ideas', {écraser:3} 'make ineffective', {perte:7} 'the act of losing', {triomphe:1 victoire:1} and {revanche:1}. With the exception of {défendre:3 lutter pour:2}, which can be used to refer to the whole action, cause or purpose of a FIGHT as well as of POLITICS, all the events denoted by these synsets occur only at certain moments of the FIGHT, or of a specific political action.
- Finally, the metaphorical synset {vainqueur:1 triomphateur:1 gagnant:1} is used to refer to one of the participants in the POLITICAL COMPETITION, with respect to its outcome.

It turns out from this analysis that meronymy and participant (EWN: "INVOLVED") relations also play a role in the mapping of this conceptual metaphor. Unfortunately, the synsets {guerre:1} and {combat:2 bagar[r]e:1 bataille:4 lutte:1}, which represent the concepts of the whole competing event, and the other involved synsets, do not display many of these relations in the French EWN. Consulting EWN, we find only the following non-taxonomic relations (i.e. neither hyperonymic nor hyponymic relations) for *all* the synsets mentioned above as referring to mapped aspects of the event:

- {guerre:1} **has_mero_part** {bataille:2 confrontation:1 conflit:1 lutte:5 combat:1} 'an engagement fought between two military forces'
- {combat:2 bagar[r]e:1 bataille:4 lutte:1} **has_mero_part** {coup:3} 'a powerful stroke with the fist or weapon'
- {vainqueur:1 triomphateur:1 gagnant:1} **antonym** {perdant:2 non-valeur:1} 'a contestant who loses the contest'
- {triomphe:1 victoire:1} **antonym** {défaite:2} 'an unsuccessful ending'

The stated subevents in this list are not bound to the overall event, and no participant relations are encoded for any event or subevent in EWN. This lack in relations means that the structure of the source domain is not visible from EuroWordNet.

Figure 1: Literal and possibly figurative synsets.



Furthermore, it is sometimes difficult to tell whether a synset has an intended figurative meaning or not, let alone which synsets are related by a literal-figurative relation. Consider the conceptual-semantic relations of the synsets {bataille:2 confrontation:1 conflit:1 lutte:5 combat:1} and {combat:2 bagar[r]e:1 bataille:4 lutte:1} as represented in EWN, displayed in Figure 1. For two reasons, it is sensible to believe that the second one has a figurative meaning, as opposed to the first one:

1. {combat:2 bagar[r]e:1 bataille:4 lutte:1} is defined as '[. . .]; any contest or strugggle', which might also refer to non-military and possibly non-physical violence.

2. There are no other synsets containing the lexemes *bataille* and *lutte* for which a figurative reading in the 'conflict' sense would be possible.

On the other hand, the gloss of the synset {coup:3} 'a powerful stroke with the fist or weapon', which is encoded to be a part of {combat:2 bagar[r]e:1 bataille:4 lutte:1}, gives a clearly literal meaning to {coup:3}, which results in an inconsistency between the possibly metaphorical sense of the holonym and the strictly literal sense of the meronym (part).

A POLITICAL PARTY IS A FAMILY. Another conceptual metaphor that turns out to be frequent in the politics domain, at least in German texts, is the one in which a POLITICAL PARTY ("PARTEI") is viewed in terms of a FAMILY ("FAMILIE").[4] This conceptual metaphor is mainly a mapping of one social group to another (cf. Eilts and Lönneker (2002, 107)). A query for these source and target domains yields 20 results for German, which will be the subject of the following analysis.

A closer look at the synsets shows a slightly different picture from what we obtained in the last analysis. 19 distinct lexemes are used, but only five of them are present in German EWN synsets. These refer mainly to individual family members: *Vater* 'father', *Bruder* 'brother', *Schwester* 'sister', *Enkel* 'grandchild', out of which only *Vater* can be found in a figurative synset ({Vater:2} 'a person who holds an important or distinguished position in some organization [. . .]').

The low coverage of the lexemes is also due to the current practice in HMD not to encode parts of compounds as individual lexemes (cf. Eilts and Lönneker (2002, 107)). In doing so, the following additional family member lexemes covered by the German EWN would appear: *Mutter* 'mother' (cf. *Mutterpartei*), *Vetter* 'cousin' (cf. *Vetternwirtschaft*), and three further occurrences of *Vater* (cf. *Vaterfigur*, *Vatermord*, *Übervater*). The most direct mapping of the metaphor is indeed represented in the lexeme *Parteifamilie* 'family of a political party', which summarises the whole conceptual metaphor in one word. While it would be interesting to further discuss the topic of German compounds, for the sake of brevity we will go on to other aspects of the conceptual metaphor that are concerned by the mapping.

In addition to a neutral reference to individual family members, two other referring methods can be detected from the metaphorically used lexemes not encoded in the German EWN:

1. collective nouns for younger members of the family: *Nachwuchs* 'offspring' (in the compounds *Nachwuchskraft, Nachwuchspolitiker* and *Parteinachwuchs*);

2. subconcepts or referring expressions encompassing specific role/character attributions: *Ziehkind* 'foster child' and *Patriarch* 'patriarch'.

In the German EWN, family member synsets are not linked to the family synset ({Familie:1}) itself. It seems that with a few synset additions to the German EWN, compound splitting, and the connection of the family members to the family synset using the **has_holo_member** relation, the mapping of this conceptual metaphor could be implemented more easily than the one previously discussed. However, as further elements in the mapping show, also this social group metaphor can be extended to an event metaphor. The lexemes *Erbe* (covered by the German EWN as {Erbe:1} 'any acquisition from past generations', represented also in the compound *Erblast*) and *Hinterlassenschaft*, which could be added to the {Erbe:1} synset[5] but has also other senses, actually denote "participants" in the semantic patient role of an event. The "inheritage" (in form of qualities, power and achievements, but also negative characteristics and problems) is handed over from one member of the political party, usually mapped to the father of the family, to other members, preferably younger or less experienced ones.

[4] A different conceptual source domain for POLITICAL PARTY attested in HMD is BUILDING.

[5] Cf. the corresponding verb synset in the German EWN: {vererben:1 hinterlassen:1}.

Only this inheriting event conveys also meaning to the position of these members in the political party.

2.2 Mappings in the SPORTS domain

SPORTS IS FIGHT. Turning to the field of sports, we query the Hamburg Metaphor Database for all French examples of the target domain SPORTS ("SPORT"). In the 34 results, the list of source domains shows that FIGHTING ("KAMPF", 16 times), also in its special form of WAR ("KRIEG", 8 times), is the predominant source metaphorically used to view this target domain.[6]

The following analysis will be based on the 24 French examples instantiating either the conceptual metaphor SPORTS IS FIGHT ("SPORT IST KAMPF") or SPORT IS WAR ("SPORT IST KRIEG"). 21 distinct lexemes occur in the examples; only two of them are not represented in any synset in the French EWN, the others instantiate 6 distinct synsets with literal meaning and 13 distinct synsets with figurative meaning, following the interpretation of HMD.

Even more clearly than in the POLITICS IS FIGHT conceptual metaphor, the resulting synsets show that not only the event itself, but several aspects of the FIGHT event are mapped across domains in the SPORTS IS FIGHT (containing SPORTS IS WAR) metaphor. The examples analysed are from a football corpus and can be narrowed down to A MATCH (as a sports event) IS A FIGHT. The mapped aspects of the event are enumerated in the list below. If a synset is contained in the French EWN only in a literal meaning, we indicate this by the addition of [L]. Note that events and subevents can equally be expressed by verb or noun synsets.

1. There are synsets referring to the entire FIGHT event matched to the SPORTS event: {combat:2 bagar[r]e:1 bataille:4 lutte:1}, {lutter:4 se battre:4} 'be engaged in a fight; carry on a fight' [L], {guerre:1} [L].

2. Actions of a participant or several participants collectively are represented by {écraser:3} 'make ineffective', {défier:1 provoquer:1} "Fischer challenged Spassky to a match", {manoeuvre:1} 'a move made to gain a tactical end', {armer:2 consolider:3 renforcer:1} 'support or hold steady, as if with a brace'.

3. Singular actions occurring during the event, in which a "hostile action" is performed not against a person, but against an object (here: the ball), are represented in {coup:5} 'the act of swinging or striking at a ball [. . .]', {frapper:7} 'hit a ball'.

4. The result of the event or of a subevent seen from a participant-dependent view is present in {triomphe:1 victoire:1} and {conquête:2} 'the act of conquering' [L].

5. The participants of the event can be identified by the synsets {adversaire:2 opposant:1 partie adverse:1} 'a hostile person who tries to do damage to you', {opposant:2 adversaire:1 ennemi:3} 'a contestant that you are matched against' and {agresseur:1 attaquant:1} 'person who attacks someone' [L]. For some of the participants, collective nouns are used: {défense:10} 'the defensive football players [. . .]'

6. Finally, the instrument can be mapped: {arme:1} 'weaponry used in fighting or hunting' [L] (here used to refer to one of the football players and his special qualities).

In some examples, a quite radical type switching occurs. Actions performed by at least one person, as subevents of the sports event (match), are represented in EWN only in synsets denoting the participants performing these actions: {attaque:6} 'the team that has the ball (or puck) and is trying to score' (here in *être à l'attaque*), {défense:3} 'the team that is trying to prevent the other team from scoring' (here in *faire une grosse défense*). A place involved in the source domain, {camp:4 bivouac:1} 'temporary living quarters, specially built by the army for soldiers', is used to refer to the players of a team and only attested by *camp* in the corpus.

The uncovered lexemes instantiate still other aspects of the event. *Duel* 'duel' refers to a part of the event from a participant-independent view, while

[6] The main mapping lines in Berkeley terms are again COMPETITION IS FIGHT (17 times; also as COMPETITION IS PHYSICAL AGGRESSION (2 times), cf. "COMPETITION IS 1 ON 1 PHYSICAL AGGRESSION, Source domains: 1-on-1 physical aggression, fight. Target domain: competition"(Lakoff et al., 1991, 66)) and COMPETITION IS WAR (8 times).

the remaining lexeme, *offensif* ‘aggressive’, characterises one of the participants or his actions. Again, with the exception of some antonymy encodings, there are no relations in EWN binding any of these elements together.

3 Implementation issues

Based on the results of the analyses in Section 2, the idea of a composite index for regular metaphorical mappings which was brought forward by Alonge and Castelli (2002a) and Alonge and Castelli (2002b) will be discussed. A necessary continuation of the work by Alonge and Castelli, who do not deal with implementation details, is to discuss this issue in more depth.

Alonge and Castelli propose to deal with metaphorical mappings using a kind of composite index. This sort of index has already been in use in form of a composite Inter-Lingual-Index during the construction of EWN and accounted for regular metonymic polysemy (cf. Section 1). Figure 2 shows an example of an existing composite ILI from EWN. It indicates that there is a metonymic polysemy of the lexeme *country*, which has three senses (cf. “gloss”):

1. territory which has been singled out for some purpose;
2. the people of a nation or country or a community of persons bound by a common heritage;
3. the people, government and territory of a state.

The effect of the composite ILI is that each synset identified by one of the three target ILIs contains an **eq_metonym** relation to the composite ILI, and this in all languages involved in EWN. By accessing this relation from one of the individual synsets, the user can thus see which synsets are bound together by the metonymic relation. However, considering figurativity aspects, there is no rule defining which synset should be the literal one, and this information cannot be obtained accessing the synsets.

Let us consider an encoding of the conceptual metaphor POLITICS IS FIGHT in such a composite index. As we have seen, all encoded aspects of this metaphor are in some way related to an overall event. One of the most general source events

Figure 2: A composite EuroWordNet ILI.

```
0 ILI_RECORD
1 PART_OF_SPEECH "n"
1 ADD_ON_ID 30
1 GLOSS "territory which has been singled out for some purpose"
"the people of a nation or country or a community of persons
bound by a common heritage"
"the people, government and territory of a state"
1 VARIANTS
2 LITERAL "country"
3 SENSE 1
2 LITERAL "country"
3 SENSE 2
2 LITERAL "country"
3 SENSE 3
1 EQ_RELATION "eq_metonym"
2 TARGET_ILI
3 WORDNET_OFFSET 5400698
[={country:1 state:1 land:3 nation:1}]
3 WORDNET_OFFSET 5208026
[={nation:2 nationality:1 land:2 country:2 a people:1}]
3 WORDNET_OFFSET 5209013
[={state:1 nation:1 country:1 commonwealth:1 res publica:1
body politic:1}]
```

Figure 3: Metaphorical composite index entries.

```
[...]
1 GLOSS "an armed conflict against an enemy"
a political conflict"
1 VARIANTS
2 LITERAL "guerre"
3 SENSE 1
2 LITERAL "guerre"
3 SENSE 2
1 EQ_RELATION "eq_metaphor"
2 TARGET_ILI
3 WORDNET_OFFSET 540597
[={guerre:1}]
3 WORDNET_OFFSET ToBeCreated
[...]
1 GLOSS "an engagement fought between two military forces"
"the act of fighting; any contest or struggle"
1 VARIANTS
2 LITERAL "lutte"
3 SENSE 5
2 LITERAL "lutte"
3 SENSE 1
1 EQ_RELATION "eq_metaphor"
2 TARGET_ILI
3 WORDNET_OFFSET 535646
[={bataille:2 confrontation:1 conflit:1 lutte:5 combat:1}]
3 WORDNET_OFFSET 645833
[={lutte:1 bataille:4 bagar[r]e:1 combat:2}]
```

can be referred to by the French literal *guerre* ‘war’. In a composite index for the conceptual metaphor A POLITICAL CONFLICT IS A WAR it could be stated that *guerre* means ‘an armed conflict against an enemy’, but also (figuratively) ‘a political conflict’. The figurative synset does not yet exist in EWN, so it should be created. A similar composite index could be used to bind together already existing different senses of *lutte* ‘fight’. The respective parts of the composite index entries are shown in Figure 3.

This representation would ensure **eq_metaphor** links from all included synsets to the composite index entry. Though, it would still not be clear which synset bears the literal meaning. As there could be several figurative meanings derived from the same literal synset (for example, a figurative meaning of *guerre* 'a sports event' could be added), the index would not solve the problem of telling whether a literal-figurative relation exists between given synsets, and even whether a synset has a figurative meaning or not. A convention could be established that the first synset mentioned in the composite index entry has to be the literal one. However, if the composite index exists for each language separately, as it might be requested because of different use of conceptual metaphors in different languages, and if it covers only the existing literal and metaphorical synsets, there seems to be no need to encode the literal-figurative relation at a higher level than the synset itself. A new conceptual-semantic relation like **derived_from_literal** could be used as well, and would keep track of the direction of the mapping.

Alonge and Castelli (2002b) note that a composite index for metaphors could account for more than one mapping and mention as an example the regular polysemy of motion verbs which can be used to metaphorically refer to stages in a love relationship. As a result of the analyses performed on data from the Hamburg Metaphor Database and the implementation possibilities presented above, it turns out that indeed a composite index can only be useful if it accounts for several, and ideally for all mappings which occur within one encompassing conceptual metaphor. Only a generalisation from one index entry to all synsets related to the source synset will be able to cover also novel metaphorical uses of words within existing conceptual metaphors.

As we have seen from the analyses, in most cases the most general mapping of the conceptual metaphor links a source event to a target event. This mapping is the one that will have to be manually encoded after analyses of texts dealing with different topics. However, for the mapping of all other aspects, metaphorical relations could be supposed and – in an automated or assisted way – added to the index. The fact of linking an entity to another by a metaphorical index should then result in the creation of corresponding synsets in the target domain for *all entities* (hyponyms, parts, participants, etc.) that are related to the source entity by sense relations. The easiest way to create such a (potential) metaphorical synset would be to copy the lexemes of the literal synset and to add a predefined gloss.

For example, if a metaphorical relation is installed between {guerre:1} and the newly created {guerre:2}, metaphorical synsets and relations for all its hyponyms, parts, subevents, participants etc., as mentioned in the analyses, should also be created. Standard glosses with variables for the different mapped events and elements would adapt to these new synsets. For example, in the gloss

> a [{être:1 mortel:1 mortel:1 homme:7}] that participates in a [POLITICAL COMPETITION] and can be compared to a [{vainqueur:1 triomphateur:1 gagnant:1}] that participates in a[n] [ARMED CONFLICT]

the event names are taken from the glosses of target and source event respectively, and the participant description (its topmost hyperonym as well as its source name) from the source synset. For more details on WordNet glosses, cf. Pala and Smrz (2002).

This method of adding a composite index for global conceptual metaphors has its limits for different reasons:

- First of all, the status of the French and German EWN do not allow such a mapping, because they encode only very few non-taxonomic relations. Some examples from the analyses even show that the set of encodable relations from EWN would not be sufficient to cover the structure of all domains. Analyses of source domains in the framework of semantic frames (Fillmore and Atkins, 1994)[7] or concept frames (Lönneker, 2002) can help identifying needed conceptual-semantic relationships and instantiations of them.

- A lot of figurative synsets are already present in EWN and often differ slightly from the literal synsets in their lexemes, so that many duplicates would be created.

- Automatically created index entries would contain no information about whether an individual mapping is actually attested or not.

[7] Cf. also the FrameNet Database: http://framenet.icsi.berkeley.edu [27 April 2003].

These considerations show that there is still a lot of work to do before a representation of whole structures of conceptual metaphors can be envisaged. Based on detailed analyses of corpora from different domains, the coverage of source domains both in synsets and in relations has to be improved, and the status of individual synsets regarding their level of figurativity has to be clarified. It can be hoped that new tools like VisDic (Pavelek and Pala, 2002; Horak et al., 2003) and DEB (Smrž and Povolný, 2003) for editing lexical databases will enable the integration of independent further developments of EWN (for example GermaNet) with EWN data and the creation of new relationships.

4 Conclusion

The answer to the question whether metaphors can be represented in WordNets depends on the interpretation of metaphor.

With respect to EuroWordNet, if *individual lexemes with metaphorical meaning* are considered, it can be stated that a lot of them are already represented by synsets that can or must be used figuratively. What is missing are relations between literal and figurative individual synsets.

If a metaphor is considered as a *structured mapping of one conceptual domain to another*, the productivity of the envisaged index, as well as its potential to account for new metaphorical word senses, increases drastically. Unfortunately, so does also the complexity of the implementation task, for example by means of a composite metaphorical index. The analyses of two different target domains, POLITICS and SPORTS, show that at first a much more encompassing representation of the source domains, mainly events and their characteristics like parts, participants, actions and characteristics of the participants, is necessary in order to represent the domain structure. This can be achieved by encoding more instances of EWN relations like Meronymy and ROLE/INVOLVED, as well as possibly additional relations.

For the time being, continuing the domain centered perspective adopted by the Hamburg Metaphor Database, the following research lines seem the most promising:

1. More clearly identify literal and figurative synsets in the mapped domains, and their linking relation.
2. Individuate elements in source domains and the conceptual-semantic relations between them.

Acknowledgements

I am grateful to Carina Eilts from the Hamburg Metaphor Database for her great help. My thanks also go to Tomáš Pavelek, Pavel Smrž and the anonymous reviewers for their comments.

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