Wordnets, Framenets and Corpus-based Contrastive Lexicology

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1   Introduction

In this paper, a Swedish FrameNet will be looked upon as a complement to Swedish WordNet (SWN), a first version of which was completed a few years ago. SWN is structured according to the principles of the original Princeton WordNet and in particular to its sequel EuroWordN (EWN). As we know, the basic unit in the wordnets is a synset, a set of synonyms which represent a certain meaning. The synsets are related according to a number of semantic relations such as hyponymy, meronymy and antonymy. At the end of the Swedish WordNet project, around 25 000 concepts were coded (around 5 000 concepts realized as verbs and around 20 000 concepts realized as nouns). With respect to words (literals), around 6 000 verbs and 27 000 nouns were included. Lists of the words included in SWN were run against frequency lists to check that no words with high frequency had been excluded, but needless to say, the present version only represents the core of a Swedish wordnet and needs to be extended.

At present, work is being carried out to extend the Swedish WordNet and to combine it with Swedish FrameNet, which is intended to form a Swedish counterpart to FrameNet developed for English by Charles Fillmore and his associates at Berkeley. Pilot work has been carried out on Swedish FrameNet with the coding of a selection of verbs. The work will not start in full scale until proper funding has been obtained. As in SWN, the intention is – as a first stage – to produce reliable coding of the core of Swedish vocabulary, in this case with particular focus on frequent verbs and semantically related abstract nouns and adjectives. The most frequent words (in particular verbs) tend to have meanings that form complex patterns of polysemy which in many respects are language-specific even when rather closely related languages such as English and Swedish are compared. Several examples of this can be found in studies using corpus-based contrastive analysis such as Viberg (1999, 2002, 2004, 2006). Another problem is language-specific semantic differentiation between basic words such as English *think* vs. Swedish *tänka/tycka/tro* (Viberg 2005). The semantic analysis presented in studies of this kind form a point of departure for the framenet coding. There is also a natural link to wordnets. Many frame elements are closely related to superordinate terms/top concepts in wordnets (e.g. Vehicle).

2   Language-specific differentiation

2. 1   The Swedish verbs of Thinking

 The distinction between the three basic verbs of thinking *tänka*, *tro* and *tycka* is a well-known example of language-specific differentiation in Swedish. As shown in Viberg (2005), these three verbs are the major translations of English *think* in the English Swedish Parallel Corpus/ESPC (Altenberg & Aijmer 2000) in translations from English to Swedish, whereas *think* is the most frequent translation of each one of these verbs in the other direction. In the following, the discussion will be restricted to cases where the three verbs take a sentential complement.

The verb *think* appears in several frames in the FN database but the only lexical entry that is completed is related to the

Awareness frame. Two of the English examples are (with my Swedish translations):

(1) You don't *think* people ought to enjoy things   Du *tycker* inte att folk ska ha det bra

(2) He *thought* he was going to die   Han *trodde* han skulle dö

The definition of the Awareness frame is quoted in full in (D1).

(D1) "A Cognizer has a piece of Content in their model of the world. The Content is not necessarily present due to immediate perception, but usually, rather, due to deduction from perceivables. In some cases, the deduction of the Content is implicitly based on confidence in sources of information (*believe*), in some cases based on logic (*think*), and in other cases the source of the deduction is deprofiled (*know*). Note that this frame is undergoing some degree of reconsideration. Many of the targets will be moved to the Opinion frame. That frame indicates that the Cognizer considers something as true, but the Opinion (compare to Content) is not presupposed to be true; rather it is something that is considered a potential point of difference. In the uses that will remain in the Awareness frame, however, the Content is presupposed."

According to the old analysis, the sentential complements in (1) and (2) represent the FE Content. According to the newer analysis, they should rather be moved to the Opinion frame, which is defined as follows: "A Cognizer holds a particular Opinion, which may be portrayed as being about a particular Topic." This can be complemented with the definition of the FE Opinion: "The Cognizer's way of thinking, which is not necessarily generally accepted, and which is generally dependent on the Cognizer's point of view." Since the frame "indicates that the Cognizer considers something as true" (see D1), Opinion is a

suitable FE for the complement of *tro* in (2). Simultaneously, this means that the FE Opinion would be different from the word *opinion* which covers also cases where evaluation rather than truth is involved. The most suitable alternative for the verb *tycka* is the frame Judgment which is defined as in (D2).

(D2) "A Cognizer makes a judgment about an Evaluee. The judgment may be positive (e.g. *respect*) or negative (e.g. *condemn*), and this information is recorded in the semantic types Positive and Negative on the Lexical Units of this frame. There may be a specific Reason for the Cognizer's judgment, or there may be a capacity or Role in which the Evaluee is judged. This frame is distinct from the Judgment_communication frame in that this frame does not involve the Cognizer communicating his or her judgment to an Addressee." An example of Judgment is: *She **admired** Einstein for his character*. Judgment_communication is illustrated with the following example: *She **accused** Einstein of collusion*.

The FE Judgment which is not mentioned in (D2) is defined as: "A description (from the point of view of the Cognizer) of the position of the Evaluee on a scale of approval." If *admire* is paraphrased 'think that someone is high on the scale of approval', this FE could be said to be incorporated into *admire* (and its Swedish counterpart *beundra*), whereas the Judgment is realized as a complement in a Swedish example such as *Hon tyckte att Einstein hade en beundransvärd karaktär* 'She thought that E had an admirable character.'

Having found suitable candidate frames for *tro* and *tycka*, the problem remains of finding a suitable frame for *tänka*, the most general of the Swedish verbs of thinking. One frequent use is to report direct and indirect thought as in (3) and (4). (cf the use of 'say' to report direct and indirect speech).

Direct thought
(3) Men oj! *tänker* flickan. MR — Oh, help, the girl *thinks*.

Indirect thought:
(4) Jag *tänker* blixtsnabbt att jag inte vill kyssa honom. MS — In a flash I *think* that I don't want to kiss him,

When *tänka* is used to report indirect thought it takes a sentential complement in the same way as *tro* and *tycka*. In principle, *tänka* can be used to report any thought, even those that represent an opinion or a judgment as in (5).

(5) På vägen *tänkte* han att allt hade gått bra — As he drove, *it occurred to* him that everything had gone well,

It seems most reasonable, however, to say that distinctions such as opinion and judgment are neutralized, and several examples such as (4) do not belong to any of these categories. Furthermore, there is often another difference, as in (5). The verb *tänka* tends to refer to the actual occurrence of a thought in the consciousness of the cognizer at a specific moment in time. Opinions and judgments are more like dispositions to think in a certain way (propositional attitudes) and need not appear in consciousness at reference time. You can say even about a sleeping person *Hon tycker att Ingmar Bergman är intressant* 'She thinks that IB is interesting'. You can 'hold' an opinion (or judgment) for a long time. The frame that appears as the best candidate for *tänka* in the uses discussed here is Mental_Activity which is defined as in (D3).

(D3) Mental_Activity "In this frame, a Sentient_entity has some activity of the mind operating on a particular Content or about a particular Topic. The particular activity may be perceptual, emotional, or more generally cognitive. This non-lexical frame is intended primarily for inheritance."

The complement of *tänka* used to report indirect thought as in (4) represents the FE Content which is defined as "The situation or state-of-affairs that the Sentient_entity's attention is focussed on." Obviously, this FE cannot be used in the revised Awareness frame, if the content is to be presupposed as indicated in (D1). A way out would be to introduce an FE like Fact to refer to the complement of LUs like *know* and *be aware*. In that case, Content could be regarded as a neutral frame which is a schematic version of more specific frames such as Opinion, Judgment and Fact. Actually, English *think* with a sentential complement could probably best be represented as neutral in this way. In many cases when *think* appears with a sentential complement in an English original text, it is necessary to use pragmatically based inferences to decide which one of the Swedish verbs *tänka*, *tro* or *tycka* is the most suitable translation.

The report of direct thought as in (3) should be treated in parallel with the treatment of direct speech in the Communication frame, which basically has the structure shown in (D4)

(D4) Communication A Communicator conveys a Message to an Addressee: *[I] TOLD [her] [it was raining]*. The Message can be refined in four ways, the most important of which are Message-Content: *I SAID [that I was planning to quit]* and Message-Form: *She SAID ["I can't stand this any longer!"]*.

By analogy with Message-Form, the direct report of thought that appears in (6) should be called Thought-Form.

(6) Nu tvingar jag dej, tänker flickan. MR — I'll make you now, the girl thought.

Note that the verb *tycka* can be used also as a communication verb as in (7).

(7) - Bra idé, tyckte   'Good idea,' said
Franklin. ARP   Franklin.

Bra idé is an example of Message-Form. Simultaneously, the use of *tycka* in the Swedish version requires that the content is a Judgment (cf hybrid frames, below). To sum up this section, it can be concluded that it is possible to find frames that can be used to represent the contrast between *tycka*, *tro* and *tänka,* but that requires several modifications of the existing frames to accommodate the language-specific aspects of the Swedish verbs. It remains an open question what will happen when more languages are taken into consideration. Probably, it will be necessary to accept language-specific frames that inherit part of their structure from more general frames. According to current work on linguistic relativity such as Bowerman & Levinson (2001), part of conceptual structure to which frames belong is language-specific.

2.2   The verbs of Placing

The differentiation between *sätta*, *ställa* and *lägga* which all belong to the around 50 most frequent verbs in Swedish is another well-known example. In examples like (8)-(10), a choice must be made when translating *put*.

(8) She **put** the bowl   Hon **ställde** skålen på
on a windowsill in   en fönsterbräda på sin
her sun porch, GN   solveranda

(9) I took my letter out   Jag tog ut mitt brev ur
of the envelope and   kuvertet och **la** det på
put it on the table,   bordet,
RDO

(10) She **put** on a pair   Hon **satte** ett par
of cheap hoop earrings   enkla ringar i öronen
FW

 The verb *put* and its Swedish equivalents are realizations of the Placing frame which is defined as in (D5).

(D5) Placing. "Generally without overall (translational) motion, an Agent places a Theme at a location, the Goal, which is profiled. In this frame, the Theme is under the control of the Agent/Cause at the time of its arrival at the Goal." Example: David [Agent] placed his briefcase [Theme] on the floor [Goal]

In this case, there is no way to mark the contrasts with the existing frame elements. On the other hand, close to 70 English verbs are given in the list of verbs that evoke this frame without any systematic indication of what differentiates them. Of course, it is an open question to what extent this is desirable. For certain purposes, FN may be used to extract information of a more general kind and in that case the Placing frame provides adequate information, and a more fine-grained analysis may be regarded as a cumbersome extravagance. However, if FN is used as a model for contrastive analysis, it is essential to be able to tease apart similarities and language-specific features. The Placing frame is part of an interlingua that shows what English and Swedish have in common. One characteristic where English is special with respect to Swedish is the relatively high number of verbs sharing the meaning 'put into a container', where the Goal is incorporated in the verb as in *archive*, *bag*, *box*, *bottle*, *cage*, *crate*, *pocket* and *shelve*. Examples of the analysis of such verbs are: *The items* [Theme] *are then* **bagged** [Goal] *by the Scenes of Crime Officer* [Agent] and *My* [Agent] *main task was to* **bottle** [Goal] *wine* [Theme]. Even if a few verbs of this type exist in Swedish such as *arkivera* 'archive', such verbs are usually translated with the container specified as part of the Goal realized as a PP as in (11) where *box* is expressed as 'pack in boxes'.

(11) **boxing** plums   **packa** plommon *i*
was not the work to   **lådor** var inte den
satisfy a youth like   sortens sysslor som
Joseph. JC   tilltalade en yngling

som Joseph.

The English verbs of the type 'put in a container' can be described as a kind of incorporation of the Goal into the verb. One way to represent the differentiation between verbs such as Swedish *lägga* and *ställa* would be to describe this as an incorporation of an FE like Result. The contrast between *ställa* and *lägga* has to do with the resulting orientation of the Theme (in Upright vs. Horizontal position), whereas *sätta* in the most typical case signals attachment of the Theme to the Goal. (A more detailed description of the semantic contrasts are given in Viberg 1998.)

3. Hybrid frames

Incorporation of frame elements is one way of extending the English framenet to account for patterns in other languages. Another characteristic of framenet which makes it possible to account for new data is the use of hybrid frames. In this section, the use of hybrid frames to account for verbs referring to sounds are presented as the major example. Actually, there are a rather large number of verbs that in various ways refer to a characteristic sound, as the verbs in (12) and (13), which are typical examples of the Make_noise frame defined in (D6).

(D6) Make_noise "A physical entity, construed as a point-Sound_source, emits a Sound. This includes animals and people making noise with their vocal tracts." Example: The wind [Sound_source] howled.

(12) Baklastarna *råmade* och *tjöt*. MPC:MN

The bulldozers *bellowed* and *roared*.

(13) Nora kunde höra att det *mullrade* till nånstans MG

Nora could hear *a rumbling* somewhere.

Characteristically, the verbs referring to sound are used with many different meanings. The verb *tjuta* and *mullra*, for example, can be used as motion verbs (14-15) and as communication verbs (16-17).

(14) Lukas drog i ångvisslan: som ett fasans skri *tjöt* ångan **ut ur** ventilen. ARP

Lukas jerked the cord of the steam whistle and like a scream of terror, steam *screeched* **out of** the valve.

(15) /---/ när tågen *mullrade* **förbi** över oss. RJ

/---/ when the trains *roared* **past**.

(16) - Det var inte mitt fel, *tjöt* pojken. MPC:LM

"It wasn't my fault!" the boy *wailed*.

(17) — Haha! *mullrade* slaktaren det var inte mycket att bita i! ARP

'Ha-ha!' *rumbled* the butcher. 'Nothing much to bite there!

As motion verbs, *tjuta* and *mullra* in (14-15) can be described with the general Motion frame (D7).

(D7) Motion "Some entity (Theme) starts out in one place (Source) and ends up in some other place (Goal), having covered some space between the two (Path)."

However, simultaneously as the verbs in (14-15) describe a motion, they also describe various types of sound emission. To catch this, a hybrid frame like Motion_noise defined in (D8) is used in FrameNet.

(D8) Motion_noise "This frame pertains to noise verbs used to characterize motion. Motion_noise verbs take largely the same Source, Path and Goal expressions as other

types of Motion verbs." Example: The limousine purred forwards [Path] into the traffic [Goal]

In a similar way, the hybrid frame Communication_noise (defined below) is used to describe examples such as (16-17). This is an amalgamation of the Communication frame (D4) with the frame Sound_movement (D9), which is primarily used with verbs that describe the motion of a sound realized linguistically as a noun.

(D9) Sound_movement "A Sound emitted by a Sound_source, which construed as a single point, moves along a Path. Rather than the Sound_source itself, the Location_of_sound_source may be mentioned. Essentially, this frame denotes the (semi-) fictive motion of the Sound." Example: Laughter [Sound] echoed through the hall [Path]

Typical Swedish examples taken from the Bank of Swedish (RomI = Novels I) are shown in (18-19).

(18) Ugliks tjut *ekade* mot väggarna. RomI	Uglik's scream *echoed* off the walls. (My transl.)

(19) Babyn däruppe *tjöt* genom trossbottnen. RomI	The baby upstairs *screamed* through the double ceiling. (My transl.)

Together with the Communication frame, this frame forms the hybrid frame Communication_noise defined in (D10).

(D10) Communication_noise. Hybrid of Communication (D4) and Sound_movement (D9): "This frame contains words for types of noise which can be used to characterize verbal communication. It inherits from Communication (possibly more specifically Communication_manner) and the Sound_emission frame (which simply characterizes basic sounds of whatever source, including those made by animals and inanimate objects). As such, it involves a Speaker who produces noise and thus communicates a Message to an Addressee." (The Sound_emission frame cannot be found in the database. The closest correspondent I have been able to find is Sound_movement.)

In several cases there is a clear reference to the motion of the sound such as *ner* 'down' in (20).

(20) Och hur hon *skrek* **ner** mot Eeva-Lisa att hon skulle ut. MPC:POE	And how she *screamed* **down** at Eeva-Lisa that she had to go.

Actually, it is possible to find examples with most communication verbs where there is a clear reference to the motion of the sound. The (semi-fictive) motion of the sound is referred to even in some examples with Statement verbs such as *säga* 'say' as in (21).

(21) Till Fögelke *sade* jag **genom dörrspringan**: ta Lejbus' sax, RomII	To Fögeleke, I *said* **through the crack of the door**: Take Leibus's pair of scissors (My transl.)

In principle, it is possible to use a wide range of communication verbs in the same context; you can promise or threaten or tell a story through the crack of a door. In the present version of FrameNet, the FE Medium is used within the communication frame: "Medium is the physical entity or channel used by the Speaker to transmit the statement." One of the examples provided is: Kim preached to me over the phone [Medium]. In examples of this type, Medium is an appropriate analysis but examples such as (21) are more naturally interpreted with reference to a hybrid frame combining Motion and Communication. Oral

communication is often conceived as the transmission of messages via sound that travels between speaker and hearer.

A tricky case is the description of directional complements of visual perception verbs. Modern science tells us that vision is the result of light moving from a perceived entity to our retina where it gives rise to a chain of recodings at various levels. Ordinary language is based on several, partly contradictory conceptualizations, one of which seems to rest on the assumption that something moves from our eyes: Examples such as (22-24) describe a motion away from the perceiver. Consider also expressions like *cast an eye on* which have parallels in many languages.

(22) Och sju trädgårdar kunde hon *se* **från** sitt fönster. MG	**From** her window she could *see* seven gardens
(23) De *kikade* **in genom** de gardinlösa fönstren HM2	They *peeked* **in through** undraped windows
(24) Hon *tittade* **upp mot** husen MPC:LM	She *looked up at* the houses

Winer et al (2002) account for a number of psychological studies which show that the belief that vision includes emanations from the eyes is present among American college students. Actually, this belief – referred to as the extramission theory of perception – was held also by Greek philosophers and existed even in scientific circles until Kepler's work on the retinal image.

4. Verbal particles

The frequent use of verbal particles, which is a characteristic feature of English, is not dealt with in any detail in FrameNet. Arguably, particles are even more important in Swedish. In principle, particles can often be treated as frame elements. Examples can be found in the FrameNet database, for instance in the description of the frame Self_motion, which is defined "The Self_mover, a living being, moves under its own power in a directed fashion /---/"), a typical example being: *The cat* [Self-mover] ran *out of the house* [Source]. There are also examples of FEs realized as single particles: *The cat* ran *out* [Source]. *The principal* walked *over* [Goal] *and sat down*. Examples like these are similar in English and Swedish. More problematic are cases when the direction is incorporated into the verb root as in *enter*. In this case, the Goal is realized as a direct object: *The messenger* [Theme] entered (*the room* [Goal]). The verb *enter* is related to the frame Arriving ("An object Theme moves in the direction of a Goal. The Goal may be expressed or it may be understood from context, but it is always implied by the verb itself.") Swedish does not have a direct equivalent of *enter*. Ex. (25) is taken from an English original text in the ESPC.

(25) Then he **entered** the sitting room and threw on the light. FF	Sedan *gick* han *in i* vardagsrummet och tände ljuset.

Examples like (25) may be analyzed by saying that English in this case uses the Arrival frame, whereas Swedish uses the Self_motion frame. The reference to different frames is justified by the fact that the English and Swedish versions are not equivalent out of context. The English verb *enter* is unmarked for intention and for manner of motion, whereas Swedish *gå* is intentional and always refers to walking when the subject is human. We can leave it at that or try to account for the differences by referring to a more abstract version of the motion scenario along the lines of Talmy (1985). There is a shared representation which basically looks as follows: A Theme moves [into]Path [room]Goal [by walking]Means. In

English, Path is incorporated into the verb, whereas Means which is not expressed in English must be incorporated into the Swedish verb. This difference between English and Swedish may appear relatively minor since both languages belong to the satellite-framed languages in Talmy's sense, but as is well known, there are a number of verb-framed languages, such as French, where incorporation of Path represents a basic pattern. In (26), Manner is expressed as an adverbial and in (27) it is left unexpressed, which represents the most frequent alternative. (These and the following examples from three languages are taken from the MPC corpus consisting of extracts from Swedish novels and their translations into various languages.)

(26) - Sorry, sa nattchefen när han **susade** *in* i rummet LM	"Sorry," the night editor said as he **hurtled** *into* the room,	- Désolé, lança le rédacteur en chef en *entrant* **en trombe** dans la pièce,
(27) Christina sätter nyckeln i köksdörren och öppnar, **glider** *in* och tänder ljuset. MA	Christina puts the key in the lock and opens the back door, **glides** *inside* and turns on the light.	Christina sort la clé, ouvre la porte de la cuisine, *entre* et allume la lumière.

A special case is represented by several Swedish particles that lack (a frequent) equivalent in English. One such particle is *ihjäl* (etymologically into Hell/Hel) as in (28).

(28) Då anmälde den andra kärringen Signe Persson för att katten hade **haft ihjäl** hennes undulat. SW	Then the other old lady made a complaint against Signe Persson, because the cat had **killed** her budgie.

In expressions such as *ha ihjäl* and arguably also *slå ihjäl*, the manner component is fairly neutralized, and it would be possible to treat them as lexical units ("phrasal verbs"). The use of the particle is, however, fully productive and can be used with many verbs expressing fine-grained manner distinctions as in (29) and (30).

(29) Den äldre albatrossungen **hackar** så *ihjäl* den yngre. POE	Then the older baby albatross **pecks** the younger one *to death*.	Le bébé albatros le plus âgé *tue* alors le plus jeune **à coups de bec.**
(30) I stallet **törstade** hästen *ihjäl*.	his horse *dying* **of** **thirst** in the stable.	Dans l'écurie, son cheval était *mort* **de** **soif.**

What happens in examples of this type is that the information in the main verb is degraded to a manner component whereas the particle refers to the focused event. The Killing frame is defined as follows: "A Killer or Cause causes the death of the Victim." Example: John [Killer] drowned Martha [Victim]. In this example, the manner is incorporated into the main verb. Ex. (29) can be derived from an underlying structure like: A Killer causes the death of a Victim by pecking [Means]. Ex. (30) represents an inchoative version of the Killing frame.

Another example from Swedish is the particle *sönder* which is the closest correspondent to *break* (in its basic sense). Intransitive *break* is a realization of the Fragmentation_scenario ("A Whole fragments or breaks into Parts"), whereas transitive break is related to the frame Cause_to_fragment ("An Agent suddenly and often violently separates the Whole_patient into two or more smaller Pieces, resulting in the Whole_patient no longer existing as such.") Ex: *I* [Agent] smashed *the toy boat* [Whole_patient] *to flinders* [Pieces]. *Break* is also related to the frame Render_nonfunctional ("An Agent

affects an Artifact so that it is no longer capable of performing its inherent function.") In Swedish, the most frequent translation of *break* is *gå sönder* 'go apart' as in (31), when *break* is intransitive, and *slå sönder* 'strike apart' as in (32) when it is transitive (*ha* 'have' and *göra* 'do/make' *sönder* are also used within a formal and a spoken register, respectively).

(31) The glass didn't Glaset i ramen **gick break** in the frame. inte **sönder**.
BO

(32) Jane going Att Jane går round **breaking** omkring och **slår** plates matters; FW **sönder** tallrikar, det har betydelse,

As argued in Viberg (1985), written within a different theoretical framework, Swedish *sönder* in its prototypical use combines two core components which roughly could be paraphrased as '(separate) into pieces' and 'not possible to use (in the conventional way)'. The FE Means, which is defined as "The action that the Agent performs which results in the Artifact being inoperable", can be incorporated into the verb in Swedish. Literally, Swedish uses a phrase meaning 'scream apart' in (33) to realize a meaning such as 'to cause to become nonfunctional by screaming'.

(33) Han hade **skrikit** He had *damaged* **sönder** nånting. KE something **by screaming**.
Quelque chose s'était *cassé* quand il avait **crié**.

To sum up, incorporation of frame elements appears to be a promising way to describe differences between languages related to the use or not of verbal particles.

5. Conclusion

In my view, FrameNet represents a fascinating further development of lexical databases after WordNet that today is available in some version in a large number of languages. This paper has been concerned with the use of framenets and frame semantics for corpus-based contrastive analysis. For this purpose, it is important to work out a fine-grained analysis to account for the contrasts between words (lexical units) that evoke the same frame, for example Placing, as discussed above. One way of extending framenet for contrastive purposes is the further development of the existing model by adding subframes, hybrid frames or by referring to various kinds of incorporation of frame elements. It is still an open question, however, how far this approach should be followed. For certain purposes, it may be more advantageous to combine framenet with some variety of componential analysis to differentiate between words evoking the same frame.

As for practical applications, contrastive analysis is important for work on translation and for language learning. In particular with a view to language learning with which I am most familiar, a major problem is patterns of polysemy that have a tendency to give rise to various transfer phenomena. Like Wordnet, FrameNet assigns different representations to each sense of a polysemous word. However, the relationships between various senses of a word are not accounted for in a systematic way to any greater extent. One device that appears to be useful for this purpose is found in the frame-to-frame relations such as inheritance, subframe, Causative_of and Inchoative_of. In spite of this, this is an area where much remains to be done.

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Electronic resources

The Bank of Swedish:
http://spraakbanken.gu.se/

FrameNet:
http://framenet.icsi.berkeley.edu/.

WordNet:
http://wordnet.princeton.edu/

Global WordNet and EuroWordNet:
http://www.globalwordnet.org/

Swedish WordNet:
http://www.lingfil.uu.se/ling/swn.html.