1 Introduction

1.1 The problem
Depending on the context of their use most verbs can receive a plurality of several readings which are related to each other in non-trivial ways.

- What is the reason for this extensive variability in verb meaning and, with it, in verbal argument structure?
- To what extent are the different interpretations of a verb triggered by semantic information from the lexicon?
- What do we know about the meaning of a verb when we know its lexical semantics?

1.2 The proposal
(i) Adopting a minimalist attitude towards the lexical semantics of verbs by
(ii) assuming radically underspecified semantic representations which
(iii) are viewed as the base for contextually varying meaning.

1.3 Basic assumptions
- Linguistic form drastically underdetermines the conceptual information that is conveyed with an utterance.
- Distinction between two major phases of understanding process:
  (i) Grammatical computation of formal meaning of utterance
  (ii) Derivation of contextually specified meaning (sense) of utterance by interpretation of formal meaning

2 Meaning variation: Types and data

2.1 Variations in verb meaning

Alternations between primary, literal verb meanings (Polysemy) Systematic shifts to a secondary, non-literal verb meaning (Reinterpretation)

Systematic alternations
(i) characterized by general relations between the several meanings
(ii) with alternations in argument structure or in situation type
(iii) in most cases exhibited by a larger number of verbs

Non-systematic alternations
(i) characterized by relations of similarity between the several meanings
(ii) with alternations in sortal restrictions on arguments or in argument structure
(iii) in each case exhibited by a particular verb

Grammar G
Computation of formal meaning
Conceptual-intentional system C-I
Interpretation
Sense
2.2 Systematic meaning alternations

- Systematic alternation in argument structure
  
  (1) a. Anna \textit{zerbrach} das Glas. \textit{causative} 'Anna broke the glass.'
  
  b. Das Glas \textit{zerbrach}. \textit{inchoative} 'The glass broke.'
  
  c. *Anna \textit{zerbrach} [argendetwas].
     *Anna broke [something].'

  (1a) \Rightarrow (1b)

- Systematic alternation in situation type (and argument structure)
  
  (2) a. Maria \textit{aß} zwei Äpfel in zehn Minuten/*zehn Minuten lang. \textit{telisch} 'Maria ate two apples in ten minutes/*for ten minutes.'
  
  b. Maria \textit{ahnte} Äpfel *in zehn Minuten/\textit{zehn Minuten lang}. \textit{atelisch} 'Maria ate apples *in ten minutes/\textit{for ten minutes}.'
  
  c. Maria \textit{aß} *in zehn Minuten/\textit{zehn Minuten lang}.
     \textit{atelisch} 'Maria ate *in ten minutes/\textit{for ten minutes}.'

  (2a) \Rightarrow (2b), (2b) \Rightarrow (2c)

2.3 Non-systematic meaning alternations

- Non-systematic alternation triggered by the sort of internal arguments
  
  (3) a. Der Pförtner \textit{öffnete} die Tür. 'The porter opened the door.'
  
  b. Der Verkäufer \textit{öffnete} das Geschäft. 'The shop assistant opened the shop.'
  
  c. Die Mutter \textit{öffnete} das Paket. 'The mother opened the parcel.'
  
  d. Der Junge \textit{öffnete} das Taschenmesser. 'The boy opened the penknife.'
  
  e. Die Dame \textit{öffnete} die Halskette. 'The lady opened the necklace.'
  
  f. 'Der Angestellte \textit{öffnete} die Datei. 'The clerk opened the file.'

  (3a) \Rightarrow (4a)

- Non-systematic alternation triggered by the sort of external arguments
  
  (5) a. Der Schlüssel \textit{öffnete} die Tür. 'The key opened the door.'
  
  b. Der Wind \textit{öffnete} die Tür. 'The wind opened the door.'

- Non-systematic alternation triggered by the sort of internal and external arguments
  
  (6) a. Der Pförtner \textit{nähme} die Tür. 'The porter took the door.'
  
  b. Der Junge \textit{nähme} das Taxi. 'The pedestrian took the taxi.'

2.4 Systematic meaning shifts

- Aspect shift
  
  (7) #Das Licht \textit{blitzte} bis zum Morgen. 'The light flashed until dawn.'

  'The light repeatedly flashed until dawn.'

- Shift to a distributive reading
  
  (8) #Hans \textit{zerbrach} fünf Gläser in zehn Minuten. 'Hans broke five glasses in ten minutes.'

  'Hans broke successively five glasses in ten minutes.'
3 Strategies to lexical verb semantics

3.1 Maximalist strategy
(cf. Engelberg 2000)

- Basic feature
Verbs have to be lexically full-specified by listing all of their meaning variants as separate semantic representations (lexical polysemy).

(9) a. Karl spülte die Wäsche/den Mund/das Geschirr/die Haare/die Wunde/... .
   'Karl washed the clothes/the mouth/the dishes/the hair/the wound/... .'

b. Karl spülte seiner Mutter die Wäsche/den Mund/das Geschirr/... .
   'Karl washed the clothes/the mouth/the dishes/... for his mother.'

c. [Mit Hinweis auf Geschirr:] Karl spülte gerade.
   [In connection to dishes:]   'Karl just washed.'

d. [Beim Zahnarzt:] Karl spülte gerade.
   [At the dentist:]     'Karl just rinsed.'

e. Die Waschmaschine spülte gerade.
   'The washing machine just washed.'

- Problem
Maximalist approaches have primarily to face the objection that they lack generalizations on the various meaning variants and, hence, are not cognitively adequate (cf. Pustejovsky 1995).

3.2 Projectionist strategy

- Basic features
(i) The number of lexical semantic representations for one and the same verb is reduced by means of lexical generalizations on its possible meaning variants.
(ii) The lexically stored information on verb meaning is viewed as central for syntactic derivation.
(iii) The most important method in the realm of projectionist analyses is that of lexical decomposition, which can be traced back to Dowty (1979).

- Some critical points on semantic decomposition

(i) It is well-known that compositional structures are logically weaker than the meaning of the verbs those structures should be the representations of.
(ii) It is an open question whether decomposition can adequately cover all similarity-based meaning variants of a verb like öffnen (cf. (3) – (5) above).
(iii) It is not clear how the meaning of verbs denoting eventualities of a more specific kind can be represented (e.g. aufreißen ‘rip open’, aufbrechen ‘break open’, aufreißen ’unbolt’, auftrennen ’undo’).
(iv) It appears that the information on a result state cannot be regarded as a necessary part of decompositional structures of a verb like schmelzen.

(12) a. Anna schmolz ein Stück Eis (in zehn Minuten). causative, event-related
   'Anna melted a piece of ice (in ten minutes).'

b. Ein Stück Eis schmolz (in zehn Minuten). inchoative, event-related
   'A piece of ice melted (in ten minutes).'

c. Anna schmolz Eis (zehn Minuten lang). causative, process-related
   'Anna melted ice (for ten minutes).'

d. Eis schmolz (zehn Minuten lang). inchoative, process-related
   'Ice melted (for ten minutes).'
3.3 Minimalist strategy

- **Basic features**
  1. The lexical verb semantics is reduced to an absolute minimum in order to keep the variability in the meaning of verbs.
  2. The syntactic construction in which a verb occurs is viewed as an essential determining factor for its meaning variant.
  3. A syntactic line of meaning decomposition (cf. Lin 2004, Ramchand 2006) follows the idea that eventuality structure expressed by a verb is explicitly encoded in syntax.

- **Severing the external argument from its verb** (Kratzer 1996)
  1. External argument positions are not included in the lexical semantic representation of verbs.
  2. They are introduced in a neo-Davidsonian manner during the syntactic derivation by a (non-overt) functional head called voice.

- **A neo-constructionist view** (Borer 2005)
  1. Generally, the argument structure of verbs is computed syntactically by means of various functional heads and independently of lexical semantic information.
  2. Verbs are concealed 'conceptual packages' which are embedded in the syntactic structure without affecting the structure or being affected themselves.
  3. After the syntactic structure has gained a grammatically determined meaning the 'conceptual packages' open and their content is verified with the structural meaning.

- **General evaluation of the minimalist strategy**
  1. **Pro:** Lexical semantic representations of verbs should contain as few as possible structural restrictions.
  2. **Contra:** The adequacy of structures that essentially result from a transfer of the device of lexical decomposition into syntax has to be questioned.

4 Semantic composition and pragmatic interpretation

4.1 The semantics/pragmatics distinction (cf. Carston 1999)

- Semantics and pragmatics are two separate systems of information processing, which are involved in the determination of utterance meaning.
- The semantic system is a subsystem of grammar but is not able to affect anyhow the structuring by the autonomous syntactic subsystem.
- The task of the semantic system is to compute the formal and, hence, merely schematic meaning of utterance. Its binding principle is that of compositional meaning.
- The task of the pragmatic system is to derive the actual sense of an utterance by means of pragmatic inferences integrating its formal meaning with elements of the conceptual-intentional system.
- This phase of pragmatic interpretation of the semantic output is governed by the principle of contextuality of meaning.
4.2 A multi-level model of meaning (cf. Dölling 2003, 2005)

At least three levels of meaning structure can be distinguished, over which the conceptual information conveyed by utterance is elaborated:

- The level of **semantic form SF**
  (i) represents the formal meaning of expressions and is the starting point for pragmatic interpretation;
  (ii) is built up strictly compositionally, i.e. is determined exclusively by the occurring lexical items and the manner of their syntactic combination;
  (iii) is radically underspecified by containing a multitude of SF-parameters, i.e. free variables that can be substituted by particular conceptual constants.

- The level of **parameter-fixed structure PFS**
  (i) differs from that of SF insofar as now the SF-parameters are substituted by means of pragmatic enrichment;
  (ii) represents the very level on which variation of verb meaning takes place.

- The level of **conceptual content CC** represents the full-specified conceptual meaning of the utterance.

5 Lexical semantic form and syntactic construction

5.1 A minimalist approach to lexical SF

- **Assumptions**
  (i) The lexical SF of a verb participates in the grammatical computation as an autonomous unit but is never able to impose any structural conditions on the syntactic distribution of the verb.
  (ii) As verbs are open to several variations of their primary meaning, their lexical SFs have to allow for each of the possible differentiations by fixing SF-parameters respectively.

- The lexical SF of a verb cannot be more than a 'pointer' that helps to identify the appropriate meaning variant in the respective syntactic and conceptual context.

- Ultimately, the lexical entry of a verb is merely a pair \((PF, SF)\), where the phonological form \(PF\) and the semantic form \(SF\) represent the abstract schemas of sound and of meaning, respectively.

5.2 A first proposal

(13) **öffnen**

\[
\begin{align*}
PF: & \quad /öffn-/= \{\text{OPEN}(\alpha)\} \\
SYN: & \quad V_\alpha, [\_/NP_{acc}/NP_{nom}] \text{ GRAMMAR} \\
SF: & \quad \lambda \alpha. \text{OPEN}(\alpha) \\
PRAG: & \quad (\text{a)} \alpha = + \iff \{\text{OPEN}_1, \text{OPEN}_2, \text{OPEN}_3, \text{OPEN}_4 \ldots \} \\
& \quad (\text{b)} \alpha = - \iff \{\text{OPEN}_1, \text{OPEN}_2, \text{OPEN}_3 \ldots \}
\end{align*}
\]

- Four components:
  (i) **PF, SYN** and **SF** constitute the grammatical part, i.e. that one which is the basis for the grammatical computation;
  (ii) **PRAG** is an extra-grammatical component which is relevant for the process of pragmatic enrichment.

- **SYN**: The subcategorization frame \([\_/NP_{acc}/NP_{nom}]\) indicates that the verb can be used in a transitive as well as in an intransitive variant; the notation \([\alpha X]\) indicates that \(X\) is present if \(\alpha\) is \(+\), and absent otherwise.

- **SF**: \(\lambda \alpha. \text{OPEN}(\alpha)\) is identified with the one-place predicate \(\lambda e. \text{OPEN}(e)\) over eventualities, i.e. no thematic argument positions are included in it (non-decompositional neo-Davidsonian format, cf. Parsons 1990).
  (i) is independent of the varying number and sort of arguments that are available in the syntactic structure in which the verb is embedded.
  (ii) \(\text{OPEN}\) is a SF-parameter which has to be contextually fixed with one-place predicate constants denoting various types of opening.

- **PRAG**: \(\alpha = + \iff \{\text{OPEN}_1, \text{OPEN}_2, \text{OPEN}_3, \text{OPEN}_4 \ldots \}\)
  (i) comprises the conditions for determining the domain of values of the SF-parameter in dependence on the syntactic context in which the verb occurs.
  e.g. the domain of values of \(\text{OPEN}\) has to be identified with the set containing predicate constants like \(\text{OPEN}_1\), \(\text{OPEN}_2\) etc. if the verb is subcategorized for a nominative and an accusative NP.
  (ii) Which of the values out of the particular domain is actually selected in the process of pragmatic enrichment is dependent on the kind of entities which the argument NPs refer to.
5.3 Introducing argument positions

- Problem
  How can the several meaning variants of the verb combine with their thematic argument structure?

- The proposal
  (i) The information about the argument positions is brought in by means of particular configurations that are inserted in the process of SF-composition.
  (ii) The insertion of these SF-configurations is triggered by the syntactic structure building process.

- Two options
  (i) The SF-configurations can be seen as operators of type-shifting (or type coercion), which do not have syntactic correlates. They are only inserted if a type conflict would emerge otherwise.
  (ii) The SF-configurations can be understood as the contributions of functional categories to the computation of SF. As a consequence, the introduction of argument positions is directly linked to the generation of syntactic structure.

Introducing by means of functional heads

The main difficulty in pursuing this option is whether internal argument positions can be introduced in the same manner as Kratzer has proposed it for the external one (for a positive answer cf. Lin 2004, Borer 2005, Williams 2007)

(14') Hans öffnete die Tür.

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

where \( \theta_{\text{open}} \) is a SF-parameter for thematic relations like AG or TH

- A further suggestion (following partially Borer 2005)

(13') \( \langle \text{PF, \text{öffn}/, BF, open} \rangle \), where open is a SF-parameter for concepts of opening like open1, open2, etc.

(14'') Hans öffnete die Tür.

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

\[
\begin{array}{c}
\text{NP} \\
\text{v}
\end{array}
\]

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6 Meaning differentiation and parameter-fixed structure

6.1 Fixation of SF-Parameters

- Problem
  What kind of meaning structure arises from the SF of an utterance by fixing its parameters with suitable values?

\[(16)\]  Hans öffnete die Tür.

SF: \[\exists e [\theta_{nom}(hans, e) \& \theta_{acc}(def\_DOOR, e) \& OPEN(e)]\]

SEMANTICS

parameter fixation by pragmatic inference

PFS: \[\exists e [AG(hans, e) \& TH(def\_DOOR, e) \& OPEN_{SF}(e)]\]

PRAGMATICS

- Observation
  Traditionally, structures of the kind of PFS would be viewed as 'semantic representations' that expressions immediately have or acquire in the process of grammatical computation of meaning.

6.2 The conceptual base for meaning differentiation

- Conditions of parameter fixations
  A lot of elements of the conceptual-intentional system \(C-I\) have to be consulted for the decision which values are suitable for the fixation of the parameters in the respective context.

- Some provisional axioms relevant for the interpretation of \(öffnen\):

\[(18)\]

\[\begin{align*}
\forall e & \left[\text{OPEN}_{SF}(e) \rightarrow \exists o o' \left[\text{AG}(o, e) \& \text{DOOR}(o') \& \text{TH}(e, o')\right]\right] \\
\forall e & \left[\text{OPEN}_{SF}(e) \rightarrow \exists o o' o'' \left[e = e' \oplus e'' \& \text{AG}(o, e') \& \text{CAUSE}(e', e'')\right.\right] \\
\exists s & \left[\text{BECOME}(e'', s) \& \text{OPEN}_{SF}(s) \& \text{TH}(o', s)\right]\end{align*}\]

The axiom characterizes events of the kind of OPEN\(_{SF}\) as including two subevents and resulting in a state of being open in a certain way.

Notice that in contrast to the strategy of semantic decomposition the CAUSE-BECOME-structure forms only a necessary but not a sufficient condition for the application of OPEN\(_{SF}\).

6.3 The case of systematic meaning alternation

- Causative/inchoative alternation of \(zerbrechen\)

\[(20)\]

\[\begin{align*}
\text{PF:} & \quad / zerbrech-/
\\
\text{SYN:} & \quad V, \left[\alpha/\text{NPacc}\right]/\text{NPnom}\n\\
\text{GRAMMAR:} & \quad \lambda e. \text{BREAK}(e)
\\
\text{SF:} & \quad \lambda e. \text{BREAK}(e)
\\
\text{PRAG:} & (a) \quad \alpha = + \iff \text{BREAK} \in \{\text{BREAK\_CAUS}\}
\\ & (b) \quad \alpha = - \iff \text{BREAK} \in \{\text{BREAK\_INCHO}\}
\\
\text{PFS}(\text{zerbrechen}): & \quad \lambda o o'. \text{AG}(o', e) \& \text{TH}(o, e) \& \text{BREAK\_CAUS}(e)
\\
\text{PFS}(\text{zerbrechen}): & \quad \lambda o e. \text{TH}(o, e) \& \text{BREAK\_INCHO}(e)
\\
\text{PRAGMATICS:} & (a) \quad \forall e \left[\text{BREAK\_CAUS}(e) \rightarrow \exists o \text{AG}(o, e) \& \exists o' \text{TH}(e, o')\right]
\\ & (b) \quad \forall e \left[\text{BREAK\_INCHO}(e) \rightarrow \exists s \left[\text{BECOME}(e, e') \& \text{TH}(e', s) \& \text{BREAK\_INCHO}(s)\right]\right]
\\ & (c) \quad \forall e \left[\text{BREAK\_CAUS}(e) \rightarrow \exists o o' \left[e = e' \oplus e'' \& \text{AG}(o, e') \& \text{CAUSE}(e', e'')\right.\right] \\
\end{align*}\]

It has to be left to future work to explicate the totality of elements of \(C-I\), which constitute the intricate network of the concepts of opening.
7 Meaning shifts vs. strict semantic composition?

7.1 A traditional view to meaning shift of verbs (cf. Pustejovsky 1995, Jackendoff 1997)

(25) a. #Anna nieste zehn Minuten lang. iterative reading 'Anna sneezed for ten minutes.'
   b. #Anna nieste wochenlang. habitual reading 'Anna sneezed for weeks.'


- Operators of type coercion
  Type coercion uses specific operators that are licensed by pieces of conceptual world knowledge.

(26) a. Iterative reading: moment: m → process: p

\[
\begin{align*}
\text{niessen: } & \lambda m. \text{SNEEZE}(m) \\
\text{iterativ: } & \lambda m p. \forall m \left[ \text{CONST}(m, p) \rightarrow \text{P}(m) \right] <\alpha_m, t> \Rightarrow <\alpha_p, t>
\end{align*}
\]

b. Habitual reading: moment: m → state: s

\[
\begin{align*}
\text{niessen: } & \lambda m. \text{SNEEZE}(m) \\
\text{habitual: } & \lambda m s. \forall m \left[ \text{REAL}(m, s) \rightarrow \text{P}(m) \right] <\alpha_m, t> \Rightarrow <\alpha_s, t>
\end{align*}
\]

- Meaning shift as a general ‘repair’ mechanism
  (i) Meaning shifts are motivated by the attempt to resolve a semantic mismatch.
  (ii) Meaning shifts involve an interpolation of concrete semantic material that is not expressed lexically, but that must be present in order to ensure semantic well-formedness.

\[
\downarrow 
\text{Meaning shift as an argument against strong semantic compositionality}
\]
Inflection template obligatorily applied to one-place predicates

(27) \[\text{met}_c: \lambda P \lambda x. Q_n y [y R_n x C_n P(y)]\]

where

(i) \(Q_n\) is a parameter that can be fixed by \(\exists\) or \(\forall\),
\(R_n\) is a parameter that can be fixed by \(-\) or by other general relations like \(\text{REAL}\) or \(\text{CONST}\)
holding between elements of two distinct conceptual domains and
\(C_n\) is a parameter that can be fixed by \(\&\) or \(\rightarrow\);

(ii) by default, \(Q_n\), \(C_n\), and \(R_n\) are fixed by \(\exists\), \& and \(-\), respectively.

Conclusions

- Variations in verb meaning can be viewed as instances of contextual differentiation and shifting performed on the grammatically determined meaning of verbal expressions.

- In the phase of grammatical computation the context-independent and, hence, merely formal meaning is calculated in accordance with the strong principle of semantic compositionality.

- In the phase of pragmatic interpretation the contextually specified meaning is derived by inferences integrating the abstract meaning base with elements of the conceptual-intentional system.

- In concretizing this picture, the talk has suggested a model in which the actual meaning variant of a verb must be elaborated, starting from a radically underspecified lexical entry, in a sequence of meaning levels.

References