

Path-Structures and Verbal Semantics

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1. Introduction

This article introduces a semantic analysis of some of the German simple verbs¹. I am mainly concerned with verbs of creation/consumption, so-called pro-acco-verbs (process-accomplishment-verbs), deadjectival verbs with incremental themes and verbs of motion. Most of them are traditionally analysed as accomplishments following the verbal classification introduced by Vendler (1967). I want to show that this classification makes wrong predictions about the behaviour of a lot of these verbs. The goal of the paper is to develop a semantic representation, which captures the intuition that some of the above mentioned verb classes are underspecified with respect to an accomplishment reading vs. an activity reading, and some of the verb classes are not, but still allow an activity reading under special circumstances.

- (1) (a) *Karla aß einen Apfel (in 5 Minuten/^{??}5 Minuten lang).*
Karla ate an apple (in 5 minutes/^{??}for 5 minutes).
(b) *Petra fegte den Fußboden (in einer Stunde/stundenlang).*
Petra swept the floor (in one hour/ for hours).
(c) *Micha trocknete sein Haar (in 2 Minuten/^{??}2 Minuten lang).*
Micha dried his hair (in 2 minutes/ for 2 minutes).
(d) *Franzi rannte nach Hause (in 20 Minuten/*20 Minuten lang).*
*Franzi ran home (in 20 minutes/*for 20 minutes).*

The representation will be developed in the framework of the Two-Level Approach to Semantics (see Bierwisch, 1987, 1988, Wunderlich, 1986, 1997).

The Two-Level Approach is based on the distinction between a semantic form (SF) and a conceptual structure (CS). SF belongs to the grammar of a language and therefore is language-specific. CS involves knowledge of language and world knowledge and gives the right interpretation of utterances. CS is not part of the grammar and not language specific.

The main concept that will be exploited is that of abstract paths. The notion of paths or abstract paths is not new in the literature on verbal semantics (see f.i. Jackendoff, 1983, 1996). What is new in the analyses introduced here is that situations denoted by verbs belong to different parts of the path structure. The main information for a process is that it started and that there is not a natural endpoint. Processes focus on the beginning of a path. Accomplishments, on the other hand, pick out the end of a path, because they are goal-oriented and have an endpoint. How this works out in combination with time information will be shown in section 2. Section 3 deals with

¹ 'Simple' is supposed to mean 'morphologically simple'. I do not consider German prefixed verbs or particle verbs.

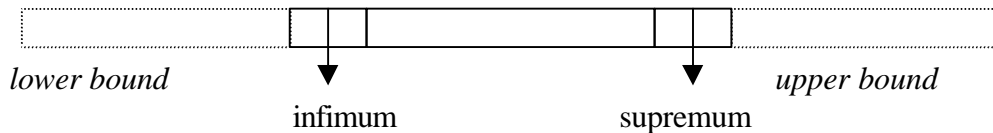
the representations of verbs of the different classes and compares these representations.

2. A Schematic Semantic Representation and its Conceptual Foundations

Accomplishments are traditionally assumed to have a complex event structure involving two subevents. The first subevent is an activity and the second subevent is a result state. The problem is, that verbs which are ambiguous between an accomplishment reading and an activity reading (like *sweep*, *wipe*) then need two different lexical entries, because in the first reading they consist of a complex event structure and in the second reading a simple event structure. The proposed representation is underspecified with respect to the existence of a result state.

$$(2) (\lambda Q)(\lambda y) \lambda x \lambda T_E \lambda T \lambda s [[DO(x, T_E) \& P(x,y)] : [[Q(y, T_i), s, T]]^2$$

In the next section I will give some details about the two three conjuncts of the SF in (2) and about their arguments. The first conjunct contains the semantic prime DO, which serves here as a structural component for all agentive verbs. DO contains basic notions like agentivity, dynamics, duration, and abstract path. It has two arguments - x denoting the subject/agent, and T_E denoting the establishing-time interval.³ The establishing-time represents that part of a real situation time (T_S), which will be evaluated. T_E stands in an improper part relation to T_S . The establishing time plays an important role in the choice of the part of the path a situation takes. The combination of the information of DO and of the establishing time yields a path structure focussing on a particular part of that structure. A path $\pi(x)$ has the orientation x . There must be at least one x_i for which holds: $x_i \in \pi(x)$. The orientation of the path can be the upper or the lower bound.



The establishing-time interval determines which part of the path is taken to be central for the situation. Processes have the infimum as T_E -interval, accomplishments have the supremum as interval.

To sum up: the first conjunct of the SF denotes agentivity, dynamics, duration and an abstract path.

² The first part of the semantic representation (λ -Prefix) is the argument structure of the verbs. As this paper is not concerned with the mapping between Syntax and Semantics, I will not go into further detail about the prefix.

³ The notion of establishing time was developed in corporation with Martin Trautwein, a colleague of mine, who is developing a time ontology.

The second conjunct ($P(x,y)$) serves as an anchor for idiosyncratic verb information. This means that P specifies the abstract path with further information coming from the domain of situations and the domain of objects. The latter is possible because object information is available via the internal argument y . The motivation for assuming P as part of the representation lies in Talmy's (1976) typological distinction between 'verb-frame-languages' and 'satellite-frame-languages'.⁴

- (3) (a) *He extinguished the candle by blowing.* (verb-frame)
 (b) *He blew the candle out.* (satellite-frame)

German is a typical satellite-frame-language, which means that the main verb carries elaborating information, mainly manner information. Exactly this manner information is expressed with the predicate P .

Not only does an abstract path conceptually underlie the predicates DO and P - so do also principles postulated by Krifka (1989, 1999). These are the principle of Mapping of Events, Uniqueness of Events, Mapping of Objects and Uniqueness of Objects.⁵ Strict incrementality is derived through the cooperation of these principles.

The last part of the semantic representation is the Q -component. This component is an underspecified predicate, which can express potential result states if needed. The arguments of Q again are the internal argument y and another time interval T_i for the result state.⁶ T_E and T_i stand in a temporal order relation⁷.

- (4) $T_E \leq T_i$

⁴ Talmy (1976) differentiates two events for the description of a situation. The first one is the frame event, which plays the major role for the situation, because it expresses whether it is a process or a transition. The second event can elaborate the frame event in terms of motivation, description etc. When the main verb expresses the frame event, then the language is a 'verb-frame-language'. If the main verb expresses the elaborating event and a satellite (like particles, prefixes) denotes the frame event, then the language is a 'satellite-frame-language'. Germanic languages belong to the latter class.

⁵ Krifka (1999: 211ff.):

θ shows mapping to objects $MO(\theta)$, iff

$$\forall x \in U_P \forall e, e' \in U_E [\theta(x, e) \wedge e' \leq_E e \rightarrow \exists y [y \leq_P x \wedge \theta(y, e')]]$$

(U_E = set of events, \leq = improper part-relation)

θ shows uniqueness of events $UE(\theta)$, iff

$$\forall x, y \in U_P \forall e \in U_E [\theta(x, e) \wedge y \leq_P x \rightarrow \exists! e' [e' \leq_E e \wedge \theta(y, e')]]$$

θ shows uniqueness of objects, $OE(\theta)$, iff

$$\forall x \in U_P, \forall e, e' \in U_E [\theta(x, e) \wedge e' \leq_E e \rightarrow \exists! y [y \leq_P x \wedge \theta(y, e')]]$$

⁶ The last two arguments of the representation are T and s . The first one is the tense argument and the second one the situation argument. T_E and T_i are proper parts of T , because the tense time is the highest temporal frame for the sentence. But this paper is only concerned with the inner semantic structure of the verbs, so that T and S will not be considered here any further.

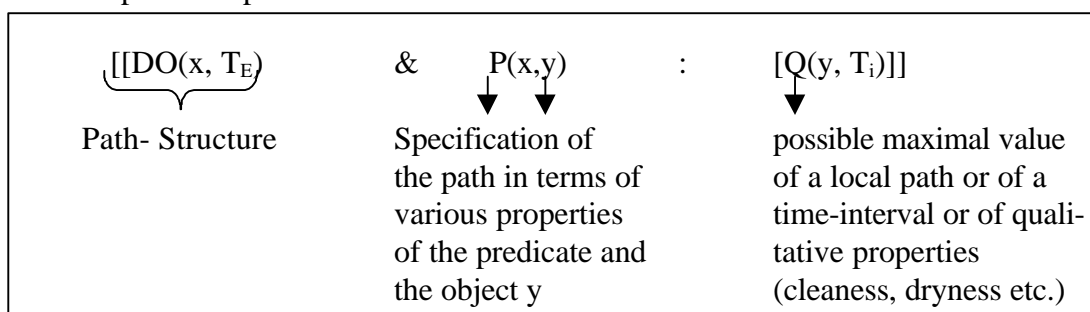
⁷ It is not a strong ordering relation, the two intervals can end at the same time.

The Q-component denotes a property of the object that is changed by the activity denoted by the verb. The only domains available for the interpretation are the domain of objects given by y and the domain of situations given by DO and P. Q is based on scales which can belong to the temporal, the spatial or other qualitative domains. Scales are understood as abstract paths, too.⁸ Therefore, the introduced representation gives the possibility of mapping all these different subtypes of paths onto each other in the interaction of y , P and Q.

- (5) *Maria wischte den Fußboden sauber.*
Maria wiped the floor clean.

The paths involved in the interpretation of the sentence (5) are the surface of the floor, which is affected incrementally on a scale of the cleanliness-property of floors. In the example sentence Q receives a maximal value on the cleanliness scale. This sentence will get a telic interpretation because of the maximal value of Q, which bounds the path.

The following scheme sketches the different information pieces working together in the interpretation process.



The Q-predicate is allowed to be underspecified in the lexicon. It can be even left underspecified in a whole sentence, if there exists no value for Q. The different verb classes differ with respect to the specification of Q, which will be shown in section 3.

Here a short comment on the two primitives CAUSE and BECOME seems necessary. The latter one is used in the literature on verbal semantics to denote changes of states. The problem often arising in connection with BECOME is the ambiguity between punctual changes of state (like *kill*, *break*) and incremental changes of state, which hold for all the verbs considered here. I do not assume the BECOME predicate in the representation here, because I think it should be reserved for punctual changes. Path information, time information and scale information can serve the purpose of denoting the incremental change.

⁸ Compare Bierwisch's (1987: 130ff) definition of scales and degrees. He analyses them as directional and one-dimensional. The scales are canonical, which means that they are metrical and contain a zero-point.

The CAUSE operator also poses a problem. We must distinguish carefully between causal relations explicitly expressed in a language and marked in the grammatical system, and causal relations interpreted via our world knowledge, but not expressed systematically in the grammar of a language. CAUSE is used only in the representation of real causative verbs (deadjectival verbs with incremental theme belong to this verbal class). For all other verbs the coherence principle of Kaufmann (1995a) holds #A lexical SF-Conjunction is contemporaneously or causally interpreted#. Therefore one does not have to assume a CAUSE operator in addition. The consequence of that assumption is that it becomes possible to connect the special behaviour of causatives (only transitively used, causative-inchoative-alternation) with the presence of that operator.

3. Examples of the different verb classes

3.1 Verbs of creation and consumption and pro-acco-Verbs

Verbs of creation and consumption like *build*, *eat*, *drink* per default denote telic events. Only the objects of these verbs can trigger an atelic interpretation, when they are bare plurals or mass nouns. But incrementality always holds.

- (6) (a) *Hans baute ein Haus.* *Hans baute Häuser.*
 Hans built a house. *Hans built houses.*
 (b) *Marie trank einen Wein.* *Marie trank Wein.*
 Marie drank a wine. *Marie drank wine.*

The pro-acco-verbs do not per default denote telic events. They stay ambiguous as long as no other material in the sentence gives rise to a telic or an atelic interpretation.

- (7) (a) *Tina wischte den Fußboden (in 10 Minuten/10 Minuten lang).*
 Tina wiped the floor (in 10 minutes/ for 10 minutes).
 (b) *Uwe backte einen Kuchen/ die Kartoffeln.*
 Uwe baked a cake/ the potatoes.

The difference between these two verb classes lies in the value for the Q-predicate. The semantics of verbs of creation/consumption contains a specified value for the Q. The pro-acco-verbs just have an underspecified Q, which can get an value through the course of interpretation.

- (8) (a) *essen (eat):*
 $(\lambda y) \lambda x \lambda T_E \lambda T \lambda s$ [[DO(x, T_E) & EAT(x, y)] : [¬ EXIST(y, T_i)], s, T]
 (b) *wischen (wipe):*
 $(\lambda Q) (\lambda y) \lambda x \lambda T_E \lambda T \lambda s$ [[DO(x, T_E) & WIPE(x, y)] : [Q(y, T_i)], s, T]

As one can see in (8)(a), Q gets the value [¬EXIST], which is systematic for all consumption verbs. This value comes out of the lexicon together with the verb, and that's why their default reading is telic. Verbs like *wipe* do not have this lexical

specification and therefore cannot have a default interpretation. If verbs of both classes are used intransitively then they always have just an activity reading, because without the internal argument *y*, there is no interpretation of *Q* possible, and the only interpretable predicates are *DO* and *P*.

3.2 Deadjectival Verbs with Incremental Themes

Deadjectival verbs with incremental themes like *dry*, *clean* etc. are also telic in the default interpretation, but there are some essential differences between them and the verbs of creation and consumption. First of all deadjectival verbs cannot be used intransitively, they are obligatory transitive, because they are marked for causativity. Another observation supporting this assumption is that they take part in the causative-inchoative-alternation.

- (9) (a) *Karl trocknete seine Wäsche (in 10 Minuten/ ?? 10 Minuten lang).*
Karl dried his washing (in 10 minutes/ ? for 10 minutes).
 (b) **Karl trocknete.*
 **Karl dried.*
 (c) *Die Wäsche trocknete.*
The washing dried.

To give the right semantics for these verbs, the representation introduced above has to be modified. The abstract path underlies the incremental development of the object only and does not underlie the action of the agent. The only point for the idiosyncratic verb information is *Q*, which is specified in the lexicon with the adjectival base of the verbs.

- (10) *trocknen (dry):*
 $\lambda y \lambda x \lambda T_E \lambda T \lambda s [(CAUSE(x))(((GO(y, T_E)) \& DRY(y)), s, T)]$

The predicate *GO* and the specified *Q* are parallel to the predicate *DO* and a specified *P*. The path is specified here as the path taking by the result development.

3.3 Verbs of Motion

The last verbal class that has to be considered as involving paths is the class of motion verbs. Here the path is not abstract, but a real spatial one.

- (11) (a) *Peter rannte nach Hause*
Peter ran home.
 (b) *Peter rollte den Ball in den Teich.*
Peter rolled the ball in the lake.
 (c) *Der Ball rollte in den Teich*
The ball rolled in the lake.

In distinction to all other considered verbs, it is not the internal object y which bounds the path here, but the directional PP. When there is an internal argument then this one follows the path incrementally up to the point denoted by the PP.

(12) *rennen* (*run*):

$(\lambda W) \lambda x \lambda T_E \lambda T \lambda s [[DO(x, T_E) \& WALK(x)] : [W(x, T_i), s, T]$

(13) *rollen* (*roll*)(causative variant):

$(\lambda W) \lambda x \lambda T_E \lambda T \lambda s [[CAUSE [DO(x, T_E) \& ROLL(x, y)]] : [W^9(y, T_i)], s, T]]$

4. Conclusion

In this paper I tried to show that the semantics of a large number of German simple verbs denoting agentive events involving incrementality in one or another way can be explained in terms of an abstract path structure. This structure conceptually underlies the SF of these verbs and helps to yield the correct mappings between the verbal and the object information. There is no longer need for assuming the BECOME operator as part of the representation. The assumed Q-predicate gives the right predictions about the default interpretations of the different verb classes depending on the value Q gets in the lexicon. In addition to that, Q can serve as an anchor for secondary predication, which could not be shown in this paper for reasons of space.

CAUSE is only needed for the representation of the deadjectival verbs, because they show the behaviour of causatives. Some of the verbs of motion also have a causative variant. The combination of DO and the establishing time interval (and GO and the establishing time interval for deadjectival verbs) can represent some of the essential features of these verbs like agentivity, dynamics, duration and path.

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⁹ W is the anchor for the directional PPs.

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