Aiming with arrows at particles.
Towards a conceptual analysis of German particle verbs

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1 Background and Motivation

Particle verbs (PVs) such as *anstrahlen* 'beam at' and *aufhören* 'stop' are very common in German. They are compositions of a prepositional particle (P) and a simple base verb (BV). We assume that each particle P has a restricted number of basic meanings. We understand those basic meanings as concepts which are underspecified at first, and then resolved by contextual constraints. Additional cognitive objects, like associations and world knowledge, determine the plausibility and grammaticality of a PV. A particle sense is therefore an adjustment to contextual constraints, by combining lexical and cognition-based meanings.

Similarly to Lakoff (1987)'s notion of Image Schemas and Gärdenfors (2004) who interprets prepositions as "primarily spatial relations" that create "spatially structured mental representations", we understand the basic meanings of Ps as spatially grounded mental structures. In this context, our work focuses on directional concepts.

In previous research on P semantics, meanings were mostly approached with discrete classifications of their PVs (cf. Kliche (2011), Lechler (2009), Springorum (2011), Stiebels (1996)). For example, 'Direction' and 'Contact' represent two independent readings for *an*. For example, the PV in the sentence *Karin schaut das Haus an* ('Karin looks towards the house') belongs to the first class, suggesting that *an* assigns a direction to the BV, whereas in *Karin klebt die Briefmarke an* ('Karin sticks the stamp on') the PV would be assigned a 'Contact' P meaning. In combination with a movement BV as in *Karin fährt die Laterne an* ('Karin drives against the lantern'), the P again introduces a direction. In addition, the meaning also requires a decreasing distance, which results in a contact when maximal. Therefore, *anfahren* represents an example with meaning components from both classes, 'Direction' and 'Contact'. The examples show that P senses vary in their complexity, and they illustrate the limits of a hard class assignment.

In a different vein, previous research already connected concepts with complex verbs. For example, Lindner (1983) used visual representations, for a lexico-semantic analysis of English verb particle constructions, and Morgan (1997) provided an extension for metaphorical readings. Abreu (2008) and Side (1990) discussed the advantage of Image Schemas for learning phrasal verbs.

2 Experiment

Our goal is to explore basic meaning components of particles, which function as building blocks for more complex meanings. In this abstract, we present an experiment which focusses on the identification of directional concepts, associated with the particle meanings.

PV data

The lexical data consist of 30 BVs from three domains, varying in their degrees of abstractness: (1) the concrete 'Machines and Tools' domain (*hämmern* 'hammer', *spitzen* 'sharpen'), (2) the less concrete 'Force' domain (*pressen* 'press', *quetschen*

'squeeze') and (3) the abstract 'Sound' domain (*donnern* 'thunder', *rattern* 'clatter'). The 30 BVs were combined with 9 prepositional particles (*ab, an, auf, aus, ein, mit, nach, vor, zu*), leading to a set of 270 PVs[1] in addition to the 30 BVs.

Simplified Image Schemas as non-lexical concept representations

The directional concepts were visually represented as Concept Images (CI), which are more universal than words, according to Neurath (1983). Although the number of directions in space is infinite, a simplified conceptual reduction into a two-dimensional setting is in many cases sufficient, because "salient dimensions of the world reinforce the horizontal and vertical" (Tversky, 2011). We defined a set of directional arrows (cf. Figure 1) representing CIs, by relying on Dreyfuss (1984)' and Frutiger (1987)'s semiotic resources.

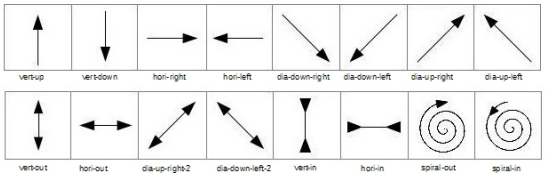
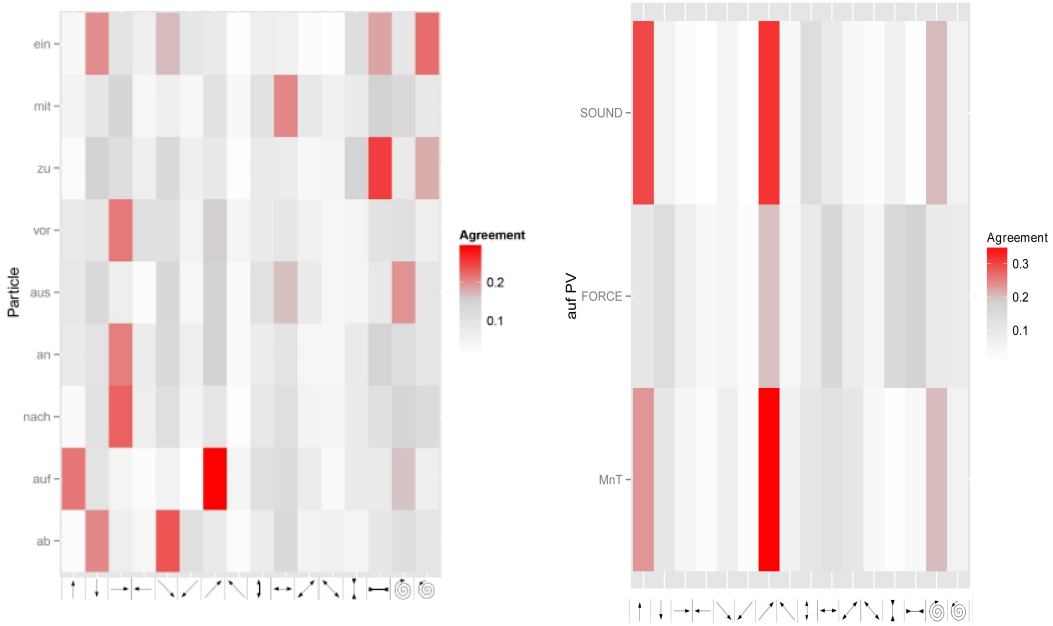


Figure 1: Concept Image set. Procedure

The experiment was performed as follows: The 300 PVs+BVs were distributed randomly over 30 lists with 10 verbs each. The random distribution was balanced for domain, particle type and neologism. The subjects were presented a list of 50 target verbs, together with the CIs, and asked to mark those CIs which fit to the target verb.

3 Results and Discussion

The main part of the talk will discuss preferences of particles and domains across the CIs, and relate them to theoretical hypotheses about particle meanings.



a) Participant agreement on CIs across Ps. (b) Participant agreement on CIs for *auf*.

Figure 2: Predominant selections of directional Concept Images.

1 About half of the PVs are neologisms.

For example, Figure 2(a) shows particle preferences for specific CIs, which we will demonstrate to fit to our hypotheses in many cases. Furthermore, PV compositions relying on semantically similar BVs were associated with similar CIs. This regularity allows to make theoretical inferences on concepts and meanings depending on BV contexts. As a second example, Figure 2(b) shows the distribution of CIs over the BV domains for PVs with *auf*. Upward arrows are linked to PVs composed of 'Sound' and 'Machines and Tools' BVs, but aren't linked to 'Force' PVs, as their BVs already were in some cases associated with CIs by themselves. This seems to indicate conflicts in the composition of the concepts. An example is **aufquetschen*, where the inward pointing arrows coming from *quetschen* 'squeeze' cannot be combined with the upward concepts in *auf*.

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