

Features of ad-hoc kinds created by similarity

Carla Umbach (ZAS Berlin)

Institut für Deutsche Sprache und Literatur I
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Similarity in natural language

Similarity is a core concept in human cognition

Quine (1969):

"... surely there is nothing more basic to thought and language than our sense of similarity; our sorting of things into kinds."

Tversky (1977):

"Similarity [...] serves as an organizing principle by which individuals classify objects, form concepts, and make generalizations."

Natural languages provide multiple ways to express similarity,

e.g. adjectives *ein ähnliches Auto / a similar car*
demonstratives *so ein Auto / such a car, a car like this*

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The German demonstrative *so*

- | | |
|---|------------------------------|
| (1) a. (speaker pointing to a person): | ad-adjectival |
| <i>So groß ist Anna auch.</i>
'Anna is this tall, too.' | |
| b. (speaker pointing to a table): | adnominal
(ad-determiner) |
| <i>So einen Tisch hat Anna auch.</i>
'Anna has such a table / a table like this, too.' | |
| c. (speaker pointing to someone dancing): | adverbial |
| <i>So tanzt Anna auch.</i>
'Anna dances like this, too.' | |

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The range of manner / similarity demonstratives

König (2012): "Manner demonstratives"

Many languages have demonstratives of verbal manner, nominal quality and adjectival degree; some even have a single expression for all of these, like German *so/solch*, Polish *tak*, and Turkish *böyle*.

Verbal manner, nominal quality and adjectival degree can also be expressed by composite demonstratives, e.g. English *like this*, French *comme ça*, German *wie dies*.

Umbach & Gust (2014): "Similarity demonstratives"

Demonstratives of verbal manner, nominal quality and adjectival degree uniformly express **similarity** instead of **identity**;

[[*so ein Tisch*]] = [[*ein Tisch wie dieser*]] = [[*a table like this*]]

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Outline

- | | |
|------------|---|
| Core | <ol style="list-style-type: none"> 1. The target of the demonstration gesture 2. The semantics of <i>so</i> 3. Spelling out similarity in multi-dimensional attribute spaces and generalized measure function 4. Features of comparison: adnominal <i>so</i> 5. Features of comparison: adverbial <i>so</i> 6. Syntactic reflexes |
| Appendices | <ol style="list-style-type: none"> 1. Varieties of similarity / identity expressions 2. Attribute spaces (with Helmar Gust) 3. The similarity relation 4. Multi-dimensional adjectives – gradability |

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The target of the demonstration gesture

What does the speaker point to ?

Option 1 – speaker points to a property / kind

Ehlich (1987): German *so* refers to aspects of objects

Carlson (1980): English (anaphoric) *such* is a pronoun referring to a sub-kind of the kind denoted by the noun.

Anderson & Morzycki (2013):

adapt Carlson's analysis to German *so* and Polish *tak*.

Option 2 – speaker points to an individual or event

Umbach & Gust (2014):

The relation between the target of the demonstration and the referent of the phrase is similarity (instead of identity).

→ The demonstrative serves as a modifier

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Similarity demonstratives generate ad-hoc kinds

- (2) (speaker points to a car in the street):
- a. *Dieses Auto will Anna kaufen.* (token / type)
'Anna wants to buy this car.'
 - b. *So ein Auto will Anna kaufen.*
'Anna wants to buy a car like this.'
- (3) (speaker pointing to a table in flea market):
- a. *Diesen Tisch will Anna kaufen.* (token only)
'Anna wants to buy this table.'
 - b. *So einen Tisch will Anna kaufen.*
'Anna wants to buy a table like this.'

→ In the case of *so*, no well-established kinds required
so phrases need not refer to previously established kinds

→ the target of the demonstration is an **individual / event**;
so phrases generate similarity classes based on individuals / events
these similarity classes constitute **ad-hoc kinds**

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Similarity requires features of comparison

Goodman (1972):

- "Similarity, ever ready to solve philosophical problems and overcome obstacles, is a pretender, an impostor, a quack."
- "... similarity cannot be equated with the possession of common characteristics [...] every two objects have infinitely many properties in common."
- "We have to say [...] in what respects two things are similar."

Similarity is a 3-place relation **SIM(x, x_{target}, \mathcal{F})**

x NP referent

x_{tar} target of the demonstration

\mathcal{F} representation, including a set of **features of comparison**

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Semantics of ad-nominal *so*

$[_{NP} [_{DET} \textit{so ein} \textit{Tisch}]]$ ('such a table')

$[[\textit{so}]] = \lambda D. \lambda P. D(\lambda x. \text{SIM}(x, x_{\text{target}}, \mathcal{F}) \ \& \ P(x))$
 $[[\textit{so ein}]] = \lambda P. \lambda Q. \exists x. \text{SIM}(x, x_{\text{target}}, \mathcal{F}) \ \& \ P(x) \ \& \ Q(x)$
 $[[\textit{so ein Tisch}]] = \lambda Q. \exists x. \text{SIM}(x, x_{\text{target}}, \mathcal{F}) \ \& \ \text{table}(x) \ \& \ Q(x)$

→ *so* modifies the determiner *ein* – a separate determiner *so'n* (Hole & Klump 2000, von Heusinger 2011) would miss generalizations

$[_{NP} [_{DET} \textit{ein}]] \ [_{N'} \textit{solcher Tisch}]]$ ('lit: a such table')

$[[\textit{solch}]] = \lambda P. \lambda x. \text{sim}(x, x_{\text{target}}, \mathcal{F}) \ \& \ P(x)$
 $[[\textit{solcher Tisch}]] = \lambda x. \text{sim}(x, x_{\text{target}}, \mathcal{F}) \ \& \ \text{table}(x)$
 $[[\textit{ein solcher Tisch}]] = \lambda Q. \exists x. \text{sim}(x, x_{\text{target}}, \mathcal{F}) \ \& \ \text{table}(x) \ \& \ Q(x)$

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Semantics of ad-adjectival *so*

Nominals

- multiple features/dimensions *s* of comparison
e.g. for *table* HEIGHT, SIZE, FORM, MATERIAL, COLOR, NUMBER OF LEGS
- relating to ratio / ordinal / nominal scales
- selected by the context, restricted by the noun

Adjectives

- (mostly) one feature/dimension of comparison
- relating to a ratio scale
- given by the adjective's meaning

$[\textit{so groß}]$ ('this tall')

$[[\textit{so}]] = \lambda f. \lambda x. \text{SIM}(x, x_{\text{target}}, \mathcal{F}(f))$
 $[[\textit{so groß}]] = \lambda x. \text{SIM}(x, x_{\text{target}}, \mathcal{F}(\text{height}))$

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How to spell out the SIM relation?

Multi-dimensional attribute spaces:

- feature structures + additional structure,
- qualitative (cf. Tversky 1977) rather than geometrical (cf. Gärdénfors 2000)

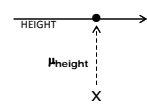
- Which features qualify as features of comparison?
- How to define the similarity relation?
- How to integrate attribute spaces into standard semantics?

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Generalized measure functions

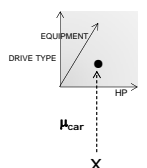
Measure function associated with *tall*
(Kennedy 1999):

$\mu_{\text{height}}: U \rightarrow \mathfrak{R}$



Suppose, relevant dimensions of comparison for *car* are

DRIVE_TYPE: {diesel, gasoline, natural gas, electric}
 HORSEPOWER: \mathfrak{R}^+
 DOORS: {1 ...5}
 EQUIPMENT: \wp {rear assistance, lane guide, park pilot, ...}

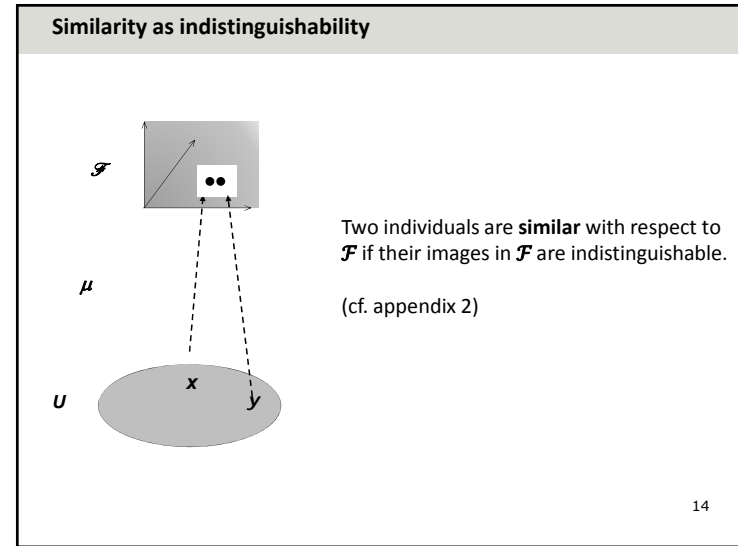
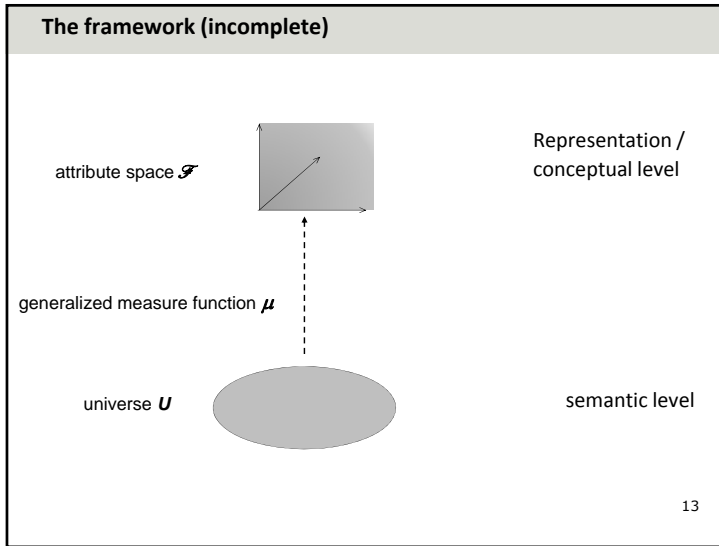


Generalized measure function associated with *car*
(in the context):

$\mu_{\text{CAR}}: U \rightarrow \text{DRIVE-TYPE} \times \text{HP} \times \text{DOORS} \times \text{EQUIPMENT}$

where $\mu_{\text{CAR}}(x) = \langle \mu_{\text{DRIVE-TYPE}}(x), \mu_{\text{HP}}(x), \mu_{\text{DOORS}}(x), \dots \rangle$

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Features of comparison

Recall: Similarity is trivial without fixing the "respects of similarity" (cf. Goodman)

→ which properties qualify as (potential) features of comparison?

Features of comparison: adnominal *so*, adverbial *so*

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Adnominal modifiers

(5) <i>Anna hat</i> 'Anna has ...'	<i>Berta hat auch</i> 'Berta also has ...'
a. ... <i>ein Rad mit Gangschaltung.</i>	... <i>so ein Rad</i> _{gears}
b. ... <i>ein elektrisches Rad.</i>	... <i>so ein Rad</i> _{electric}
c. ... <i>ein elektrisches Rad mit Gangschaltung.</i>	... <i>so ein Rad</i> _{electric+gears}
d. ... <i>ein Mountain Bike</i> '... bike with gears /electric /mountain bike'	... <i>so ein Rad</i> _{mountain bike} '... such a bike'
e. ... <i>ein griechisches Rad.</i>	?? ... <i>so ein Rad</i> _{Greek}
f. ... <i>ein holländisches Rad.</i>	... <i>so ein Rad</i> _{Dutch}
g. ... <i>ein neues Rad.</i> '... Greek/Dutch/new bike'	# ... <i>so ein Rad</i> _{new} '... such a bike'

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Adnominal modifiers

- (5) *Anna hat* 'Anna has ...' *Berta hat auch* 'Berta also has ...'
- h. ... *ein neues Mountain Bike* ... *so ein Rad*_{mountain bike}
- g. ... *ein altes verrostetes Rad* ... *so ein Rad*_{old+rusty}
- '... new Mountainbike / old and rusty bike' '... such a bike.'
- (6) a. *Anna's Auto ist ziemlich verbeult. Berta hat auch so ein Auto.*
'Anna's car is heavily dented. Berta has such a car, too.'
- b. *Anna's Auto hat einen CD-Spieler. ?? Berta hat auch so ein Auto.*
- c. *Anna's Auto hat ein Ticket. ?? Berta ...*
'Anna's car has a CD player / parking ticket.'
- (7) a. *Anna hat ein neues I-Phone. Berta hat auch so eins.*
'Anna has a new I-Phone. Berta has one, too.'

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Adnominal modifiers

The puzzle:

Why do *electric* and *with gears* and *old and rusty*, but not *new*, qualify as features of comparison in establishing ad-hoc subkinds of the bike kind?

And why does *new* qualify as a feature of comparison when combined with *iPhone*?

- (8) a. *A bike with gears is a kind of bike.*
 b. *An old an rusty bike is a kind of bike.*
 c. *?? A new bike is a kind of bike.*
 d. *The new iPhone is a kind of iPhone.*

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Principled connections

Prasada et al (2013) (Cognitive Psychology)

- Principled vs. statistical connections between kinds and properties
- Principle connection properties are properties an entity has because it is the kind of thing it is.

- (9) a. *Dogs, in general, are four-legged.*
 b. *Dogs, by virtue of being the kinds of things they are, are four-legged.*
 c. *A dog should be four-legged.*
 d. *Dogs are four-legged. / A dog is four-legged.*
- (10) a. *Barns, in general, are red.*
 b. *# Barns, by virtue of being the kinds of things they are, are red.*
 c. *# A dog should be four-legged.*
 d. *Barns are red. / # A barn is red.*

see also Greenberg (2003) 19

Features of comparison

Hypothesis:

Features of comparison in establishing ad-hoc subkinds via similarity have to be principally connected to the (superordinated) kind
 e.g., possible features of comparison in *so ein Fahrrad* have to be features the target of demonstration has because it is a bike.

Caveat:

features are dimensions -- properties are features + values

critical dimensions (Umbach & Gust 2013)

properties an entity **may have** because it is the kind of thing it is.

- (11) a. *A bike may have gears (or not) in virtue of being a bike.*
 b. *?? A bike may be new (or old) in virtue of being a bike.*

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Adverbial modifiers

- (11) *Anna hat das Huhn* *Berta hat die Ente auch*
 a. ... *im Wok zubereitet.* ... *so zubereitet*_{in the wok}
 b. ... *fettarm zubereitet.* ... *so zubereitet*_{low-fat}
 c. ... *gebraten.* ... *so zubereitet*_{fried}
 'Anna prepared the chicken in the wok / low-fat/ fried.' 'Berta prepared the duck like this, too.'
- (12) *Anna hat das Huhn* *Berta hat die Ente auch*
 a. ... *im Garten* # ... *so zubereitet*_{in the garden}
 b. ... *müheless zubereitet.* # ... *so zubereitet*_{easily}
 'Anna prepared the chicken in the laundry / skillfully.' 'Berta prepared the duck like this, too.'

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Features of comparison: Adverbial modifiers

- (13) a. *Anna hat das Huhn schnell zubereitet.*
 # *Berta hat die Ente auch so zubereitet.*_{fast}
 b. *Anna ... Berta hat die Ente auch so schnell zubereitet.*_{fast}
 'Anna prepared the chicken quickly. Berta did it this way / quickly, too.'
- (14) *Anna hat laut die Vereinshymne gesungen.*
 a. # *Berta hat sie auch so gesungen.*
 b. *Berta hat sie auch so laut gesungen.*
 'Anna loudly sang the Internationale. Berta sang it like this, too. / lit: sang it so loud, too.'
- (15) *Anna hat die Einleitung der Arie laut / forte gesungen.*
Berta hat sie auch so gesungen.
 'Anna sang the introduction of the aria forte. Berta sang it like this, too.'
 (Martin Schäfer p.c.)

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Adverbial modifiers

Same puzzle as in the adnominal examples:

→ Why do *in the wok* and *low-fat*, but not *in the garden*, *easily* and *quickly*, qualify as features of comparison in establishing ad-hoc subkinds of the preparing chicken (event) kind?

- (16) a. *Preparing chicken in the wok is a kind of preparing chicken.*
 b. ?? *Preparing chicken in the garden is a kind of preparing chicken.*
 b. ?? *Preparing chicken easily is a kind of preparing chicken.*

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External vs. internal event modifiers

external vs. **-internal** event modifier (Maienborn&Schäfer 2011)

external: modifying the event

internal: modifying a manner dimension of the event

Event-internal adverbials denote **manner objects** (Schäfer 2013)

- (17) a. *Anna hat laut La Paloma gesungen.*
 b. *Anna hat La Paloma forte gesungen.*
 'Anna sang La Paloma loudly / forte.'
 a'. $\exists e$ [... & SING(e) & LOUD(e)]
 b'. $\exists e$ [... & SING(e) & $\exists m$ [MANNER_{MUSIC}(m,e) & FORTE(m)]]

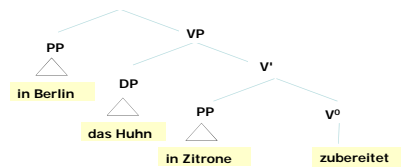
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Syntactic reflection: base position of adverbial modifiers

Frey (2003):

sentence adverbials > frame adverbials > **event-external** adverbials
> the highest ranked argument > **event-internal** adverbials >
process-related adverbials > verb

- (18) a. ... *weil sie in Berlin das Huhn in Zitrone gekocht hat.*
b. # ... *weil sie in Zitrone das Huhn in Berlin gekocht hat.*
'because she cooked the chicken in lemon in Berlin.'



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Syntactic reflection: default order of adjectival modifiers

Is there a syntactic reflection in the case of adjectival modifiers?

Duden (1984): number < time/space < quality/color < material/origin

Bouchard (2005): The easier the adjectival property can be understood as denoting an ad-hoc concept when combined with the head noun, the closer to the noun will it be positioned.

- (19) a. *ein neues japanisches Auto*
b. # *ein japanisches neues Auto*
'a new Japanese car / a Japanese new car'

Are syntactic structures parallel in the adverbial and the adnominal case?

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Summary + conclusion

There is a class of demonstratives – **similarity demonstratives** – e.g. German *so*.

- expressing similarity instead of identity,
- generating ad-hoc kinds (nominal, verbal).

Similarity is spelt out in **many-dimensional attribute spaces**

- attributes are given by relevant features of comparison
- individuals / events are mapped to points in attribute spaces by **generalized measure functions**.
- similarity is defined as **indistinguishability** with respect to a given set of features (+ classification functions) – which is an equivalence relation.

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Summary + conclusion

- Features of comparison (to be picked up by *so*) are subject to similar restrictions in the adnominal and in the adverbial case:

adnominal: **principled connection** properties (dimensions)
adverbial: **event-internal**, modifying a manner dimension

→ Manner dimension of verbal concepts seem to correspond to principled connection dimensions of nominal concepts.

(even with respects to the syntactic position of the corresponding expressions)

- From an ontological point of view, **degrees**, (pure) **manners** and principled connection **nominal qualities** seem to play the same role: descriptions on a conceptual level.

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