

Main claims

- Method-oriented adverbs are not manner adverbs.
- Method-oriented adverbs relate to events like instrumentals.
- Not causal intermediaries. No causal force to them.
- Facilitating instrumentals making use of a HELP relation.
- Methods come from lexical decomposition of the adverbial or context.

Classification of adverbs and method-oriented adverbs

Classification and analysis of classes of adverbs is a staple in formal semantics and syntax.

- What adverbs mean and their syntactic position.
- Many classes of adverbs identified, with much attention paid to **manner adverbs**.

(1) quickly, clumsily, hastily, elegantly (manner)

- Much still not understood about some (many?) classes of adverbs.
- One such ill-understood class is **method-oriented adverbials** (MOAs), such as in (2).
- Method-oriented adverbials characterize method or means by which event comes about.

(2) a. Alma categorized the plants biologically. (Schäfer, 2013)
b. Noam evaluated the data linguistically. (ibid.)
c. The nations intervened militarily. (ibid.)

(3) Dieses Problem ist nur wirtschaftlich zu lösen
this problem is only economically to solve
'This problem can only be solved economically.' (ibid.)

Questions:

- How do MOAs differ from other classes of adverbs?
- How do MOAs relate to a method rather than a manner?
- How are methods introduced into the semantic representation?

Method-oriented adverbs are not manner adverbs

Different paraphrases.

(4) a. The way John fell was clumsy.
b. The way Noam evaluated the data was slow.

(5) a. ??The way Noam evaluated the data was linguistic.
b. ??The way Alma categorizes the plants is biological

Paraphrased with methods mentioned explicitly. Reminiscent of instrumentals.

(6) a. Alma used biological methods/principles to categorize the plants.
b. Noam analyzed the data with the help of linguistic methods/tests.
c. The nations used their militaries to intervene.

Not able to be coordinated with manner adverbs.

(7) a. *evaluate the data slowly and linguistically
b. *evaluate the data deliberately and linguistically
c. *categorize the plants thoroughly and biologically

Non-gradable.

(8) a. *Noam evaluated the data very linguistically.
b. *The nations solved the problem more diplomatically than the citizens wanted.

Obligatory low position.

(9) a. *Linguistically, Noam evaluated the data.
b. *Telepathically, the aliens communicated.

These data demand an analysis distinct from that of manner adverbials.

Method-oriented adverbs and instruments

How to link method-oriented adverb to verb? **Paraphrases are a clue.**

- Method-oriented adverbs are often paraphrasable with *use*, *using*, and *with* (Schäfer, 2013).

(10) a. Alma categorized the plants biologically.
b. Noam analyzed the data linguistically.
c. The nations solved their disagreements diplomatically.

(11) a. Alma used biological methods/principles to categorize the plants.
b. Noam analyzed the data with the help of linguistic methods/tests.
c. The nations solved their disagreements using diplomacy.

- Use*, *using*, *with* often taken to be diagnostic of instrumentals (Lakoff, 1968).

Varieties of instrumentals and method-oriented adverbs

Different types of instruments, distinguished by their semantics.

- Not all instrumentals have the same causal force (Koenig et al., 2008).
- Some instruments are causal intermediaries.
- Link in a causal chain between the agent of an event and the affected object.

(12) John smashed the zombie's head with a club.
≈ John causes club to come into contact with the zombie, which causes it to be smashed.

- Other instrumentals have a weaker relation to the event.
- Not a causal relationship.**

(13) a. Lucy ate the cereal with a spoon.
≠ ... the spoon caused the cereal to be eaten
b. Martha changed the light bulb with a ladder.
≠ ... the ladder caused the bulb to be changed

- These instruments lead to the event being "better" or "easier" in some way.

Method-oriented adverbs also don't denote intermediate causers.

(14) a. The aliens communicated telepathically.
b. Noam evaluated the data linguistically.

(15) a. ??The aliens did something using telepathy, which caused them to communicate.
b. ??Noam did something using linguistic methods, which caused the data to be evaluated.

Weaker relation to the event, more similar to instruments like *eat with a spoon*.

Weaker causal relation: HELP

Method-oriented adverbials are facilitating instrumentals and make use of a HELP relation.

HELP definition (based on Koenig et al. 2008)

An eventuality e_1 helps the occurrence of token e_2 of the event category C iff
(i) there is an ordering of tokens of C along a pragmatically defined scale
(ii) e_1 caused e_2 of C to be higher on that ordering than it would have been.

- Helping is a scalar notion. Instrument helps an event if the event is affected in some way.
- VPs that method-oriented adverbs modify encode a HELP relation.
- Underspecified events (e.g., **act**) that facilitate the completion of the event in their lexical semantics.

(16) $\llbracket evaluate \rrbracket = \lambda e \exists e' \left[\begin{array}{l} evaluate(e) \wedge \\ act(e') \wedge \\ HELP(e', e) \end{array} \right]$

- This follows Koenig et al. (2008) in making this ingredient part of the verbal meaning.

Methods come from lexical semantics

Linguistically provides a clear case where the **methods come from the adverb**.

(17) Noam evaluated the data linguistically. (=used linguistic methods)

- Method-oriented adverb has the same semantics as the adjective *linguistic*.
- Adjectives for scientific fields encode scientific methods particular to that field (analysis of morphemes, finding minimal pairs, ...)
- Decomposition of adjective meaning** given as a frame, a recursive attribute-value structure (Petersen, 2007; Löbner, 2017).
- Attributes are functional (type $\langle e, e \rangle$) with typed values.

(18) $\llbracket linguistically \rrbracket = \left[\begin{array}{l} science(x) \wedge \\ language(object_of_study(x)) \wedge \\ linguistic_method(method(x)) \wedge \\ linguist(agent(method(x))) \end{array} \right]$

- The type **linguistic_method** will be true of events of analyzing morphemes, finding minimal pairs, constructing arguments based on linguistic data, and so on.
- Unification of *linguistically* with *evaluate* identifies the helping act with a linguistic method.

(19) $\llbracket evaluate\ linguistically \rrbracket = \lambda e \exists e' \left[\begin{array}{l} evaluate(e) \wedge \\ act(e') \wedge \\ HELP(e', e) \wedge \\ science(x) \wedge \\ language(object_of_study(x)) \wedge \\ linguist(agent(method(x))) \wedge \\ linguistic_method(method(x)) \end{array} \right] \wedge e' = method(x)$

Methods also come from context

Manually (=by hand) does not obviously lexically encode methods.

(20) $\llbracket manually \rrbracket = \left[\begin{array}{l} hand(x) \wedge \\ x = hand(y) \end{array} \right]$

- Many different methods of realization for *manually* (from BNC). Suggests **contextually determined**; not determined (solely) by the adverbial frame.

(21) a. sort and clean the seeds [...] manually, by sieving or blowing away the debris
b. silenced manually at any time by operating levers
c. This kind of map analysis used to be done manually [...] by overlaying transparent map sheets
d. it was to be driven manually by turning the big wheel

- Context and world knowledge determine specifics of how *manually* interacts with verb. Need for a "bridging" context to unify verb and adverb.
- Parallels to how context and world knowledge determine how relational adjectives (e.g., *presidential*, *dental*) and nouns should be composed (Anderson & Löbner, 2018).

Selected references and acknowledgements

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