Decomposing attitudes: The view from Navajo

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1 Introduction

• Since Hintikka (1962, 1969), sentences expressing attitudes of belief and desire have received a modal semantics:

\[(\text{Alice thinks that it is raining})(w_0) = \forall w' \in \{w': w' \text{ is a world consistent with Alice's beliefs in } w_0\} : \text{rain}(w')\]

Alice thinks it is raining is true just in case it is raining in all possible worlds consistent with Alice’s beliefs in the base world \((w_0)\).

\[(\text{Alice wants it to rain})(w_0) = \forall w' \in \{w': w' \text{ is a world consistent with Alice's desires in } w_0\} : \text{rain}(w')\]

Alice wants it to rain is true just in case it is raining in all possible worlds \(w'\) in which Alice’s desires in the base world \((w_0)\) are met.

• English: Different verb for each attitude (think, want, say, wish, know, doubt, demand, see, ...)

→ Neo-Hintikkan analysis: Locate all modal meaning in verb’s entry ←

\[(\text{think}) = \lambda p_{st} \lambda x \lambda w \forall w' \in \{w': w' \text{ is consistent with } x’s \text{ beliefs in } w\} : p(w')\]

\[(\text{want}) = \lambda p_{st} \lambda x \lambda w \forall w' \in \{w': w' \text{ is consistent with } x’s \text{ desires in } w\} : p(w')\]


– But a common core is maintained. All attitude verbs are modals:

\[\begin{array}{c}
\text{think}_{\text{modal}} \phi \\
\end{array} \quad \begin{array}{c}
\text{want}_{\text{modal}} \phi \\
\end{array}\]

Is a modal semantics motivated for all attitude verbs? No.

• Not for all English attitude verbs (Kratzer 2006, 2013; Moulton 2009; Anand & Hacquard 2009)...

• ...And not cross-linguistically either (this talk).

1 All Navajo data not otherwise attributed here are due to fieldwork that I conducted with Navajo speakers Ellavina Perkins, Leroy Morgan, Louise Ramone, Irene Tsosie, Louise Kerley, and Johnny Harvey. I thank them for their patience and insight. This project has benefited from discussion with Rajesh Bhatt, Seth Cable, Angelika Kratzer, Maribel Romero, Peggy Speas, Paul Platero, and the audience at SULA 8 at the University of British Columbia, especially Jurgen Bohnemeyer, Amy Rose Deal, Leslie Saxon, and Judith Tonhauser. Any errors are my own.

2 Abbreviations in glosses: ATT: ‘attitude’; IMPF: imperfective aspect; PROSP: prospective aspect; LOC: locative; NEG: negation; NEUT: neuter aspect; OPT: optative; PERF: perfective aspect; PST.ENC: past enclitic; SUB: subordinator. 1poss: 1st person possessive pronoun; 2S: 2nd person subject; 3O: 3rd person object.
2 The interpretation of Navajo *nízin*-sentences

- All of the following sentences appear to contain the same verb, *nízin*.

- *Nizin*-sentences can express belief (3), desire (4), or be ambiguous between the two (5).
  - Choice of morphology in embedded clause seems relevant to the *nízin*-sentence’s interpretation:

  (3) Unambiguous attitudes of belief

     man 3S.rain.FUT MODAL 3S.ATT
     ‘The man thinks it will probably rain.’
     Epistemic particle *sha’shin*

  b. [Nahałtin] nisin.
     3S.rain.IMPF 1S.ATT
     ‘I think it is raining.’
     Verb with non-future interpretation

  (4) Unambiguous attitudes of desire

  [Níneez laanaa] nisin.
  2S.tall.IMPF DESIRE 1S.ATT
  ‘I wish you were tall.’
  Particle *laanaa*

  (5) Ambiguous attitudes

  Alice [nahodoołtįįl] nízin.
  Alice 3S.rain.FUT 3S.ATT
  Belief: ‘Alice thinks it will rain.’
  Desire: ‘Alice wants it to rain.’
  But not: ‘Alice doubts / knows / imagines it will rain.’

  - Sentences like (5) are truly ambiguous: a given instance of (5) expresses either a belief or a desire.
  - In an appropriate context, utterances like (6) are judged to be noncontradictory:

  (6) Conjunction of ambiguous *nízin*-sentences

  a. Context: Alice looks outside and sees dark clouds gathering. It is monsoon time, too, so it has been frequently raining in the afternoon. Alice thinks it will rain. However, Alice was supposed to drive to Flagstaff today and she hates to drive in the rain. She doesn’t want it to rain.

  Alice 3S.rain.FUT 3S.ATT but NEG 3S.rain.FUT NEG 3S.ATT
  ‘Alice thinks it will rain but she doesn’t want it to.’

  2
3 Nizin is not a modal

- **Modal hypothesis 1, to be discarded:** Navajo is amenable to a neo-Hintikkan analysis. There are multiple modal verbs which are all pronounced nizin.

\[(\text{‘think’-nizin}) = \lambda p_{st}. \lambda x. \lambda w. \forall w' \in \{w'' : \text{‘w’ is consistent with } x\text{’s beliefs in } w\} : p(w')\]

\[(\text{‘want’-nizin}) = \lambda p_{st}. \lambda x. \lambda w. \forall w' \in \{w'' : \text{‘w’ is consistent with } x\text{’s desires in } w\} : p(w')\]

- However, positing such homophony for Navajo is deeply unappealing.
  - Nizin is morphologically consistent regardless of its translation (Young and Morgan 1987).
    * Such homophony is simply not attested elsewhere in Navajo.

Table 1: Imperfective Paradigm (partial), compiled from Young and Morgan (1987)

<table>
<thead>
<tr>
<th>Person</th>
<th>Verb</th>
<th>Translations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S</td>
<td>nizin</td>
<td>‘I think, want, wish, hope’</td>
</tr>
<tr>
<td>2S</td>
<td>ninízin</td>
<td>‘you think, want, wish, hope’</td>
</tr>
<tr>
<td>3S</td>
<td>nizin</td>
<td>‘he/she thinks, wants, wishes, hopes’</td>
</tr>
<tr>
<td>1pl</td>
<td>niidzin</td>
<td>‘we think, want, wish, hope’</td>
</tr>
<tr>
<td>4S</td>
<td>jinízin</td>
<td>‘it is thought, wanted, wished, hoped’</td>
</tr>
</tbody>
</table>

- Same translations for a single verb found in other Athabaskan languages, e.g. Slavey (Rice 1989), Tłįchǫ (Saxon 2014), Ahtna (Kari 1990), and Koyukon (Jetté and Jones 2000).
  - Such recurrent homophony seems suspect.

→ **Conclusion:** There is only one verb nizin. A neo-Hintikkan analysis will not stand.←

- **Modal hypothesis 2, to be discarded:** Nizin is lexically unambiguous but semantically underspecified like English modal auxiliaries (Kratzer 1981, 1991; Hacquard 2006, 2010).

\[(\text{must})^c = \lambda p_{st}. \lambda w. \forall w' : w' \in \cap \text{ACC}^c(w) : p(w')\]

- The accessibility relation ACC determines which worlds are quantified over.
  - Epistemic: Worlds consistent with evidence in the base world.
  - Priority: Worlds in which goals, desires, etc. in the base world are met (Portner 2009).

- Hypothetical underspecified modal entry for nizin:

\[(\text{nizin})^c = \lambda p_{st}. \lambda x. \lambda w. \forall w' : w' \in \cap \text{ACC}^c(x)(w) : p(w')\]
However, *nizin* and English modal auxiliaries do not exhibit the same behavior.

**English:** Single overt instance of *may* \(\rightarrow\) only one kind of modal meaning possible.

- Expected if context fixes the modal interpretation of *may*.

(11) a. *Context:* You are telling me about where Mary might be right now (she’s not at home or school) and what she is allowed to do tomorrow.
   
   b. #Mary may be at the park now and go to the fair tomorrow.

   - (11-b) becomes felicitous if context only requires *may* to express one kind of modal meaning at a time.

(12) Mary may be at the park now and go to the fair tomorrow.

a. *Priority (rule-oriented) interpretation:* Given the rules, Mary is allowed to be at the park right now, and she is allowed to go to the fair tomorrow.

b. *Epistemic interpretation:* Given my evidence, Mary might be at the park now and she might go to the fair tomorrow.

**Navajo:** One overt instance of *nizin* but two modal meanings (belief vs. desire) possible in (13).

- First embedded clause describes a situation which Alice *believes* is the case.
- Second embedded clause describes a situation which Alice *wants* to be the case.

(13) a. *Context:* Alice thinks Bill moved to Flagstaff. She wants to go visit him some time, but she does not have any definite plans to do so and knows it is very likely it will not happen.


   Alice Bill Flagstaff.to 3S.move.PERF but.even.so 3O.to 1S.go.FUT 3S.ATT

   ‘Alice thinks Bill moved, but even so she wants to go see him.’

   \[\text{\rightarrow Conclusion: We cannot give } nizin \text{ any modal entry at all.}\]←

**The puzzle:**

- Hintikka (1962, 1969): Attitude sentences as a whole are modal statements.

- If *nizin* itself is not a modal, then:
  - What is the source of modality in *nizin*-sentences?
  - What entry can we give to *nizin*?
4 Decomposing Navajo *nizin*-sentences

- Kratzer (2006, 2013): Alternative to the neo-Hintikkan analysis of clause-embedding verbs in German and English.
  - Attitude verbs are not modal. They denote situations of a particular type.
    * see denotes situations of ‘seeing,’ think denotes situations of ‘thinking,’ want denotes situations of ‘wanting,’ say denotes situations of ‘saying,’ etc.
  - Modal meaning comes from functional morphology in the embedded clause.
- Elaborated for other verbs by Moulton (2009) and Anand and Hacquard (2009).
- I argue that a decompositional analysis is well-suited to Navajo *nizin*. The analysis below adopts and develops machinery from Kratzer (2006, 2013).
- See Appendix for brief summary of Moulton’s motivation for decomposing English perception verbs.

The Proposal:

- *Nizin* contributes the part of meaning held in common by beliefs and desires: it denotes ‘mental attitude’ situations:

\[
\text{[nizin]} = \lambda s. \lambda w. \text{mental-attitude}(s)(w)
\]

- Belief and desire meanings contributed by modal in embedded clause:

![Diagram](image)

- Question: What embedded modal operators does Navajo have?
- In sentences like (15), we could attribute the modality to the particles *sha’shin* or *laanaa*:

(15)  
\[\text{a. Hastiin [nahodoolt'i]l sha'shin] nizin.}\]
\[\text{man 3S.rain.FUT MODAL 3S.ATT}\]
\[\text{‘The man thinks it will probably rain.’}\]
\[\text{b. [Níneez laanaa] nisin.}\]
\[\text{2S.tall.IMPF DESIRE 1S.ATT}\]
\[\text{‘I wish you were tall.’}\]

- However, we saw that particleless *nizin*-sentences can also express beliefs or desires, so we will need covert modal operators too:

(16)  
\[\text{a. Hastiin [nahaltin] nizin.}\]
\[\text{man 3S.rain.IMPF 3S.ATT}\]
\[\text{‘The man thinks it is raining.’}\]
\[\text{b. Alice [nahodoolt'i]l nizin.}\]
\[\text{Alice 3S.rain.FUT 3S.ATT}\]
\[\text{‘Alice thinks it will rain,’ ‘Alice wants it to rain.’}\]
Modal Inventory, simplified:

(17) a. \[sha’shin / \emptyset_{\text{epi}}\] = \(\lambda p. \lambda s. \lambda w. \forall w' : w' \in \text{EPI}(s)(w). p(w')\)

b. \[laanaa / \emptyset_{\text{des}}\] = \(\lambda p. \lambda s. \lambda w. \forall w' : w' \in \text{DES}(s)(w). p(w')\)

- Entries above based on decompositional analyses of attitude verbs, perception verbs, and verbs of communication by Kratzer (2006, 2013) and Moulton (2009).
  
  - Domain of modal quantification obtained by function which takes situation \(s\) as argument and returns Stalnakerian propositional content (set of worlds \(w'\)) compatible with \(s\) in a particular way (Hacquard 2006, 2010; Kratzer 2006).
    *
    * EPI in takes \(s\) as argument and returns worlds \(w'\) compatible with beliefs in \(s\).
    *
    * DES in (17-b) takes \(s\) as argument and returns worlds \(w'\) compatible with desires in \(s\).

→ Illustration of composition of the attitude of belief in (18):

(18) Alice [nahoodoo\(t\)\(i\)ł (sha’shin)] nizin.
    Alice 3S.rain.FUT MODAL 3S.ATT
    ‘Alice thinks it will (probably) rain.’

- The steps of composition shown follow the steps employed by Kratzer (2006, 2013).

(19) **Step 1**: Composition of embedded modal and \(\phi\) via Function Application:

\[
[\emptyset_{\text{epi}}][[\text{it will rain}]]
\]

\[
= [\lambda p. \lambda s. \lambda w. \forall w' : w' \in \text{EPI}(s)(w). p(w')]([[\text{it will rain}]]
\]

\[
= \lambda s. \lambda w. \forall w' : w' \in \text{EPI}(s)(w). \text{it will rain}(w'))
\]

(20) **Step 2**: Composition of nizin and embedded clause via Predicate Modification:

\[
[nizin] \oplus [\emptyset_{\text{epi}} \text{it will rain}]
\]

\[
= \lambda s. \lambda w. \text{mental-attitude}(s)(w) \land \forall w' : w' \in \text{EPI}(s)(w). \text{it will rain}(w')
\]

- Following Kratzer (2006, 2013), the subject of nizin is introduced via a functional head EXP:

(21) \[
[\text{EXP}] = \lambda x. \lambda s. \lambda w. \text{experiencer}(x)(s)(w)
\]


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3This is a simplification. Beliefs also factor into semantics of desire (Heim 1992, Villalta 2008, Rubinstein 2012).
(22) **Step 3:** Composition of EXP and (20):

\[ \text{[ EXP ] } \oplus [ \text{nizin } \emptyset_{\text{epi it will rain}} ] \]

= \lambda x. \lambda s. \lambda w. \text{mental-attitude(s)(w) } \& \text{experiencer(x)(s)(w)}

\& \forall w' : w' \in \text{EPI(s)(w).it will rain(w')}\]

- **Final Steps:**
  - Alice saturates the experiencer argument \(x\).
  - Situation argument \(s\) is existentially closed.
  - The world of evaluation is filled in \((w_0)\).

(23) \[ \exists s. \text{mental-attitude(s)(w_0) } \& \text{experiencer(Alice)(s)(w_0)} \]

\& \forall w' : w' \in \text{EPI(s)(w_0).it will rain(w')}\]

There exists a **mental attitude** situation \(s\) in \(w_0\) experienced by Alice.
In all worlds \(w'\) compatible with the epistemic content in \(s\), it will rain in \(w'\).

→ **Key outcomes:**

- The contribution of **nizin** is constant. The choice of modal operator determines the attitude.
  - If we substitute \(laanaa/\emptyset_{\text{des}}\) for \(sha'shin/\emptyset_{\text{epi}}\), we generate a ‘desire’ interpretation:

(24) Alice [nahoodooltįįl (laanaa)] nizin.
Alice 3S.rain.FUT DESIRE 3S.ATT
‘Alice **wants, wishes** it to rain.’

(25) \[ \exists s. \text{mental-attitude(s)(w_0) } \& \text{experiencer(Alice)(s)(w_0)} \]

\& \forall w' : w' \in \text{DES(s)(w_0).it will rain(w')}\]

There exists a **mental attitude** situation \(s\) in \(w_0\) experienced by Alice.
In all worlds \(w'\) compatible with the desires in \(s\), it will rain in \(w'\).

- Locating the modality in the embedded clause — and not in the entry of **nizin** itself — gives us an account of conjunctions like (26):
  - We’re allowed a different attitude for each complement.

(26) Alice \[ \emptyset_{\text{epi Bill Kinlánígóó ‘íná]} } \] \’ákondi \[ \emptyset_{\text{des bich’į deesháát]} \] nizin.
Alice BELIEF Bill Flagstaff.to 3S.move.PERF but.even.so DESIRE 3O.to 1S.go.FUT 3S.ATT
‘Alice thinks Bill moved, but even so she wants to go see him.’
Aside on the benefits of multiple operators

- Given both $\varnothing_{epi}$ and $\varnothing_{des}$, we can explain why particle-less nizin-sentences are only ambiguous if the embedded verb is future-marked, as in (27a).

  - $\varnothing_{epi}$ does not impose any temporal selectional restrictions on the embedded clause.
  - $\varnothing_{des}$ selects for a future-marked verb.\(^a\)

\[(27)\]

   Alice 3S.rain.FUT 3S.ATT
   ‘Alice thinks it will rain,’ ‘Alice wants it to rain.
   [p $\varnothing_{epi}$] nizin \hspace{1cm} [p $\varnothing_{des}$] nizin

b. Alice [nahalt̕ín] nizin.
   Alice 3S.rain.IMPF 3S.ATT
   ‘Alice thinks it is raining.’ (Not: ‘Alice wants it to be raining.’)
   [p $\varnothing_{epi}$] nizin \hspace{1cm} *[p $\varnothing_{des}$] nizin

Future work: Revisit the equation of $\varnothing_{des}$ and laanaa

- While $\varnothing_{des}$ selects for future-oriented verbs, laanaa does not:

\[(28)\]

Alice [nahalt̕ín  laanaa] nizin.
   Alice 3S.rain.IMPF DESIRE 3S.ATT
   ‘Alice wishes for it to be raining.’

- Link between futurity and kind of ‘desire’ (e.g. want vs. wish)?

\(^a\)There is much discussion of modal expressions similar, or identical, to modal expressions of desire selecting for future-oriented verbs, including Enç 1996, Condoravdi 2002, Borgonovo and Cummins 2007, Matthewson 2014.

5 Conclusions and questions for further investigation

- I demonstrated that nizin cannot be analyzed as a modal expression of any kind.
  - Navajo must have some other source for modality of beliefs and desires.

- I argued that a decompositional strategy, modeled on proposals for English by Kratzer (2006, 2013) and Moulton (2009), is supported by Navajo. Key points of decompositional strategy:
  - Non-modal embedding verb
  - Embedded modal operators.

- Typological conclusions:
  - The neo-Hintikkan analysis (modal attitude verbs) is not the only strategy in natural language for constructing attitudes.
  - The decompositional analysis for Navajo motivates two covert modals: $\varnothing_{epi}$ and $\varnothing_{des}$. 
• **Question 1:** Do we find $\varnothing_{\text{epi}}$ and $\varnothing_{\text{des}}$ elsewhere in Navajo? Yes.

  - Navajo does not seem to have an overt lexical item comparable to English *need* or *should*. Future-marked verbs used instead:

    -(29) a. **Context:** We are town inspectors who visit towns and tell them what they need to fix, and what will be possible given their budgets. You think the roads in this town need to be fixed, but you have seen that the town cannot afford it. You say:

      
      b. ['Atiin t’áá yá’adát’égíí 3plS.good=nom 3S.be.FUT but NEG 3S.be/do.FUT NEG 3S.be/do.FUT NEG
        Translation: ‘There **need** to be new roads, but it’s not going to happen.’
        ‘Literal’ Translation: ‘There will be new roads, but it’s not going to happen.’

  - **Idea to be explored:** The first conjunct of (29) contains the operator that we earlier called $\varnothing_{\text{des}}$. The second conjunct contains $\varnothing_{\text{epi}}$.4

    - We will want to generalize the meaning of $\varnothing_{\text{des}}$, slightly.
      
      * (29) does not concern what the inspector personally **wants** to be the case, but rather what **should** be the case given more widely relevant priorities (laws, etc.).

    - Precedent for semantic relationship between *should* and *want*: Rubinstein (2012)

    ![Points for further work](image)

    - If $\varnothing_{\text{epi}}$ and $\varnothing_{\text{des}}$ are independently needed in matrix clauses, then we can describe attitudes of belief and desire in Navajo as ‘decompositional’ in an additional sense:

      - The only component of meaning unique to attitudes is a mental attitude situation.

      - Modality found in attitudes come from ‘recycled,’ independently-needed modal operators.
        
        * Any specialized attitude meaning (e.g. priorities in general $\rightarrow$ desires only) arises when these modals are evaluated relative to a particular kind of situation...

        ...namely, a mental attitude situation experienced by an attitude holder.

    - A further direction to develop is: given the importance of future marking to desire and priority interpretations, can we instead attribute the semantic content of $\varnothing_{\text{des}}$ to future morphology itself?

        

      - We must be able to explain why this particular modal interpretation only arises for certain future-marked verbs.

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Question 2: Do we find $\varnothing_{des}$ and $\varnothing_{epi}$ in other languages?

- Romance verbs of communication exhibit behavior very similar to nizin.
  * E.g., Spanish verbs decir ‘to say,’ escribir ‘write,’ repetir ‘repeat,’ and indicar ‘indicate’
- Depending on the choice of embedded morphology (subjunctive vs. indicative), the interpretation of the verb seems to shift.$^5$
  * Indicative morphology → ‘reportative’ interpretation ((a) sentences)
  * Subjunctive morphology → ‘directive’ interpretation ((b) sentences)

(30) **Spanish**

a. Dice [que pones mucha sal].
   says COMP you.put.INDIC much salt
   ‘He says that you put in lots of salt.’ \(\text{Reportative}\)

b. Dice [que pongas mucha sal].
   says COMP you.put.SUBJUN much salt
   ‘He tells you to put in lots of salt.’ \(\text{Directive}\)

(Ahern and Leonetti 2004)

(31) **Romanian**

a. Ion a spus [ca Maria a plecat].
   Ion has said that Maria has left.INDIC
   ‘Ion said that Maria left.’ \(\text{Reportative}\)

b. Ion a spus [ca Maria să plece imediat].
   Ion has said that Maria SUBJUN leave immediately
   ‘Ion told Maria to leave immediately.’ \(\text{Directive}\)

(Farkas 1992)

**Point for further work:**

- We could posit homophony, or we could give verbs of communication a decompositional analysis like nizin.
  - Verbs like decir denote situations of ‘saying’ (Kratzer 2013).
  - If $\varnothing_{epi}$ is embedded, reportative interpretation arises (Kratzer 2013).
  - **Novel:** If $\varnothing_{des}$ is instead embedded, a directive interpretation arises.

**References**


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$^5$Comparable data available for Hebrew (Landau 2004) and English (Portner 1997).

Bresnan, J. (1972) Theory of Complementation in English Syntax, Doctoral dissertation, MIT.


A Decomposition in English

- The challenge posed by *nizin* is similar to the challenge posed by the following well-known paradigm for English perception verbs (Kiparsky and Kiparsky 1970, Bresnan 1972, Pesetsky 1991).
  - Morphosyntactic shape of the complement correlated with interpretation of clause as a whole.

(32) a. Alice saw Fred to be driving too fast, \(\text{ECM infinitival} \rightarrow \text{Epistemic commitment}\)
    (# but she believed he wasn’t).

b. Alice saw Fred driving too fast, \(\text{Bare infinitival} \rightarrow \text{No epistemic commitment}\)
    (but she believed he wasn’t).

- **Question:** Should we propose multiple homophonous lexical entries for *see* in (32)?

- **Answer by Moulton 2009:** No.
  - Inelegant, leads to proliferation of homophony (same issue posed by *hear*, *taste*, etc., and ignores correlation between interpretation and morphosyntax of the complement.

- Moulton proposes a **decompositional analysis** using machinery developed in Kratzer (2006, 2013) for English and German clause-embedding verbs. **Key parts:**

  I: Matrix verbs denote sets of situations of a particular, lexically determined kind, e.g. (33):

  (33) \([\text{see}] = \lambda s.\lambda w.\text{seeing}(s)(w)\) (External argument introduced later by functional head)

  II: Modal meaning (e.g. epistemic commitment) comes from operators in the embedded clause.
  - (33-a): Embedded clause contains epistemic modal (\(\text{EPI}\)):
    (33-a)
  - (33-b): No epistemic modal (\(\emptyset\)) in embedded clause:

  III: *See* and the modalized embedded clause compose by identification of situation arguments.
  - This will modal entries which take situations, rather than entire worlds, as argument (Hacquard 2006, 2010; Kratzer 2006).
  - **Aside:** The modalized embedded clause modifies *see*: *see* does not take the embedded clause as argument (contra modal entries for attitude verbs).

- **Decomposition is not just relevant for perception verbs:** Kratzer (2006, 2013) explores a decompositional analysis for English *think* and German and English verbs of communication (including ‘manner of speaking’ verbs).
  - *think* denotes ‘thinking’-situations *say* denotes ‘saying’-situations, *sigh* denotes ‘sighing’-situations...

- See Kratzer (2013) for discussion of other motivation for decompositional analysis.