Constraining the identification of epistemic judges across different syntactic categories

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Overview

Epistemic modality

Lyons’ original motivation

Objections to objective epistemic modality
   EVM un information seeking questions
   EMV under Negation
   EMV in the antecedent of event related conditionals

Alternative Analysis
Topics and Goals of this talk

- Why are epistemic adjectives in Germanic (Greenbaum 1969, pp. 111, 153, Jackendoff 1972, pp. 84–85, Bellert 1977, pp. 344–345, Lyons 1977, pp. 799 Nuyts 2001a, pp. 58–59) at least such as *possible*, *probable*, *certain* or *möglich* ‘possible’ so much more acceptable in non-canonical environments such as questions than epistemic adverbs like *possibly*, *probably*, *certainly* or *möglichweise*?

- What is the precise interpretation of epistemic modal operators in non-canonical environments?
Goals of this talk

▶ **Standard solution**: all epistemic operators in non-canonical environments belong to the class of objective epistemic modals which take a narrower scope
  ◀ **Problem 1**: no agreement what is subjective epistemic and objective, so far no consistent definition
  ◀ **Problem 2**: many of the items that are considered as subjective only occur in environments where only objective epistemic operators should occur

▶ **Solution presented here**:
  ▶ Epistemic operators always have same meaning, even in non-canonical environments
  ▶ epistemic operators introduce a variable for deictic centres and can embedded more easily if the variable is locally bound
  ▶ epistemic adjectives are more easily interpretable in non-canonical environments than epistemic adverbs and verbs because they differ in argument structure
Topic of this talk: contrasts I


(1)  a. Is it probable that Frank beat all his opponents?
    b. * Did Frank probably beat all his opponents?

(2)  a. Is it possible/probable that John will come?
    b. * Will John possibly/probably come?

(3)  a. Is it probable that they run out of fuel?
    b. * Did/Have they probably run out of fuel?
    c. * Probably they have run out of fuel?

¹Lyons is not explicit about this contrasts but they follow from his claims (cf. 805–806.)

(4)  a.  It is improbable/impossible that John has come.
    b.  * Improbably/Impossibly/Not probably John has come.

(5)  a.  It is improbable that they have run out of fuel.
    b.  * Improbably they have run out of fuel.
    c.  * They have improbably run out of fuel.

²Again, Lyons is not very explicit of such a contrast but he notes that negation may take scope over epistemic adjectives and that they are objective epistemic
Likewise such a contrast is discussed for the occurrence within the antecedents of conditionals (cf. Lyons 1977, pp. 805–806 ex. 6, Hengeveld 1988, pp. 236–240 ex. 7).³

(6) a. If it may be raining, you should take your umbrella.
    b. If it is possible that it will rain, you should take your umbrella.
    c. If there is a possibility of rain you should take your umbrella.

(7) a. If it is possible that John will come, I am going home.
    b. * If possibly John will come, I am going home.

³Once again Lyons is not very explicit. He does not provide any ungrammatical example for epistemic adverbs.
Not all the authors make the same claims for all the environments. Contrasts in acceptability between adjectives and adverbs are suggested for the following environments:

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<th>Author</th>
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<th>conditionals</th>
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</table>

✓ ✓ means that the author provides examples, ✓ means that the author explicitly claims that there is a contrast, (√) means that the author doesn’t explicitly mention such a contrast but it follows from other claims made, empty fields mean no claims were made.
Epistemic modal verbs in information seeking questions

(8) a. „Wer kann Ihnen etwas ins Glas geworfen haben?“, fragte der Richter.
     “Who could have thrown something into the glass?”, asked the judge.

     b. „Ich denke, es war dieser Bekannte”, erwiderte die Frau.  
        “I think it was that friend”, answered the woman.

‘“Who could have thrown something in your glass?”’, the judge asked.
“I think it was this friend”, the woman answered.’
Lyons, Hengeveld argue that these contrasts are result of two different types of meanings and different ranges of scopes/scopal positions:

- **epistemic adverbs**: express subjective epistemic modality, speaker weakens truth commitment
- **epistemic adjectives**: express objective epistemic modality, statement of a (logical) possibility or necessity
- **epistemic modal verbs**: depending on lexical item express both or only one epistemic modality

Many of the authors here are no native speakers (Bellert, Hengeveld, Nuyts)

A consulted native speaker questions most of these results

Greenbaum (1969, pp. 111–113, 132–141, 148–153) conducted an experiment and collected corpus data which suggest the existence of a contrast for the adverbs *possible/possibly*,
Modality in a nutshell

Modality

Expressions that allow the speaker to talk about situations which are not part the set of facts he knows. (Inspired by Portner 2009, pp. 1)

1. Situations including unrealised wishes of the subject referent.
   (9) Maria wants to become famous.

2. Situations which include rules that are not obeyed.
   (10) You should go to bed now.

3. Situations which are not part of the speaker’s knowledge
   (11) He might be Pedro’s brother.

4. Situations expected to occur after utterance time
   (12) Tomorrow, there is going to be rain.
Types of modality

- **circumstantial**
  - dynamic
    - ability (eg. *Marta can swim.*)
    - bouletic (eg. *John wants to travel.*)
  - deontic (eg. *The children must go to school.*)
  - practical (eg. *In order to get to Seixal you have to cross the Tejo.*)
- **judge-related**
  - epistemic (eg. *He might be his brother.*)
  - reportative (eg. *Er soll sein Bruder sein* ‘he is claimed to be his brother’)
- **evidential**
Flavours of modality in a nutshell

- **ability**
- **bouletic** in line with situations which provide a higher degree of happiness to the subject referent
- **deontic** in line with situations which provide a higher degree of happiness to some other referent, potentially a collective abstract body
- **practical** necessities and possibilities that arise from the nature of things
- **epistemic** assumptions and inferences based on the speaker’s knowledge
Epistemic modality has two basic characteristics:

- modified proposition cannot be part of speaker knowledge
- epistemic modal verbs allow to embed predicates referring to states that cannot be changed (individual level predicates), whereas circumstantial modals do not
A basic feature of epistemic modality

(13) This lake could be deep.

- Speaker can utter (13) without knowing anything
Three ways to characterise epistemic modality

(14) Three ways to formulate the CoDeC:
   a. \( p \) is not part of the deictic centre’s knowledge
   b. \( \neg p \) is not part of the deictic centre’s knowledge
   c. neither \( p \) nor \( \neg p \) part of the deictic centre’s knowledge

▶ Martin (2011, Sect. 3.1.) in favour of option (14b)
▶ Westmoreland (1998, pp. 12) in favour of option (14c)
Option (14a) is the most plausible
Speaker can be aware that epistemically modified proposition is false
Speaker in example (15) that Kidman does not have 30 babies
(15) Wenn alle Meldungen über Schwangerschaften der Oscar-Preisträgerin gestimmt hätten, müsste sie mittlerweile 30 Babys bekommen haben. Kidman ist Mutter zweier adoptierter Kinder.  
‘If all of those reports about the Oscar winner’s pregnancies had been true, then she would have had 30 babies by now. Kidman is the mother of two adopted children.’
The second basic property

- Circumstantial modal verbs fail to embed predicates that refer to states that cannot be changed.
- Epistemic/evidential modal verbs allow if not prefer such predicates.
Circumstantial only: *can*


(16) a. * Smerdyakov can be the murderer. (only CIRC)
    b. Smerdyakov could be the murderer. (EPIST)

(17) a. * Smerdyakov can have killed Fyodor Pavlovich. (only CIRC)
    b. Smerdyakov could have killed Fyodor Pavlovich. (EPIST)
Results of corpus study

- Only epistemic, reportative and evidential modality modify predicates that refer to states which (cf. Maché 2013)
- The use of epistemic modal operators are much more limited in many environments (cf. Maché 2013), such as:
  - excluded embedded under other modal operators
  - limited in questions
  - limited in antecedents of conditionals
Influential work on objective epistemic modality

- Lyons (1977, pp. 787–809): very sketchy, enigmatic, no systematic classification of which lexical expression belongs to which class
- Nuyts (2001a): criticism of Lyon’s original work, introduces new dimension subjective vs. inter-subjective
Lyon’s organisation of the utterance

Inspired on work by the philosopher R.M Hare, Lyons (1977, pp. 749, 802) assumes that each utterance consists of three components:

1. **phrastic component**: propositional content of the utterance
2. **tropic component**: specifies the kind of speech act
3. **neustic component**: speaker commitment to that speech act.
Lyon’s types of negation

According to the three components, three types of negation:

1. **phrastic negation**: context free assertion of a negative proposition
   
   (18) I say that it is the case that not-\(p\).

2. **tropic negation**: denial
   
   (19) I say that it is not the case that \(p\).

3. **neustic component**: non-commitment
   
   (20) I don’t say that it is the case that \(p\).
Lyons’ analyses of different illocution types

Lyons (1977, pp. 802): phrastic component represented by \( p \), the tropic and the neustic component each by a full-stop.

assertion . . \( p \)
tropic negation . \( \sim \) \( p \)
question ? . \( p \)
command . ! \( p \)
prohibition . \( \sim ! \) \( p \)
deliberative question ? ! \( p \)
Lyons (1977, pp. 804)

Objective epistemic modality is a qualifier for the tropic *It-is-so* component:

(21) I say that it is possibly the case that $p$.
≈ asserting a possibility/necessity

Lyons (1977, pp. 804)

Subjective epistemic modality is a qualifier for the neustic *I-say-so* component:

(22) Possibly/Perhaps it is the case that $p$.
≈ no assertion but entirely independent illocutionary force with reduced speaker commitment to the truth
Lyons (1977, pp. 806)

[subjective epistemic modality] is more basic than [objective epistemic modality], as far as the everyday use of language is concerned; and that OEM can be thought of as being derived from SEM by a process of objectification.
Assume the following premisses are part of the speakers knowledge:

1. Alfred is part of a community of 90 people
2. 30 of these people are unmarried
3. It is not known whether Alfred is among the unmarried people

(23) Alfred may be unmarried.
Lyons does not discuss the consequences explicitly:

- **claim 1**: ADJ are more appropriate for OEM than for SEM
- **claim 1**: ADV are more appropriate for SEM than for OEM
- An ADJ should be significantly better to express the state of affairs described above

(24) a. It is possible that Alfred is unmarried.
    b. Possibly, Alfred is unmarried.
Discussion: German

Clear contrast expected between (25) and (26)\textsuperscript{7}

(25) a. Es ist möglich, dass Alfred unverheiratet ist.
b. Ich halte es für möglich, dass Alfred unverheiratet ist.
c. Es besteht die Möglichkeit, dass Alfred unverheiratet ist.
d. Alfred kann unverheiratet sein.
e. Es kann sein, dass Alfred unverheiratet ist.

(26) a. Alfred ist möglicherweise/vielleicht/womöglich unverheiratet.
b. Alfred könnte unverheiratet sein.
c. Es könnte sein, dass Alfred unverheiratet ist.

\textsuperscript{7}According to Öhlschläger (1989, pp. 207, 210) and Diewald (1999, pp. 82–84, 274) kann can be OEM, but könnte is always SEM
Assume the following premisses are part of the speakers knowledge:

1. Alfred is part of a community of 90 people
2. 30 of these people are unmarried
3. It is not known whether Alfred is among the unmarried people
4. 70 married people are already known by name
5. Alfred is not among them

(27) Alfred must be unmarried.
Again Lyons does not discuss the consequences explicitly, but following his claims above an ADJ should be significantly appropriate here than a ADV

(28)  a. It is necessary/certain that Alfred is unmarried.
    b. Certainly/Necessarily, Alfred is unmarried.
Discussion: German

Clear contrast expected between (29) and (30)

(29)  
  a. Es ist sicher, dass Alfred unverheiratet ist.  
  b. Ich halte es für sicher, dass Alfred unverheiratet ist.  
  c. Es besteht Sicherheit, dass Alfred unverheiratet ist.  
  d. Alfred muss $L^*/L+H^*$ unverheiratet sein.  
  e. Es muss $L^*/L+H^*$ (so) sein, dass Alfred unverheiratet ist.

(30)  
  a. Alfred ist sicher/sicherlich/mit Sicherheit unverheiratet.  
  b. Alfred muss $L^*/L+H^*$ unverheiratet sein.  
  c. Es muss $L^*/L+H^*$ (so) sein, dass Alfred unverheiratet ist.
I do not observe any contrast between ADV and ADJ
nor between typical SEM verbs like *könnte* and typical OEM verbs such as *kann*
Doubtful whether there is a 1:1 relation
- modal operators that are embedded under the discussed operators
- an epistemic judgement which is accessible to other referents aside the speaker
More reasons to doubt the division

Accounting for epistemic modal operators in non-canonical environments:


2. clear SEM in non-canonical environments

3. there are no diagnostics that apply to all alleged OEM

4. there are no allegeded OEM which pass all the suggested diagnostics
EMV in information seeking questions

- ‘Subjective’ epistemic modal operators DO occur in information seeking questions
- Canonical interrogations: speaker asks addressee to return assertion among the possible assertions which answer the questions
- Interrogations that include epistemic operators: speaker asks addressee to return assertion among the possible assertions which answer the questions
- Involve context shift: deictic center/judge is not the speaker but the addressee
- They are used when speaker assumes that addressee is not in the position to commit to a single answer as an assertion
Epistemic modal verbs in information seeking questions II

Clearly based on evidence accessible only to addressee.

(31) a. „Wer kann Ihnen etwas ins Glas geworfen haben?”, fragte der Richter.
   throw-POP have-INF asked the judge

   b. „Ich denke, es war dieser Bekannte”, erwiderte die Frau.  
   the woman

   ‘ “Who could have thrown something in your glass?” , 
   the judge asked.

   “I think it was this friend”, the woman answered.’

8DeReKo: BVZ07/FEB.00540 Burgenländische Volkszeitung, 07/02/2007.
(32) a. Was dürfte bei diesem Unglück passiert sein?

b. Z.O.: Ein Triebwerk hat zu brennen begonnen. Der Brand kann viele Ursachen haben, ein Leck in der Kerosinzufuhr, alles Mögliche.‘[journalist:] “What do you think had happened at this disaster?”

Zhuber-Okrog: “An engine caught fire. The fire can have several causes, a leak in the kerosin supply; a lot of things.” ’

\[^9\] DeReKo: K00/JUL.55992 Kleine Zeitung, 27/07/2000.
(33) a. „Kann das Glas schon länger, also beispielsweise zwei Monate, gestanden haben?”
Can the glass already longer thus for example two month stand have

b. „Die Wohnung sah so aus, als würde sie benutzt”, erwiderte der PASS.AUX-SBJV.PST she used responded the Zeuge.
the flat looked so out as if she used

‘ [lawyer:] “Could the glass have already stood there for two months?”

witness: “The flat looked liked it was used.” ’

\[DeReKo: \text{RHZ08/JUN.01066 Rhein-Zeitung, 02/06/2008.}\]
EMV under Negation

- EMV in the scope of negation well documented: English can’t, needn’t, German können ‘can’, brauchen ‘need’, Dutch hoeven ‘need’, Mainland Scandinavian beøve
- Objective interpretation not applicable
- Evidence accessible only to main character.
- Even Lyons (1977, pp. 801) acknowledges that can’t has an ‘subjective’ epistemic interpretation despite being in the scope of a negation:

(34) It can’t be raining.
(35) Zwei Pferde trabten durch den Wald. Sie kamen aus Northgate, dessen war sich Sonaja sicher. Sie brauchten nicht unbedingt hinter ihr her zu sein, aber es war besser, Vorsicht walten zu lassen.¹¹


‘Two horses were trotting through the forest. They came from Northgate. She was certain about that, but they needn’t necessarily be after her. However, it would be better to act with caution.’
(36) Die beiden Reiter suchten nach einer Spur. Es brauchte nicht ihre gewesen sein, aber wer war denn sonst noch in ihrer Richtung unterwegs gewesen?¹²


‘The two horse men were looking for a trace. It needn’t have been hers. But who else could have been moving along with her in that direction.’
Pose an additional complication.

Sweetser (1990, pp. 123), Kratzer (1995, pp. 130) and Haegeman (2002, pp. 117) three different types of conditionals:

- **content/event-related conditionals** if \( e_1 \) happens, \( e_2 \) is going to happen too.
- **epistemic conditionals**: if \( q \) is true, than \( p \) must be true to, ‘mostly echoic’
- **Speech act conditionals** if antecedent \( q \) is fulfilled, then utterance is relevant

Exluding conditionals with ‘echoic’ antecedents
If event $e_1$ happens, event $e_2$ is going to happen too:

(37)  a. If you click this button, you are going to format your hard drive

b. When Mary speaks French, she speaks it well.
Epistemic conditionals

a. If Mary knows French, she knows it well.
b. If they have to leave a message, he has gone already. (epistemic)

- If \( q \) is true, then \( p \) must be true to, ‘mostly echoic’.
- Event of main clause can precede event of antecedent (38b).

- 3
- 4
- 5
Speech act conditionals I

(39)
(40) If you are hungry, just serve you selfe.

- Speech act conditionals may modify other illocutions such as imperatives or questions
- They often involve echoic antecedents
(41) a. Wenn das stimmt, warum sollen wir uns dann überhaupt mit den utopischen Steuerträumereien von Schwarz-Gelb beschäftigen?¹³

‘If this is true, why should we then be concerned with the utopian dreams of the black yellow coalition about taxes?’

b. Wenn Bush behauptet, dass die Welt seit dem Einmarsch der Koalitionstruppen sicherer geworden sei, dann lügt er.¹⁴

‘If Bush claims that the world has become safer after the invasion of the allies, then he lies.’
As well known: epistemic and speech act conditionals operate on a higher level/conjoin bigger types of clauses.

It is not surprising, even expected to find epistemic operators in antecedents of these.

Any conditional that involves an ‘echoic’ antecedent is either epistemic or speech act.

In order to target event-related ones, exclude all examples with echoic antecedents.
There are. Interestingly only with *könnte*, which is claimed to be only SEM by objective-epistemic modality believers.

(42) Wenn der Täter bewaffnet sein könnte, würde ich jedoch dringend abraten.¹⁵
‘If the offender could be armed, I would strongly advise against it.’

¹⁵DeReKo: RHZ96/OKT.04492 Rhein-Zeitung, 08/10/1996.
Es besagt, dass eine in die Schweiz geflüchtete Person nicht in ihr Ursprungsland zurückgeschafft werden darf, wenn sie dort an Leib und Leben bedroht sein könnte.

‘It says that a person who has fled to Switzerland must not be returned to his origin.country if he could be physically threatened there.’
Under very specific conditions EMV with subjective interpretation even in antecedents of event related conditionals

Only with könnte

Involve context shift: deictic center is addressee

If addressee alone has the evidence, rather than the evidence is publicly accessible

5
### Different views on objective epistemic modality.

<table>
<thead>
<tr>
<th>Environment</th>
<th>kann</th>
<th>muss</th>
<th>dürfte</th>
<th>könnte</th>
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#### GERMAN


#### DUTCH


#### ENGLISH

- Watts (1984, pp. 133): yes

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Lyons is not very explicit. Below are enlisted examples he uses for *may* as OEM (14) 797–798, (20) p.799, (24–25) p. 801, (45) p.804; *might* (19) p. 799; *can’t* as OEM (26–27), *must* (15) 797–798, hardly natural with *needn’t* (31) p. 801; Examples of *may* as SEM (14) p. 797, (20) p.799, (24–25) p. 801, *might* (22–23) p. 799; *must* as SEM (15) p. 797 and *can’t* as SEM despite the fact it is occurring in the scope of a negation (26) p. 801.
Interim conclusion

- ‘subjective’ epistemic modals are attested in information seeking questions
- ‘subjective’ epistemic modals are attested under negation
- ‘subjective’ epistemic modals even are attested in antecedents of event related conditionals
- assumption of objective epistemic modality served to account for epistemic modal operators that occur in ‘forbidden environments
- division becomes obsolete
(44) Und er erzählt, dass dieses Rätsel bald gelöst sein könne. ¹⁸
‘And he said that this riddle could be solved soon.’

¹⁸ DeReKo: NUN03/AUG.02519 Nürnberger Nachrichten, 28/08/2003.
Occur much more readily in non-canonic environments than epistemic modal verbs (cf. Doherty 1985, pp. 118–119 and Reis 2001, pp. 296):

(45) Will Uderzo mit dieser Abrundung seines (und Goscinny) Lebenswerks vielleicht wirklich endgültig den letzten Band herausgebracht haben?

‘Does Uderzo really want to say that this is definitely the last volume which he has edited of his and Goscinny’s lifework?’
Open questions

1. How does one account for the contrast of acceptability between embedded epistemic ADV and ADJ?
2. How does one account for different possibilities to identify deictic center?
3. How does one account for the fact that EMV are never attested under other modal operators?
(46) It might be raining in Lagos right now.

- Speaker makes a claim about possible worlds/possibilities about their knowledge
- Epistemic operators are always evaluated with respect to the knowledge of some judge
- Controversy
  - Common knowledge of everyone?
  - Knowledge of an individual attitude holder?
Three different ways of building epistemically modified VPs

Epistemic adverb (47a), epistemic modal verb (47b), predicative epistemic adjective (47c) build propositions with similar meanings:

(47)  a. . . dass wahrscheinlich der Joseph die Maria
       that probably the Joseph the Mary
       kennt.
       knows
       ‘. . . that Joseph probably knows Mary.’

b. . . dass der Joseph die Maria kennen dürfte.
       that the Joseph the Mary knows-INF may
       ‘. . . that Joseph might know Mary.’

c. . . dass es wahrscheinlich ist, dass der Joseph
       that it probable is that the Joseph
       die Maria kennt.
       the Mary knows
       ‘. . . that Joseph probably knows Mary.’
(48) ... dass der Joseph die Maria kennen will.
   that the Joseph the Mary know-INF wants
   ‘... that Joseph wants it to be accepted as a truth that he knows Mary.’
In corpus data evaluated by Maché (2013), four different possibilities can be found how epistemic operators are interpreted:

1. Unembedded EMVs/EMADV: DC=SPEAKER
2. EMVs/EMADV embedded under a non-factive attitude predicate: DC=EXP of matrix predicate
3. Reportative MVs: DC=EXP of MV
4. EMADJ DC=EXP of epistemic predicate
5. EMV/EMADV in information seeking questions/conditionals: DC=ADDRESSEE
Epistemic operators are always evaluated with respect to the knowledge and believes of some DEICTIC CENTRE. In matrix declarative clauses it is identified with the speaker (49):

\[(49)\text{ der Joseph } \textit{dürfte} \text{ die Maria kennen.} \]
\[(49)\text{ the Joseph } \textit{‘be.probable’ the Mary knows-INF} \]
\[\text{‘Joseph probably knows Mary.’} \]
DEICTIC CENTRE=\textit{spkr}
Context dependence of epistemic operators: embedded non-factives

As shown by Stephenson (2007), the DC is identified with an appropriate attitude holder in the matrix clause in embedded non-factive clauses. (49):

(50) Der Gabriel vermutet, dass der Joseph die Maria kennen dürfte.

‘Gabriel assumes that Joseph might know Mary.’

DEICTIC CENTRE = matrix EXP = Gabriel
As shown by Lasersohn (2005), Maché (2013), the DC is identified with the addressee in information seeking interrogatives and event related conditionals (51):

(51) Wen dürfte der Joseph hier aller kennen?
‘Whom do you believe does Joseph know here?’

DEICTIC CENTRE = \textit{addr}

- Epistemic operators in information seeking interrogatives impose strict conditions of use.
- Only used in situations in which the speaker assumes that the addressee is not in the position to commit to any answer and only able to provide assumptions that reflect the modal strength of the modal operator suggested by the speaker.
In reportatives, the DC is identified the argument of the modal verb which refers to the attitude holder (52–53):

(52) der Joseph **will** die Maria kennen.
    the Joseph **wants** the Mary **knows-INF**
    ‘Joseph wants everybody to add the proposition to the common ground that Joseph knows Maria.’
    DEICTIC CENTRE=SUBJ

(53) der Joseph **soll** die Maria kennen.
    the Joseph **shall** the Mary **knows-INF**
    ‘someone wants everybody to add the proposition to the common ground that Joseph knows Maria.’
    DEICTIC CENTRE=EXP
Condition on Deictic Centres (CoDeC)

The use of an epistemic operator indicates that the embedded proposition is not part of the DEICTIC CENTRE’s knowledge. (cf. Maché 2013, pp. 415)

Hierarchy of Salience

The variable of the DEICTIC CENTRE is bound by...

1. ...the experiencer arguments of the predicate which introduce the epistemic modal operator
2. ...the experiencer argument of an attitude predicate in the superordinate clause
3. ...the most salient referent of the speech act

(cf. Maché 2013, pp. 422)
Intuition behind the analysis

Slight contrast between *für*-PPs binding the argument position for the attitude holder of the adverb/adjectives in question:

(54)   a.  ? . . . aber für IHN ist es
        but for him it is
        sicher/wahrscheinlich/möglich, dass der HSV
        certain/probable/possible, that the HSV
        gewinnt.
        wins
        ‘...but to him it is certain/probable/possible that HSV is
        going to win.’

b.  ?? . . . aber für ihn gewinnt der HSV morgen
        but for him wins the HSV tomorrow
        sicher/wahrscheinlich/möglicherweise.
        certainly/probably/possibly
        ‘...but for him HSV is going to win
        certainly/probably/possibly.’
argument position within sentential adverbs less accessible for syntactic operations than argument positions of the predicate
(55) *wahrscheinlich* ‘probably’

- **PHON**: \(/vəˈɐ̯.fəɪn.ˈliç/\)
- **SYNSEM**:  
  - **LOC**:  
  - **CAT**:  
  - **COMPS**:  
  - **ARG-ST**: \(\langle VP_i, PP_j \rangle\)
  - **SOA**: \(i\)
  - **EXP**: \(j\)
  - **DC**: \(\text{ind}\)
  - **epistemic-soa**

- **HEAD**:  
  - **MOD**:  
  - **LOC**:  
  - **CAT**:  
  - **CONT**:  
  - **HEAD**:  
  - **verb**

- **CONT**:  
  - **SOA**:  
  - **EXP**:  
  - **DC**:  
  - **epistemic-soa**

- **based on entries for sentence adverbs as suggested by Müller (2020, pp. 223) or Kim (2021, pp. vii)**

- **include a DEICTIC CENTRE** (DC) which determines the attitude holder with respect to whose knowledge the epistemic modal operator is evaluated
(56) *wahrscheinlich* ‘probable’

- PHON: /vəˈʃɛn.ˈliʦ/ (phonetic transcription)
- HEAD: *adjective-prd*
- SUBJ: [1 *dass*-Sᵢ]
- COMPS: [2 PPₕᵢᵣᵦᵢ⟩]
- ARG-ST: [1 *dass*-Sᵢ, 2 PPₕᵢᵣᵦᵢ⟩]
- MOD: ⟨⟩
- SOA: *i*
- EXP: *j*
- DC: *ind
epistemic-soa*

- **has an argument for an attitude holder which can optionally realises as** PPₕᵢᵣᵦᵢ
- **if unrealised, usually interpreted as** generic pronoun like PROₐᵣᵦ
- **DC** not yet instantiated
Lexicon entry of an epistemic modal verb

(57) *dürfte* ‘be.probable’

\[
\begin{array}{c}
\text{CAT} \\
\text{HEAD verb} \\
\text{ARG-ST 1} \oplus 2 \oplus \langle V[ bse, LEX +, SUBJ \{1\}, \text{COMPS} \{2\}]_i \rangle \\
\text{SOA } i \\
\text{DC } \text{ind} \\
\text{epistemic-soa}
\end{array}
\]

- Raising analysis cf. Müller (2013, pp. 243, 277)
- no restriction on IC: they can be embedded under non-factives
- no restriction on VFORM: they can be nonfinite when embedded under non-factives
Lexicon entry of an reportative modal verb

(58)  \textit{wollen} ‘want’ here: ‘claim’

\begin{align*}
\text{CAT} & \quad \text{HEAD} \quad \text{verb} \\
\text{ARG-ST} & \quad \langle \text{NP[ str } i \rangle \oplus 2 \oplus \langle \text{V[ bse, LEX +, SUBJ } \langle \text{NP[ str } i \rangle, \text{COMPS[2] } i \rangle \rangle \\
\text{EXP} & \quad i \\
\text{SOA} & \quad j \\
\text{DC} & \quad i \\
\text{CLOSED} & \quad + \\
\text{epistemic-soa} & \quad \\
\end{align*}

\begin{itemize}
\item Based on the analysis of control predicate by Müller (2013, pp. 280)
\item By virtue of \textit{HoS1} \text{DC} is bound by the attitude holder argument introduced by the verb \textit{wollen} (or \textit{sollen})
\begin{itemize}
\item a structure with a verbal head which has a \text{EXP} on its \text{ARG-ST} and an \text{epistemic-soa} in its \text{CONT}.
\end{itemize}
\item no restriction on \text{VFORM} because also attested as infinitive
\end{itemize}
Clause 1

the variable of the DEICTIC CENTRE is identified by the EXPERIENCER argument of the predicate which introduce the epistemic modal operator:

\[
\begin{array}{c}
\text{CAT} \\
\text{HEAD} \\
\text{ARG} \\
\text{EXP} \\
\text{epistemic-soa}
\end{array}
\]

\[
\begin{array}{c}
\text{CONT} \\
\text{EXP} \\
\text{DC} \\
\text{CLOSED}
\end{array}
\]

\[
\begin{array}{c}
\text{verb} \\
\text{list} \oplus \langle \text{NP/PP}_i \rangle \oplus \text{list}
\end{array}
\]

\[
\to
\begin{array}{c}
\text{EXP}_i \\
\text{DC}_i \\
\text{CLOSED} +
\end{array}
\]

▶ When ever a predicate of the type *verb* introduces an epistemic operator with DEICTIC CENTRE and has an EXPERIENCER on its COMP-list: the DEICTIC CENTRE is locally bound by the EXPERIENCER argument

▶ applies to reportative modal verbs and copulas with predicative epistemic adjectives
Formalisation of HoS 1 Comments

- *HoS1* does apply to VPs modified by epistemic adverbs
- Mother node does not have appropriate attitude holder on ARG-ST list
- *HoS1* does not apply to epistemic adverb as it is not of the category *verb*
Formalisation of HoS 2

Clause 2

the variable of the DEICTIC CENTRE is bound by the EXPERIENCER argument of an attitude predicate in the superordinate clause

\[
\begin{align*}
\text{CAT} & \quad \text{ARG-ST} \odot (\text{NP}) \odot \text{list} \odot \left( \text{S} \left[ \text{H-DTR}\mid \text{SYNSEM}\mid \text{LOC} \left[ \text{CAT}\mid \text{HEAD}\mid \text{IC} \right] \right] \right) \\
\text{CONT} & \quad \text{EXP} \ i \\
\text{CAT} & \quad \text{ARG-ST} \odot \left( \text{S} \left[ \text{H-DTR}\mid \text{SYNSEM} \left[ \text{CONT} \left[ \text{DC} \ i \right] \right] \right] \right) \\
\text{CONT} & \quad \text{EXP} \ i
\end{align*}
\]

- **IC** – signals that clause is embedded (cf. Ginzburg and Sag 2000, pp. 45)
- the feature **VFORM** of the embedded verb remains unspecified, because embedded clause can be non-finite too in German
- **CLOSED** – signals that deictic centre in the clause is not bound yet
Formalisation of HoS 3

Clause 3a

the most salient referent of the speech act (declaratives)

- CLOSED—indicates that there is no potential binder which is more local than speaker
- root clause constraint according to Ginzburg and Sag (2000, pp. 26, 42–46)
- representation of the speaker inspired by Ginzburg and Sag (2000, pp. 120–124)
only declarative clause have CONT value specified for message-type *proposition*

the feature CLOSED— signals that there is no more local binder between the root-level node and the DC-variable contributed by the epistemic operator

in such environments the DC is identified with the speaker
Formalisation of HoS 3b

Clause 3b

the most salient referent of the speech act (information seeking interrogatives)
only interrogative clause have CONT value specified for message-type *question*

the feature CLOSED— signals that there is no more local binder between the root-level node and the DC-variable contributed by the epistemic operator

in such environments the DC is identified with the addressee
The arguments 1, 2 of the ADJ will end up in the predicate’s ARG-ST-list.

By virtue of argument attraction in cluster formation the copula attracts the arguments of the embedded predicative adjective.
There is constituent with a head of the category *verb*
  - that has an *EXP* on its *ARG-st*
  - and that a *DC* in its content:

Arguments of the ADV will not end up in the predicates

Clause 1 of HoS cannot apply:

Epistemic adverbs with VP

 ARG-ST-list

Arguments of the ADV will not end up in the predicates

Clause 1 of HoS cannot apply:
There is no AVM with a head of the category *verb* that has an EXP on its ARG-st and that a DC in its content:

- consequence: clause 1 cannot apply
- consequence: DC-variable left be unbound.
- consequence: DC-variable can only be bound by the top most binder
Epistemic modal verbs

- CONTENT of epistemic modal verb is *epistemic-soa*
- If in matrix clauses *HoS3* applies
- If embedded in clause *HoS2* applies
The different behaviour of epistemic adverbs and epistemic adjectives in Westgermanic languages is caused by a difference in argument structure and binding behaviour:

- Epistemic operators introduce a variable for a DEICTIC CENTRE.
- Depending on the context, different binding behaviour occurs.
- If DC-variable is not bound locally, subject to strict conditions on context.
- Argument position in predicates can be locally bound by EXPERIENCER arguments.
- Epistemic adverbs do not participate in predicate complex formation, DC cannot be bound locally.
- Predicative epistemic adjectives are part of the predicate complex, DC is bound locally.


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