Epistemic, Evidential and Discourse Modalities in Commitment Space Semantics

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1. Overview

Topics to be covered:

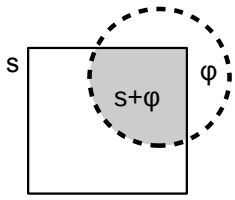
- The nature of assertion as expressing commitments
  Assertions and questions in the commitment space framework
- Judgements as a separate act from commitments
- Subjective epistemics as expressing strength of judgments
- Evidentials as expressing source of judgements
- Discourse epistemics

2. Assertions as Commitments

2.1 The dynamic view of assertions

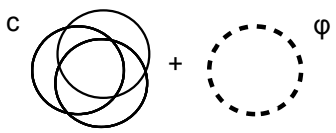
(1) Assertions as modifying the common ground,
"a body of information that is available, or presumed to be available, as a resource for communication" (Stalnaker 1978)

(2) Standard view of assertion in dynamic semantics
(Stalnaker 1978, 2002, 2014; Heim 1983, Veltman 1996)
– Common ground is modeled by a set of propositions (context set),
– Assertion of a proposition restricts the input common ground to an output common ground by intersection. +



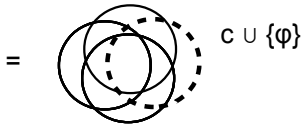
Example: $s + \varphi = s \cap \varphi$

(3) Alternative view: Common ground as sets of propositions
– Assertion of a proposition adds the proposition to the common ground
– Context set: the intersection of the propositions of the common ground



Example: $c + \varphi = c \cup \{\varphi\}$

(4) Advantages of this view:
– Meaningful addition of tautologies, e.g. '2399 is a prime number'
– possible modeling of contradictory common grounds
(would lead to empty context set)
– possible enrichment by imposing a saliency ordering of the propositions



1 *thanks to the commentary of Dag Haug and by other participants of the workshop, thanks to funding by DFG, in particular the project Past Tense Morphology in Tense and Modality

2.2 How do speakers add propositions to the common ground?

(5) S_1 asserts φ at c: S_1 applies function $f(\varphi) = \lambda c'[c' \cup \{\varphi\}]$ to c

(6) Problems:
– This assumes that one speaker S_1 has authority over the common ground
– Does not appreciate that common ground is negotiated
– Even if φ is accepted to c, it should remain on record that it was S who introduced φ

(7) Concept of **table** in Farkas & Bruce 2010:
– Common ground has a negotiating area on which participants place propositions
– After acceptance by other participants, move proposition to permanent common ground
– Problem: After acceptance, information who introduced a proposition gets lost

(8) Participants convey information due to the rules of a particular game, the CG game
But in order that this is not just any arbitrary game, there must be ethical rules attached to it, what are those rules?

(9) Stenius 1968: Produce a sentence in the indicative mood only if its sentence-radical is true.

(10) Lewis 1972: Convention of truthfulness and trust
Problem: This is not just a convention, like driving on the right side of the road?

(11) Lauer 2013: How to get from utterances to propositional updates of information states, in the current framework, how do you get from (b) to (c):
a. c + **S_1: *It is raining.***
b. c ∪ {**S_1 uttered: *it is raining***} "cautious update"
c. c ∪ {S_1 uttered: *it is raining*, …, **'it is raining'**} "credulous update"

2.3 Three approaches to assertion

(12) Bach & Harnish 1979, Lauer 2013 **"I believe"**
Speaker expresses a belief in the truth of a proposition
Moore's paradox: # *It is raining, but I do not believe that it is raining.*

(13) Bach & Harnish 1979, Truckenbrodt 2006: **"you should believe"**
Spreaker expresses (in addition) the intention that the addressee should form a like belief.
Paradox: # *It is raining, but I don't want you to belief it.*

(14) Ch. S. Peirce, Searle 1969, Brandom 1983, Alston 2000, McFarlane 2011, **"I am to blame"**
Speaker expresses public responsibility for truth of the proposition, involving social sanctions
Paradox: # *It is raining, but I don't want to be blamed if it is not raining.*

2.4 Discussion of the three approaches

(15) The "I believe" approach:
– Assumes that if S_1 expresses a belief in φ, this is reason for others to belief φ as well, provided that S_1 is well-informed (Lauer 2013), does not want to misinform
– Problem: Difference between *It is raining* and *I believe that it is raining*, if we assume that *x believes that x believes φ* is equivalent to *x believes φ*.
– Explains Moore's paradox, does not explain other paradoxes.
– Makes lying, strictly speaking, impossible.

(16) The "you should believe" approach:
– Most direct approach to change of common ground
– Explains Moore's paradox indirectly: I should not order you to believe φ if I do not.
– Does not explain blame paradox.
– Makes assertions a subspecies of commands
– But: *Believe it or not / I don't care whether you believe it, but / Just for the record, it is raining.*
– Makes lying morally objectionable: Do not want others to believe what you do not believe!

(17) The "I am to blame" approach:
– Assumes that if S declares public responsibility for φ, this is reason for others to assume φ
– Reason: S tries to avoid social sanctions, and the other participants know that
– Relation to speaker's belief: Better declare responsibility for φ only if you belief φ yourself, otherwise you might end up being sanctioned. Explains Moore's paradox.
– S knows that A knows that S would undergo sanctions if φ is false, and A knows that; by this S can convey φ to A as a conversational implicature if S asserts φ (Grice 1975).
– Explains paradox "... but I don't want you to believe it"
– Explains "Believe it or not... / Just for the record...": Cancelling of conversational implicature
– Makes lying expensive: loosing face, social capital, ability to communicate in the future

2.5 The commitment view, implemented

(18) Implementation of commitment view in Krifka 2015:
– S_1: *It is raining.* : c + $\mathbf{S_1 \vdash}$ **'It is raining'**,
where S⊢φ: the proposition 'S is publicly committed to the truth of φ'
– The proposition φ itself is then added as a **conversational implicature**,
if no objection, or simple acknowledgement *okay*. c + 'S_1⊢'It is raining' + **'It is raining'**
– The source of a proposition, the participant responsible, remains on permanent record
– As common grounds essentially contain commitments, I call them "**commitment states"**.

(19) Possible reactions after c + S_1⊢'It is raining':
– *No*. S_2 takes up proposition 'It is raining' and asserts its negation,
resulting in c + S_1⊢'It is raining' + $\mathbf{S_2 \vdash}$**¬'It is raining'**,
preventing the proposition 'It is raining' from becoming part of c,
– *Yes*. S_2 takes up proposition 'It is raining' and asserts it,
resulting in c + S_1⊢'It is raining' + 'It is raining' + $\mathbf{S_2 \vdash}$**'It is raining'**,
making S_2 also publicly responsible for the truth of φ

(20) The content of the assertion proper, S_1⊢'It is raining', cannot be addressed directly by S_2, except by comments like *Don't say that*, *Take this back*, *Don't make a fool of yourself*.

(21) Syntactic implementation, assuming of head movement of finite verb, movement of subject:
$[_{\text{ActP}}$. *it* $[_{\text{CommitP}} \vdash$ *is* $[_{\text{TP}}$ _ _ *raining*]]]

(22) Semantic interpretation:
$[\![[_{\text{ActP}}$. *it* $[_{\text{CommitP}} \vdash$ *is* $[_{\text{TP}}$ _ _ *raining*]]]$]\!]^{S_1S_2}$, where S_1: speaker, S_2: addressee
= λc[c + S_1⊢$[\![[_{\text{TP}}$ *it is raining*]$]\!]^{S_1,S_2}$]
= λc[c + S_1⊢λi[it is raining in i]]
= λc[c ∪ {λi′[S_1 is responsible in i′ for the truth of the proposition λi[it is raining in i], at i′]}]

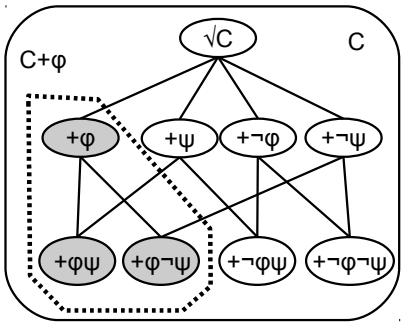
2.6 Questions in the commitment view

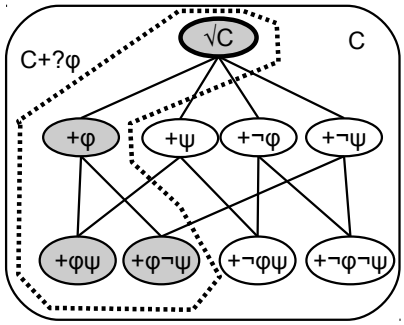
(23) Extension from commitment states to **"commitment spaces"**:
commitment state + possible continuations
(Cohen & Krifka 2014, Krifka 2015)

(24) Commitment spaces modeled as sets of commitment states C ordered by set inclusion;
the actual commitments are the smallest commitment state, the root of the commitment space, √C

(25) Update with regular speech acts: C + φ = {c∈C | √C + φ ⊆ c}

(26) Allows for denegation, conjunction, disjunction, conditionalization of speech acts, cf. Krifka 2014, 2015, 2017





(27) Questions as restrictions of continuations
that do not change the root (meta speech acts)
a. monopolar question: $C + ?\pi = \{\surd C\} \cup \{c \in C \mid \surd C + \varphi \subseteq c\}$
b. bipolar question: $C + [?\varphi \vee ?\neg\varphi] = C + ?\varphi \cup C + ?\neg\varphi$
c. wh questions, see Krifka 2015

(28) More specifically: In a monopolar question *Is it raining?*
speaker S_1 imposes on S_2 to update C with $S_2 \vdash$ 'it is raining';
S_2 can perform this update, reject it and answer *no* ($S_2 \vdash \neg$'it is raining'), or reject S_1's move

(29) Syntactic and semantic implementation: $[\![[_{ActP} ? [_{CommitP} \vdash \textit{is} [_{TP} \textit{it} \_ \textit{raining}]]]]\!]^{S_1,S_2}$
? has the effect that speaker S_1 shifts $x \vdash ...$ to $S_2 \vdash ... = \lambda C[\{\surd C\} \cup C + S_2 \vdash \lambda i$[it is raining in i]]

2.7 Refinements of the commitment view

(30) Subtypes of assertions that relate to degrees of seriousness / social consequences:
– Explicit performatives: *I swear / claim / suggest that he did not steal the money.*
cf. strength distinctions of speechact-denoting verbs in Vanderveken 1990
– Speech act adverbials relating to seriousness: *I honestly did not steal the window.*
– Invocation of authorities: *Let God be my witness / Jeez, I did not steal the money.*
– Sanction specification: *For the life of me, I did not steal the money.*
– Oath phrases:
a. *wallaahi / winnabi / wi?ingiil ma-ʔaxatt-iš ḥaaga* (Egyptian Arabic)
by.good / by.the.prophet / by.the.bible I did not steal anything (Mughazi 2003)
b. *ischwör, Alter, war so* (Kiezdeutsch)
I.swear, guy, it was like that (http://www.kiezdeutsch.de/sprachlicheneuerungen.html)

(31) Invoking another authority that is to blame if proposition is false:
a. *The weather forecast says it will rain.*
b. *According to the weather forecast, it will rain.*
c. *It will rain, the weather forecast says.* (cf. Koev 2017)
d. *Laut (dem) Wetterbericht wird es regnen.*
loud (the.DAT) weather.forecast will it rain

(32) What about epistemics, evidentials?
a. *It probably / certainly is raining.*
b. *I think / believe it is raining.*
c. *It must / might be raining.*
d. *It seems to be raining.*

(33) Assertion + Epistemic evidence for *it likely is raining*; P: probability
a. von Fintel 2003: λc[c + speaker has put forward φ ∧ P('it is raining') > 0.5]
b. Cohen & Wolf 2011: Assert ('it is raining', P('it is raining') > 0.5)
c. Epistemic on the expressive dimension: ⟨'it is raining', P('it is raining') > 0.5⟩

Problems:
a. Why is assertion "weakened" by epistemic?
b. Why ✓*It likely will rain.* but # *It will rain. It likely will rain.*
c. Why # *It will rain. (It is likely).* (elaboration)
d. Why # *It will – likely – rain.* (parentheses)

(34) Wolf 2015: objective / descriptive vs. subjective / expressive epistemics
a. *It is probable that it will rain tomorrow.* P_{assert} (P(rain) > 0.5) ≥ high
b. *It will probably rain tomorrow.* P_{assert} (P(rain) ≥ high) > 0.5

(35) Problem:
Can **commitment strength** (backed by social sanctions) really be captured by **probability**?

3. Epistemics and Judgements

3.1 Peirce and Frege on Judgement and Assertion

(36) Charles Sanders Peirce on Assent / Judgement vs. Assertion (Tuzet 2006)

> [A]n act of **assertion** supposes that, a proposition being formulated, a person performs an act which renders him liable to the penalties of the social law (or, at any rate, those of the moral law) in case it should not be true, unless he has a definite and sufficient excuse;
> and an act of **assent** is an act of the mind by which one endeavors to impress the meanings of the proposition upon his disposition, so that it shall govern his conduct, this habit being ready to be broken in case reasons should appear for breaking it. (CP 2.315)

> What is the essence of a **Judgment**? A judgment is the mental act by which the judger seeks to impress upon himself the truth of the proposition. It is much the same as an act of asserting the proposition, or going before a notary and assuming formal responsibility for its truth, except that those acts are intended to affect others, while the judgment is only intended to affect oneself. (CP 2.252)

(37) Frege on **Gedanke** (Proposition), **Urteil** (Judgement) and **Behauptung** (Assertion)

> In einem Behauptungssatz ist also **zweierlei** zu unterscheiden: der Inhalt, den er mit der entsprechenden Satzfrage gemein hat und die Behauptung. (…) In einem Behauptungssatze ist **beides** so verbunden, daß man die Zerlegbarkeit leicht übersieht. Wir unterscheiden demnach
> 1. das Fassen des Gedankens -- das Denken,
> 2. die Anerkennung der Wahrheit eines Gedankens – das Urteilen
> 3. die Kundgebung dieses Urteils -- das Behaupten. (Frege 1918, *Der Gedanke*).

> I propose a correction: All **three** aspects may be combined in an assertion.

3.2 Propositions, Judgements and Assertions

(38) There are **three** distinct semantic operations;
- a. Forming a **proposition** / thought φ which has truth conditions
- b. Forming a **judgement** of x concerning a proposition φ, a **private** act
- c. Forming an **assertion** of x of φ, a **public** act with social consequences

(39) We can distinguish between:
- a. x asserts a **simple proposition** φ, in order to introduce φ to the common ground
- b. x asserts a **judgement** by x about a proposition φ in order to introduce φ to the common ground

(40) Reason for asserting judgments: Weakening of commitment by committing to a weaker proposition
- a. *It will likely rain* weaker than *It will rain*, as private beliefs are not easily checked publicly.
- b. Karttunen 1972, Veltman 1996: *It is the mailman* "stronger" than *It must be the mailman.*
- c. Experimental result by Knobe & Yalcin 2014 for extracontextual assessors (eavesdroppers):
  - a. S_1: *John is dead.* E knows that John is not dead, judges what S_1 said as false.
  - b. S_1: *John might be dead.* E knows that John is not dead, judges what S_1 said as true.

(41) Lauer 2013 only has (39)(b), i.e. asserting φ is always committing to a judgement (belief) of φ however, there is a difference between S_1: *It is raining.* and S_1: *I believe that it is raining*, even though *I believe that I believe that φ* probably entails: *I believe that φ*

(42) Two uses of judgement/belief clauses:
a) With '*I* [prop.attitude] *φ*', speaker S_1 wants to add proposition 'S_1 believes φ' to common ground
b) With '*I* [pro.attitude] *φ*', speaker S_1 wants to add φ itself to common ground, if φ is a QUD

(43) Two claims for case (b):
(i) there are special grammatical forms for (b): epistemic adverbials, embedded root clauses
(ii) [prop.attitude] must assign high or at least non-zero subjective probability to φ

(44) No negated epistemic adverbials (Bellert 1977, Ernst 2009):
*It will likely / *unlikely rain.* vs. *It is likely / unlikely that it will rain.* (objective epistemics)

(45) No embedded root phenomena in negative contexts:
Ich glaube, es wird regnen. vs. **Ich glaube nicht, es wird regnen.*
vs. *Ich glaube (nicht), dass es regnen wird.*

3.3 Judgements in syntax and semantics

(46) Subjective modals to express confidence of speaker, addressee, attitude holder:
a. Peter: *It will likely rain.* assertion – speaker
b. Mary, to Peter: *Will it likely rain?* question – addressee
c. *Peter thinks that it will likely rain* propositional attitude – subject, here: Peter

(47) Assume a **judgement phrase** for expressing the confidence of a judger in a proposition φ;
when asserted, the speaker S commits to the proposition that S has the specified confidence in φ,
in a propositional attitude context, it is expressed that the subject has the specified confidence in φ;
cf. Speas 2004, Evaluative Phrase.

(48) The judger aligns with the judge parameter of personal taste / perspective predicates by default:
a. *The pizza is tasty.* default judge: speaker
b. *Is the pizza tasty?* default judge: addressee
c. *Peter thinks that the pizza is tasty.* default judge: subject, here: Peter

(49) TPs are interpreted as propositions with a judge parameter
that figures in the interpretation of perspective expressions and predicates of personal taste,
in addition to a parameters for speaker, addressee etc.
$[\![[_{TP}$ *the pizza is tasty*$]]\!]^{s,a,\mathbf{j}} = \lambda$i[the pizza is tasty for **j**]

(50) JP that makes the judge parameter accessible for semantic operators:
$[\![[_{JP}\ [_{J'}\ J\ [_{TP}$ *the pizza is tasty*$]]]\!]^{s,a} = \lambda\mathbf{j}[[\![[_{TP}$ *the pizza is tasty*$]]\!]^{s,a,\mathbf{j}}]$
$= \boldsymbol{\lambda}\mathbf{j}\lambda$i[the pizza is tasty for **j** in i]

(51) JP can be modulated by subjective epistemic operators:
– epistemic particles (German *wohl*, Zimmermann 2004; English *perhaps*),
– epistemic adverbials (*certainly, likely, possibly*)
– epistemic modals in subjective reading (*may*)

3.4 Subjective vs. objective epistemic operators and judgements

(52) Lyons 1977: Subjective: Poss + it-is-so + Alfred is unmarried.
Alfred may be unmarried. Objective: I-say-so + Poss + Alfred is unmarried.

(53) Papafragou 2006: $[\![$*might* φ$]\!]^{con,i} = \forall x \in G_{con}\ \exists i' \in f_x(i)\ [\![\varphi]\!]^{con,i'}$
G_{con}: group of knowers whose knowledge is relevant; subjective: G_{con} = {speaker(con)},
G_{con} might be specified, e.g. *as reported by the weather forecast*
cf. also Kratzer 1981, Tancredi 2007, Portner 2009

(54) Wolf 2012, 2015: **expressive** (better: **judgmental**) vs. **descriptive** epistemic modality

(55) Epistemic adjectives vs. epistemic adverbials:
a. *It is likely that it will rain.* – objective
b. *It likely will rain*. – subjective

(56) Objective epistemics are at-issue:
a. S_1: *It is likely that it will rain.* – S_2: *I don't believe it.*
i) S_2 does not believe that it is likely that it will rain, picking up 'It is likely that it will rain'
ii) S_2 does not believe that it will rain, picking up embedded 'it will rain'
b. *It is not likely that it will rain. / It is unlikely that it will rain.*

(57) Subjective epistemics are not-at-issue (Murray 2010)
a. S_1: *It likely will rain.* – S_2: *I don't believe it.*
only (ii): S_2 does not believe that it will rain.
b. * *It not likely will rain.* / * *It unlikely will rain.*
c. S_1: *It likely will rain.*
S_2: *Yes.* S_2: *No.*
i) 'It will rain' i) 'It will not rain'
ii) 'It will likely rain'- confirming act ii) 'It is not likely that it will rain' – rejecting act
d. S_1: *It likely will rain.* – S_2: *I don't believe you.* challenges (i), hereby not accepting (ii)

(58) Objective epistemics occur in non-assertive environments, subjective epistemics don't:
*If it is likely that it will rain / If it will ??likely / *perhaps rain, we should take umbrellas.*

3.5 Implementation of subjective / objective epistemics

(59) Assume for concreteness a probability-theoretic approach to epistemics:
P(x, i, φ): the probability that x assigns at index i that φ is true at i

(60) Objective epistemics are proposition-internal, relating to the TP:
a. $[\![[_{TP}$ *it is likely that it will rain*$]]\!]^{s,a,j} = \lambda i[P(x, i, \lambda i'[$it will rain in i'$]) > 0.5]$,
x: a contextually salient authority, as unspecified: one with which the speaker aligns
b. *As reported by the the weather forecast, it is likely that it will rain.*
$\lambda i[P($report of the w.f. in i, i, $\lambda i'[$it will rain in i'$]) > 0.5]$,
speaker considers w.f. relevant, otherwise there is no add this to the common ground

(61) Subjective epistemics are proposition-external, relate to the judgement phrase, JP:
a. $[\![[_{JP}$ [J $[_{TP}$ *it will rain*$]]]\!]^{s,a}$ $= \lambda\mathbf{j}\lambda i[$it will rain in i$]$ bare JP
b. $[\![[_{JP}$ *likely* $[_{JP}$ [J $[_{TP}$ *it will rain*$]]]\!]^{s,a} = \lambda\mathbf{j}\lambda i[P(\mathbf{j}, i, \lambda i'[$it will rain in i'$]) > 0.5]$ epistemic adverbial
c. $[\![[_{JP}$ *perhaps* [J $[_{TP}$ *it will rain*$]]]\!]^{s,a} = \lambda\mathbf{j}\lambda i[P(\mathbf{j}, i, \lambda i'[$it will rain in i'$]) \neq 0]$ epistemic particle
d. $[\![[_{JP}$ [J *must* [J $[_{TP}$ *it rain*$]]]\!]^{s,a} = \lambda\mathbf{j}\lambda i[P(\mathbf{j}, i, \lambda i'[$it rains in i'$]) = 1]$ epistemic verb

(62) Anaphoric uptake:
a. S_1: (61)(a,b,c,d), S_2: *I (don't) believe it.* – S_2 does (not) believe that it rains (TP)
b. S_1: (61)(a,b,c,d), S_2: *I believe so, too.* – S_2 does aligns with S_1's JP
a. JPs are not propositions, type **st**, but functions from judgers to propositions, type **est**,
no anaphoric uptake for such functions by *it, that*.

(63) a. In $[_{ActP} \ldots [_{CommitP} \ldots [_{JP} \ldots [_{TP} \ldots]]]]$, only TP can relate to "factual" common ground
b. Anaphoric means to relate to judgements, acts: *That's right, I agree, Well said! ...*

(64) Not accessible to negation: **It not likely will rain, *It not perhaps will rain*
a. JPs cannot be negated, as they are not propositions, type **st**, but of type **est**.
b. Why: **It unlikely will rain* – as speaker wants to propose TP, P(s, i, $[\![$TP$]\!]$) must exclude 0

3.6 Judgement phrases in assertions and questions

(65) Alignment of Committer of CommitP and Judge of JP:
S_1: *It will likely rain.* – S_1 claims responsibility for truth of: S_1 thinks it is likely that it will rain.

(66) Committing to a judgement phrase without epistemic modifier:
$[\![[_{CommitP}$ *it* $[_{Commit'} \vdash$ *will* $[_{JP}$ $[_{TP}$ _ _ *rain*$]]]]]\!]^{s,a}$
$= \lambda\mathbf{s}$ [**s**$\vdash[\![[_{JP}$ $[_{TP}$ *it will rain*$]]]\!]^{s,a}(\mathbf{s})]$, $= \lambda\mathbf{s}$ [**s**$\vdash\lambda i[$it will rain in i$]]$

(67) Committing to a judgement phrase with subjective epistemic modifier:
$[\![[_{CommitP}$ *it* $[_{Commit'} \vdash$ *will* $[_{JP}$ *likely* [J $[_{TP}$ _ _ *rain*$]]]]]\!]^{s,a}$
$= \lambda\mathbf{s}$ [**s**$\vdash[\![[_{JP}$ *likely* $[_{TP}$ *it will rain*$]]]\!]^{s,a}(\mathbf{s})]$, $= \lambda\mathbf{s}$ [**s**$\vdash\lambda i[P(\mathbf{s}, i, \lambda i[$it will rain in i$]) > 0.5]]$

(68) Assertion of commitment phrase with a judgement phrase with epistemic modifier:
S₁, to S₂: ⟦[$_{ActP}$ *it* [. *will* [$_{CommitP}$ ⊢ [$_{JP}$ *likely* _ _ *rain*]]]]⟧^{s,a}
= λC {c∈C | √C + **S₁**⊢λi[P(**S₁**, i, λi[it will rain in i]) > 0.5)] ⊆ c}

(69) Additional specification of a commitment phrase operator (just for illustration)
S₁ to S₂: ⟦[$_{ActP}$ *it* [. *will* [$_{CommitP}$ *honestly* [⊢ [$_{JP}$ *likely* [$_{TP}$ _ _ *rain*]]]]]]⟧^{s,a}
= λC {c∈C | √C + **S₁** honestly responsible for: λi[P(**S₁**, i, λi[it will rain in i]) > 0.5] ⊆ c}

(70) Questioning a commitment phrase, shift of judge to addressee (interogativity flip, Faller 2002)
S₁, to **S₂**: ⟦[$_{ActP}$ [? *will* [$_{CommitP}$ *it* [⊢ [$_{JP}$ *likely* _ _ *rain*]]]]]⟧^{s,a}
= λC [{√C} ∪ {c∈C | √C + [**S₂**⊢λi[P(**S₂**, i, λi[it will rain in i]) > 0.5)] ⊆ c}]

(71) Subjective + objective epistemic operator o.k. not subjective + subjective
It is perhaps likely that it will rain, but * *It will perhaps likely rain*
S₁, to S₂: ⟦[$_{ActP}$ *it* [. *is* [$_{CommitP}$ ⊢ [$_{JP}$ *perhaps* [J [$_{TP}$ _ _ *likely that it will rain*]]]]]]⟧^{s,a}
= λC {c∈C | √C + **S₁**⊢λi[P(**S₁**, i, λi[P(**x**, i, λi[it will rain in i]) > 0.5)]) ≠ 0] ⊆ c}

3.7 Judgement phrases in propositional attitudes

(72) *John thinks that it likely will rain.*

(73) Embedded judgement phrase:
⟦[$_{JP}$ *it* [$_{J'}$ *likely* [$_{J'}$ J *will* [$_{TP}$ _ _ *rain*]]]]⟧^{s,a}
= **λj**λi[P(**j**, i, λi[it will rain in i]) > 0.5]

(74) Filling argument slot of propositional attitude predicate
⟦[$_{TP}$ *John thinks* [$_{CP}$ *that* [$_{JP}$ *it likely will rain*]]]⟧^{s,a,j}
= λi[think(i)(**john**)(⟦[$_{JP}$ *it likely will rain*]⟧^{s,a}(**john**)]
= λi[think(i)(**john**)(λi[P(**john**, i, λi[it will rain in i]) > 0.5)]
= λi[P(**john**, i, λi[it will rain in i]) > 0.5)
John has a thought that can be characterized as: he considers it > 0.5 likely that it will rain.

(75) a. *John thinks that perhaps it will rain.* subjective epistemic
b. #*John doubts that perhaps it will rain.* subjective epistemic
c. *John doubts that it is likely to rain.* objective epistemic

(76) **John doubts that perhaps it will rain.*
⟦*doubt that φ*⟧ = think (¬φ),
negation does not have scope over a JP, as negation is a propositional operator

(77) High negation in questions is possible:
Isn't this perhaps too simple?
Cf. Krifka 2015 for high negation in questions as applying to CommitP;
speaker tests whether addressee would refrain from committing to the unnegated proposition
= λC [{√C} ∪ {c∈C | √C + ¬[**S₂**⊢λi[this is too simple in i]] ⊆ c}]

3.8 Non-at-issuenesss

(78) Assumption here:
a. Regular semantic representation: ActP [CommitP [JP [TP]]]
b. In a non-embedded clause, only material in the TP can be at-issue
c. Material in JP, CommitP just helps to make TP-material become part of the common ground
i) CommitP: Declare responsibility
ii) JP: relate responsibility to judgement strength, thus lowering responsibility

(79) Differs from approaches that have the effect of JP / CommitP on a separate, "expressive" layer, e.g. Wolf 2014;
explains why #*It is raining (I think it is likely.*) is odd,
as it involves a full commitment to 'It is raining'

(80) Example with speaker attitude in JP vs. TP:

a. S_1: *It will likely rain.*
$[\![[_{ActP}$ *it* [⊢ *will* $[_{CommitP}$ [⊢ $[_{JP}$ *likely* $[_{JP}$ [J $[_{TP}$ _ _ *rain*]]]]]]]]$]\!]^{s,a}$
$= \lambda C[C + S_1 \vdash \lambda i[P(S_1\ i, \lambda i[\text{it will rain}]) > 0.5]]$
S_2: *I don't believe it.* (= that it will rain.)

b. S_1: *I think it is likely that it will rain.*
$[\![[_{ActP}$ *I* [J *think* $[_{CommitP}$ [⊢ $[_{JP}$ [J $[_{TP}$ _ _ *it is likely that it will rain*]]]]]]]$]\!]^{s,a}$
$= \lambda C[C + S_1 \vdash \lambda i[P(S_1, i, \lambda i[\text{it will rain}])]]$
S_2: *I don't believe it.* (i) that you think it is likely (ii) that it will rain.

3.9 Evaluation dimensions beyond Truth

(81) Dimensions: the True, the Good, the Beautiful; here we have a closer look at the Good.

(82) a. *Es regnet leider / gottseidank / (un)glücklicherweise.* subjective, not-at-issue
'Unfortunately / fortunately, it is raining.'
b. *Es ist schade / gut, dass es regnet.* objective, at-issue
'It is (un)fortunate that it is raining'

(83) Flip / shift with subjective goodness evaluations?
a. **Regnet es leider?* 'It is unfortunately raining?'
Ist es schade, dass es regnet? 'Is it unfortunate that it is raining?'
b. *#Peter glaubt, dass es leider regnet, aber ich finde es gut.*
'Peter thinks that it is unfortunately raining, but I like it.'
Peter glaubt, dass es schade ist, dass es regnet, aber ich finde es gut.
'Peter thinks that it is unfortunate that it is raining, but I like it.'
c. *#Peter findet, dass es leider regnet.*
Peter findet es schade, dass es regnet, aber ich finde es gut.
'Peter finds it unfortunate that it is raining, but I like it.'

(84) Subjective goodness always related to the speaker, modeled as expressive meaning:
a. $[\![[_{TP}$ *leider* $[_{TP}$ *es regnet*]]$]\!]^{s,a,j}$
$= \lambda i$[it is raining in i], expressive: $\lambda i'$[s considers λi[it is raining in i] unfortunate in i']
b. $[\![[_{TP}$ *es ist schade, dass es regnet*]$]\!]$
$= \lambda i'$[x considers λi[it is raining in i] unfortunate in i'], expressive: –
c. $[\![[_{TP}$ *ich finde es schade, dass es regnet*]$]\!]^{s,a,j}$
$= \lambda i'$[s considers λi[it is raining in i] unfortunate in i']: expressive: –

(85) Interactions of the True with the Good:
a. *Es regnet wahrscheinlich leider.* 'it will probably rain, the raining is unfortunate'
b. *Es regnet leider wahrscheinlich.* 'it will probably rain, it is unfortunate that it will rain'

4. Evidentials and judgements

(86) Evidentials often difficult to tease apart from epistemics,
do not express the confidence of a judger that a proposition is true,
but rather the source of the judgement (de Haan 2000, Hacquard 2011),
e.g. a person, a rumor, a sensory channel

(87) Here I propose no separate projection for evidentials,
but that they specify the judge parameter of a judge phrase;
consequence: evidentials are always not-at-issue, as judge phrases are not-at-issue

4.1 Non-reportative Evidentials: Sensory, Inferential

(88) Non-reportative evidentials specify the nature of the judge relation,
e.g. sensory channel: hearing, source of knowledge: inferential

(89) Example: **auditory evidentials**, e.g. Koasati (Kimball 1991)
fápli-yá:li-hawa-t
be.windy-ABILITY-AUDIT-PAST
'one could hear the wind occasionally'

(90) $[\![[_{JP}$ AUDITORY [J $[_{TP}$ *it is raining*$]]]]\!] = \lambda\mathbf{j}\lambda i[\text{hear}_i(\mathbf{j}, [\![[\textit{it is raining}]]\!]^{s,a,\mathbf{j}})]$,
where $\text{hear}_i(j, \varphi)$: in i, person j has auditory evidence for the truth of φ

(91) Example: **inferential evidentials** e.g. German *wohl*
es regnet wohl
'presumably it is raining'

(92) Doherty 1979: presenting a hypothesis,
Zimmermann 2004: expressing a conjecture ("Vermutung") by speaker or addressee,

(93) $[\![[_{JP}$ INFER [J $[_{TP}$ *it is raining*$]]]]\!] = \lambda\mathbf{j}\lambda i[\text{infer}_i(\mathbf{j}, [\![[\textit{it is raining}]]\!]^{s,a,\mathbf{j}})]$,
where $\text{infer}_i(j, \varphi)$; in i, person j has inferential evidence for the truth of φ

(94) Assertion of non-reportative evidentials serve to reduce the blame if proposition is false, as sensory evidence / inferential evidence is not always to be trusted.

(95) Meaning contribution of *wohl* is not-at-issue (Zimmermann 2004):
S_1: *Es regnet wohl.*
S_2: *Das glaube ich nicht.* 'I don't believe it', i.e. S_1 strictly believes that it is not raining.

(96) Interrogative flip, as j is specified as addressee in questions: *Regnet es wohl?*

4.2 Reportative Evidentials

(97) Reportative evidentials shift the evidence holder

(98) Example hearsay evidential; cf. Schenner 2008. *Es soll regnen.* 'Reportedly, it will rain'

(99) Not-at-issue meaning contribution:
– S_2: *Das glaube ich nicht.* 'I do not believe that', i.e. that it will rain.
– ??*Wenn es regnen soll, dann müssen wir einen Schirm mitnehmen.*

(100) $[\![[_{JP}$ *es* [*soll* $[_{TP}$ _ *regnen*$]]]]\!]^{s,a} = \lambda j\lambda i\exists\mathbf{x}[\mathbf{x}\vdash_i$'it will rain'], i.e. some x claims that it will rain.

(101) $[\![[_{CommitP}$ *es* [⊢ $[_{JP}$ _ [*soll* $[_{TP}$ _ *regnen*$]]]]]\!]^{s,a} = s\vdash\lambda i\exists\mathbf{x}[\mathbf{x}\vdash_i$'it will rain'],
i.e. speaker s is responsible for the proposition that some x claims that it will rain

(102) S_1: *Laut Wetterbericht wird es regnen*. 'According to the weather forecast it will be raining.'

Possibly at-issue meaning contribution:
a. S_2: *Das glaube ich nicht.* i) 'I do not believe that it will rain' (preferred)
ii) 'I do not believe that the weather forecast predicted so'
b. *Wenn es laut Wetterbericht regnet, müssen wir einen Schirm mitnehmen*.
c. *Laut Wetterbericht regnet es nicht.* i) According to the w.r., it will not rain.
ii) ??*It is not the case that according to the w.r. it will rain*.

(103) Possibly interpretable in TP or JP?
a. $[\![[_{TP}$ *laut WB* [*wird es regnen*$]]]\!]^{s,a,j} = \lambda i[$weather-report $\vdash_i$ 'it will rain']
b. $[\![[_{JP}$ *laut WB* [J *wird* $[_{TP}$ *es regnen* _$]]]]\!] = \lambda j\lambda i[\lambda i[$weather-report $\vdash_i$ 'it will rain']]

(104) Asserting reportative evidential helps to introduce proposition when source is trusted, while the speaker can shift responsibility to the indicated source,

(105) Similar use with embedded clauses, especially with root clause syntax in German:
*Der Wetterbericht sagt (*nicht), es wird regnen.* (Simons 2007; Krifka 2014 for proxy speech acts)

5. Discourse epistemics

5.1 German *mögen / mag*

(106) literal meaning: 'to want, to like', cognate with *may,* historically 'be able to', cf. *vermögen*

(107) *Das mag in der Theorie stimmen, taugt aber nicht für die Praxis.*
'(granted that) this may hold in theory, but is not useful for practical purposes'

(108) Objective epistemic modal? Probably not.
a. S_1: *Das mag in der Theorie stimmen.*
S_2: *I don't believe it.*
'I do not believe that it holds in theory', rather than 'I do not believe that it can hold in theory'
b. **Wenn das in der Theorie stimmen mag, dann muss die Theorie schlecht sein.*
'If this may hold in theory, the theory must be bad.'

(109) Subjective epistemic modal?
Not really, as it cannot serve to introduce a proposition into discourse.
S_1: *Wir mögen die Atmosphäre durch SO_2-Injektionen abkühlen können, aber...*
'We may be able to cool down the atmosphere with SO_2 injections, but...'
S_2: *#Du willst wirklich behaupten, dass wir mit SO_2-Injektionen die Erde abkühlen können?*
'You really want to claim that we can cool down the atmosphere with SO_2 injections?

(110) What is rather going on:
Speaker grants a proposition to the addressee without claiming it,
cf. Cohen & Krifka 2014 for *John drank at most 3 martinis*.

5.2 Implementation of discourse epistemics

(111) Idea: *mag* φ guarantees that φ in at least one continuation of input commitment space C,
cf. interpretation of modals in dynamic semantics as checks of input states, Veltman 1996.

(112) $C + [\![mag\ \varphi]\!] = C$, iff $\exists c \in C[\varphi \in c]$, else undefined; C may become accommodated accordingly
i.e. $[\![mag\ \varphi]\!] = \lambda C.\ \exists c \in C[\varphi \in c]\ [C]$ (i.e. λC[C] restricted to those C where $\exists c \in C[\varphi \in c]$

(113) Syntactic implementation:
$[\![[_{ActP}\ das\ [\ .\ [_{CommitP}\ [\ mag\ [_{JP}\ J\ [_{TP}\ \_\ in\ der\ Theorie\ stimmen]]]]]]\!]^{s,a}$
$= \lambda C\ .\ \exists c \in C[[\![[_{JP}\ J\ [_{TP}\ das\ in\ der\ Theorie\ stimmt]]]\!]^{s,a}(s/a)\ [C]$

(114) Not possible in propositional attitude verbs, as they do not embed CommitP:
**Peter weiß, dass es regnen <u>mag</u>*. vs. *Peter weiß, dass es regnen <u>soll / kann</u>*.
Peter knows that it rain MAG Peter knows that it rain REPORT / POSS

(115) Other discourse epistemics? E.g., future:
Dieses Tier dort – das wird ein Esel sein.
'that animal over there – this will (turn out to) be a donkey'
in all inertia developments of the common ground, φ will turn up in a commitment state c

(116) Combination with other modal operators:
a. Epistemic modal (objective, subjective?)
Es mag regnen können, aber wir machen auf jeden Fall einen Spaziergang.
it MAG rain POSS
'Granted that it might rain, but in any case, we go on a walk.'
b. Evidential, possibly with shift to addressee?
Es mag wohl regnen, aber wir machen auf jeden Fall einen Spaziergang.
'Granted that you have evidence that it is raining, but...'

(117) *Es mag vielleicht möglich sein, dass dein Vorschlag semantisch plausibel ist,*
| | |
discourse subjective objective

er hat aber leider viele syntaktische Fragen unbeantwortet gelassen.

'Granted that it is perhaps possible that your proposal is semantically plausible, but it unfortunately left many syntactic issues unanswered.'

6. References

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