‘But it was only fantasy’: Epistemic contrast in a multimodal DRT

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Abstract

This paper aims to provide a novel dynamic semantic specification for the cross-linguistically common category *epistemic contrast* (EC), which has most frequently been called ‘denial of expectation’ in the literature on contrastive markers. On the basis of data from the English *but,* it argues that an EC-clause deems the epistemic context of a judgmental content *counterfactual* by introducing information that is incompatible with it. It thus suggests that counterfactuality is the essential ingredient of EC, and that implication or modality are not. This specification offers a solution to the *problem of contradiction* in EC without resorting to nonmonotonic logic. The analyses are cast in a multimodal dynamic semantic framework, tentatively called *mmDRT*.

Keywords: Contrast, denial, contradiction, counterfactuality, discourse.

1. Introduction

Apparently, all languages possess contrastive markers —connectives or discourse markers that introduce contents that oppose some previously given or contextually available information. A cross-linguistically common contrastive sense is what has most often been called 'denial of expectation'. Here is an example with the English marker *but*, from Lakoff (1971):

(1) John is tall, *but* he is no good at basketball.

According to the widely adopted descriptive analysis, a *but*-clause denies a possible inference (or 'expectation') afforded by the first conjunct and the background context. In (1), for instance, the first conjunct raises the expectation that 'John is (probably) good at basketball', which is denied by the second conjunct.

It has been convincingly argued that *but* and other 'denial of expectation' markers do not necessarily target contents that are 'expected' from any perspective (e.g., Iten, 2000, p. 215). Therefore, this paper uses the label *epistemic contrast* (*EC*) to refer to this sense. An *EC utterance,* i.e., one that conveys this sense, is schematically represented as S_1 *but* S_2, where S_1 and S_2 are the first and second segments of the contrastive relation, S_2 being the one which performs a denial.

Since the two segments of an EC utterance communicate two incompatible contents, a *problem of contradiction* arises, which is especially apparent in monological uses of EC. A common remedy is to use nonmonotonic logic, which renders the implication from S_1 a 'defeasible' one, which is then canceled or removed by S_2 (e.g., Lagerwerf, 1998; Jayez, 2003; Kruijff-Korbayová & Webber, 2007; Asher, 2013; Spenader & Maier, 2009; Robaldo & Miltsakaki, 2014). Another solution is to 'suspend' the implication from S_1, holding it from being added to the discourse or common ground (e.g., Koenig & Benndorf, 1998 for the German *aber*; Iten, 2000 for *although*; Hall, 2004 for *but* and *although*). A third solution is to take the content from S_1 as a 'weak implication' that holds in some possible world(s) other than the actual one (Francez, 1991/1995; Meyer & van der Hoek, 1991/1996; Winter & Rimon, 1994; Toosarvandani, 2014). Finally, some of the accounts based on 'contextual alternatives' let both the implication from S_1 and its denial hold 'simultaneously', allowing inconsistency in an epistemic context (Umbach, 2005; Olmos & Ahern, 2009).

This article analyzes data from various (monological, dialogical, connective, sentence initial, and discourse initial) uses of *but* with a focus on the problem of contradiction. While the analyses mainly concern examples of usage of *but* from the previous literature and from the British National Corpus (BNC) Online[1], they arguably apply to any contrastive marker that includes EC in its conventional semantic range[2].

The following, counterfactuality-based dynamic semantic specification for EC is proposed:

> *An EC-clause denies a judgmental content by retrospectively deeming its epistemic context counterfactual with respect to the current one.*

It is argued that CF is an essential element of the conventional meaning of EC markers, and that implication and modality are only ingredients that often interact with it.

The paper also proposes a *judgmental logic* which does not require the use of nonmonotonic logic or other mechanisms of defeasibility in the analysis of EC.

Section 2 briefly mentions cross-linguistically common contrastive senses other than EC, in connection with the issue of polysemy vs. monosemy. It then reviews previous solutions proposed for the problem of contradiction in EC, and comments on their problems and costs. Section 3 exposes the analytic framework: It sketches a multimodal extension to DRT, tentatively called *mmDRT,* which takes temporal, epistemic and volitional values as necessary components of utterance meaning. Section 4 pursues an empirical inquiry, focusing on instances of EC that are largely ignored or

[1] Examples of usage have been extracted from BNCweb (CQP-Edition), at http://bncweb.lancs.ac.uk/, which is part of the British National Corpus Online service. The service is managed by Oxford University Computing Services on behalf of the BNC Consortium. All rights in the texts cited are reserved.

[2] I will refer to markers that are conventionally associated with the EC sense as *EC markers*, whether or not they are also associated with other senses or have specific syntactic or pragmatic restrictions. An EC marker can be a connective that joins clauses or sub-clausal constituents, a discourse marker with sentence- or discourse-initial uses, or can function both ways (see e.g., Fraser, 2009).

underestimated in previous studies, such as cases where the relevant content from S_1 is directly expressed rather than being contextually implied. Section 5 proposes a dynamic semantic specification for EC, and analyzes some utterances into mmDRT representations. Section 6 compares the current proposal to previous logical specifications and states the conclusions.

2. A survey of the previous specifications for EC

2.1 EC and other contrastive senses

The seminal work of Lakoff (1971) on English coordinate conjunctions identifies the two contrastive uses of the English *but* as 'denial of expectation' and 'semantic opposition'. The example (1) above illustrates the former, which is labeled here as Epistemic Contrast (EC). Lakoff argues that 'semantic opposition' differs from 'denial of expectation' in that it merely contrasts two semantic contents, without denying an implication from the first conjunct:[3]

(2) Susan is tall *but* Mary is short. (Blakemore, 1989)

But can also convey 'correction'. In this use, S_2 replaces a negated constituent of S_1 with 'correct' information:

(3) John is not American *but* British. (Izutsu, 2008)

Whether or not *but* can express 'semantic opposition' *without* an element of 'denial of expectation' is controversial, since opposition contexts can afford abductive implications from S_1 that are denied by S_2 (e.g., Lang, 1984; Foolen, 1991; Winter & Rimon, 1994). There are also controversies on whether the different uses of *but* should be taken as related but distinct senses (polysemy) or as contextual variations of a single sense (monosemy). Monosemist accounts provide representational economy, yet generally do not afford the cross-linguistic and diachronic explanations provided by polysemist accounts (e.g., Bybee, Perkins & Pagliuca, 1994; Haspelmath, 2003; van der Auwera & Temürcü, 2006). The current treatment, in attempting to characterize a cross-linguistically common notional category, is compatible with the polysemist view[4], but it does not invalidate monosemist accounts that attempt to derive all or some of the uses of a contrastive marker from a general specification.[5] Yet, the possibility of assigning a general or central meaning to a marker is not taken to mean that an adequate specification for a certain sense or use should also apply to related senses or uses.

2.2 Main types and uses of EC

In Lakoff's (1971) example given in (1) above, S_2 *directly* denies a content afforded by S_1. Such uses of EC, dubbed 'direct contrast' in Winter & Rimon (1994), will similarly be identified here as involving *direct denial*. It is also known that S_2 can deny a content from S_1 via a contextual implication, in what Winter & Rimon call 'indirect contrast', as in their following example:

(4) It's raining, *but* I'm going to take an umbrella. (Winter & Rimon, 1994)

Here S_1 affords the implication that 'the speaker will get wet', and S_2 indirectly denies it by implying its opposite. Such uses will be identified as involving *indirect denial* in this paper.

What is referred to as EC here has been assigned different labels in the literature. Lakoff's 'denial of expectation' is adopted by Blakemore (1987, 2002), Lagerwerf (1998), Rouchota (1990), and Iten (2000), among others. Other labels include 'concession' (Mann & Thompson, 1988; Izutsu, 2008; Robaldo & Miltsakaki, 2014), 'violated expectation' (Kehler 2002), 'oppositive' (Jayez & Rossari, 1999; Jayez, 2003), 'adversative' (Foolen, 1991; Lang, 2000; Mauri & van der Auwera, 2012; Gülzow et al., 2015) and 'counterexpectation' (Toosarvandani, 2014). EC is also often treated under the general label

[3] This use is sometimes simply labeled as 'contrast', e.g., in Blakemore (1989) and Izutsu (2008).

[4] The polysemist approach is supported by the observation that many languages express 'denial of expectation' (labeled as EC here), 'opposition' and 'correction' in distinctive ways (e.g., Foolen, 1991; Crevels, 2000; Malchukov, 2004; Izutsu, 2008; Mauri & van der Auwera, 2012; Cuenca et al., 2019).

[5] Monosemist treatments of *but* include Blakemore (1989), Hall (2004), Fraser (2009), and Toosarvandani (2014) for 'denial of expectation', 'opposition' and 'correction' uses, and Busquets (2007) and Spenader & Maier (2009) for 'denial of expectation' and 'opposition' uses.

'contrast' (Francez, 1991/1995; Winter & Rimon, 1994; Meyer & van der Hoek, 1996; Koenig & Benndorf, 1998; Umbach, 2004, 2005; Spenader & Maier, 2008; Olmos & Ahern, 2009). EC with indirect denial, as illustrated in (4) above, is sometimes treated distinctively as 'concession' or 'concessive opposition' (Lagerwerf, 1998; Kruijff-Korbayová & Webber, 2007; Busquets, 2007). The term 'concessive' is also sometimes reserved for *although*-type contrastive markers (e.g., König, 1986; Crevels, 2000).

While EC is generally illustrated with connectives that join two clauses in a sentence, as in (1) and (4), the following examples with *but* show other possibilities for S_1 and S_2. In (5), both S_1 and S_2 are sub-clausal constituents. (6), (7), and (8) illustrate *but* as a discourse marker. In (6), S_1 consists of just one sentence, while in (7), it spans across two sentences. In (8), S_1 and S_2 belong to different interlocutors, in what is called here the *dialogical use* of EC. In (9), S_1 is syntactically null, thus its content is only deictically determined by the immediate communicative context:

(5) Mary is [S_1: not stupid] *but* [S_2: ugly.] (Izutsu, 2008)

(6) [S_1: She may end up testifying about that.] *But* [S_2: what are your thoughts?] (Seah, 2014)

(7) [S_1: Chairman John McFall asked what they would call an "excessive" interest rate. Most said 20 to 25 per cent]. *But* [S_2: Mr Barrett, 59, who earned £1.7 million last year, refused to say.] (Bednarek, 2006)

(8) A. [S_1: The Smiths will be coming over tonight.]

B. *But* [S_2: John is in Paris.] (Zeevat, 2012)

(9) (Peter puts some salmon on Mary's plate)

Mary: *But* [S_2: I'm allergic to fish.] (Rouchota, 1998)

In addition to these variations, one or both conjuncts of an EC marker can be in a non-assertive mood. Below are examples from Winter & Rimon (1994). In (10) both segments are in the imperative mood, and in (11), S_2 is in the interrogative mood:

(10) [S_1: Take a chair] *but* [S_2: don't sit.]

(11) [S_1: John is here] *but* [S_2: why isn't Bill here too?]

The specification proposed in this paper is intended to cover direct and indirect denial uses of *but*, its uses as a connective or a discourse-marker, and with assertive and non-assertive segments.

2.3 The common descriptive specification

The following descriptive specification is almost consensual, especially for the monological (connective) uses of EC:

(12) S_2 counteracts a contextual implication from S_1.

This contextual implication is variously referred to as an 'expectation', an 'available assumption', or a 'potential inference'. The effect of S_2 is variously specified as 'denying', 'canceling', 'eliminating', 'retracting', 'suspending', or just 'contextually contrasting' the implicit content from S_1. Specifications compatible with (12) can be found in Lakoff (1971), Spenader & Maier (2009, p. 1712), Winter & Rimon (1994), Renkema (2009, p. 78), Blakemore (1989, p. 34), Hall (2004, p. 235), Bell (1998, p. 533), Toosarvandani (2014, p. 50), Robaldo & Miltsakaki (2014, p. 4), Iten (2000, p. 228), Izutsu (2008, p. 661), Umbach (2005, p. 224), Kruijff-Korbayová & Webber (2007, pp. 152-153), and Olmos & Ahern (2009, p. 53), among others.

2.4 The problem of contradiction and the previous proposals

As often noted, the explicit contents of S_1 and S_2 cannot contradict in the monological uses of EC:

(13) # John is short *but* he is not short.

(14) # John is short *but* he is tall.

(15) John is an eye doctor. # *But* he is not an oculist.

In the standard analysis of EC as entailing a simple conjunction, e.g., as hinted in Frege (1879, p. 63) and elaborated in Grice (1961, pp. 126-32), the unacceptability of such sentences is due to a contradiction in the form of $p \wedge \neg p$. The following sentences will similarly be analyzed as entailing the formulas $\Diamond p \wedge \neg p$ and $\Box p \wedge \neg p$ respectively, both of which are contradictory in natural language as in the standard systems of modal logic:

(16) # John may be short *but* he is not short.

(17) # My wallet must be in the room *but* it is not.

This local conjunction account implies that there should be a problem of contradiction in typical EC utterances too, where the denied content is only implied by S_1. Naming the propositional content of S_1 as p, that of S_2 as q, and the relevant contextual implication from S_1 as r, such utterances will entail:

(18) $(p \wedge q) \wedge (p \rightarrow \{mod\}r \wedge (q \rightarrow \neg r))$

where *{mod}* stands for an optional epistemic modality operator ($\Diamond$ —possibility or $\Box$ —necessity). This general formula will hold regardless of whether one takes the second main conjunct as a simple entailment, a conventional implication, or a presupposition. And it will entail, by Simplification and Modus Ponens:

(19) $\{mod\}r \wedge \neg r$

When there is no modal operator, $r \wedge \neg r$ is a straightforward contradiction. So are $\Diamond r \wedge \neg r$ and $\Box r \wedge \neg r$ in standard systems of modal logic, as well as in natural language, as evinced by (16) and (17) above.

The conundrum can then be stated as follows: Since the explicit contents of S_1 and S_2 in an EC utterance cannot contradict each other, their implications should not contradict either. Then how can S_2 deny an implication from S_1 without giving rise to unacceptability? This is simply called *the problem of contradiction* in this paper.

The following sections provide a review of the previous logical specifications of EC, with a focus on the proposed solutions to the problem of contradiction.

2.4.1 Pioneering works in EC

Grice (1961, pp. 127-132) famously argued that an utterance in the form *p but q* is truth-conditionally equivalent to $p \wedge q$, and identified the sense of contrast as a 'conventional implicature' of *but*. Later logical specifications for contrast mostly followed Grice in taking a contrastive sentence as entailing $p \wedge q$ in its 'asserted', 'truth-conditional' or 'at-issue' meaning. Disagreements have generally been about the nature of the implication from S_1 and of the contrastive relation itself, i.e., whether these are expressed as presuppositions, conventional implicatures, or as part of multiple entailed propositions.

Other early works on contrast mainly aimed at describing the different senses or uses of contrastive markers. As mentioned in Section 2.1, Lakoff (1971) identified 'denial of expectation' as a main type of contrast expressed by *but*. Halliday & Hasan (1976) analyzed *but* as marking an 'adversative' relation that indicates a conflict between ideas. In Anscombre & Ducrot's (1977) analysis of *p mais q* in French, (i) *p* is an argument for a proposition (*r*), (ii) *q* is an argument for its negation ($\neg r$), and (iii) *q* is argumentatively superior to *p*. Dascal & Katriel (1977) analyzed *aval*-clauses in Hebrew as 'canceling' a relevant content from S_1 by placing it in a distinct layer of utterance meaning. In her Relevance Theoretic treatment, Blakemore (1987, 1989) characterized the 'denial of expectation' utterances with *but* as assisting the hearer's inferential processes, by indicating that the evidence presented by S_2 is relevant for the 'denial' of an assumption that is manifest in the context.

Among the above-cited studies, Anscombre & Ducrot's (1977) proposal includes an argumentation-based solution to the problem of contradiction, which has inspired later, more formal treatments, including Winter & Rimon (1994), Koenig & Benndorf (1998), Jayez (2003), Spenader & Maier (2009), and Toosarvandani (2014).

2.4.2 Nonmonotonic implications

The treatments of EC that address the problem of contradiction by using nonmonotonic logic include Lagerwerf (1998), Jayez (2003), Kruijff & Korbajova (2007), Spenader & Maier (2009), Asher (2013), and Robaldo & Miltsakaki (2014).

Lagerwerf (1998) analyzes the Dutch *hoewel/maar* and the English *although/but* as presupposing default general implicative relations in the background. These relations, together with the content of S_1, give rise to 'defeasible implications'. For example, in (20) below, 'Greta Garbo is married' is an implication from the explicit content of S_1 and the background implicational assumption that 'normally, if a woman is called the yardstick of beauty, she is married.':

(20) *Hoewel* [S_1: Greta Garbo de maatstaf werd genoemd van schoonheid,] [S_2: is zij nooit getrouwd geweest.] (Lagerwerf 1998)

Although Greta Garbo was called the yardstick of beauty, she never married.

Lagerwerf argues that these background implicational relations are nonmonotonic. They have the form $p' > q'$, where p' and q' are general propositions, and > is Asher & Morreau's (1991) defeasible implication operator. Since the specific implication from S_1 derives from such a background implication, it is also defeasible. S_2 can then cancel this implication to rule out a contradiction.

Jayez (2003), in his analysis of *pourtant* and *mais* in French, states that "the speaker has no means to resolve the contradiction, as long as she does not revise old information and/or add new information." Jayez implements his solution in a framework that allows defeasible implications from 'belief bases', which can contain inconsistent beliefs.

Kruijff-Korbayová & Webber (2007) focus on the English 'concession' markers such as *although*, *however*, and *nevertheless*. They formulate their logical specifications for both the 'denial of expectation' and 'concessive opposition' interpretations on the basis of Grote et al.'s (1995) nonmonotonic implicational scheme.

Spenader & Maier's (2009) account based on the Layered Discourse Representation Theory (LDRT) (Geurts & Maier, 2003, 2013) describes the discourse function of contrast as "retracting potential implications that the context might suggest but which are not intended by the speaker." Contrast differs from other types of denial in targeting defeasible, 'weak' entailments that reside at the 'inferential layer' of the common ground. The *but*-clause triggers a nonmonotonic 'downdate' operation, which removes "as many DRS conditions and discourse markers from the background as needed to restore consistency with the new material."

In Asher's (2013) account too, the Contrast relation involves "defeasibly contradictory" contents "in the sense that they defeasibly imply, in context, contradictory propositions." Such defeasible implications (or D-inferences) result from the nonmonotonic 'weak conditional' operator > defined in Asher & Morreau (1991).

Robaldo & Miltsakaki (2014) provide a logical specification for the RST category 'Concession', as expressed by English contrastive markers, building on Hobbs's (1998) formalism, which includes 'reified' entities such as sets, times, and eventualities. They too propose a solution based on nonmonotonic default reasoning in the derivation of the relevant implication from S_1.

2.4.3 Suspension of an implication

Iten (2000) preserves the Relevance Theoretic account for *but*, as 'contradicting and eliminating an assumption' (Blakemore, 1987, 1989; Rouchota, 1990), yet argues that it can deny not only 'manifest' assumptions but any assumption that is accessible in the context. She proposes a different procedural meaning for *although*: An utterance in the form *Q although P* signals an instruction to "suspend an inference from what follows (P) which would result in an unresolvable contradiction" (Iten 2000, p. 215). A contradiction does not arise because the implication from *P* is not even processed. Hall (2004) seems to generalize Iten's (2000) account for *although* to *but*, arguing that it "targets the inferential process itself, rather than any identifiable conclusion of this inference."

A similar account is presented in the neo-Gricean dynamic semantic account of Koenig & Benndorf (1998). In a contrastive statement of the form *p aber q* in German, *p* entails, together with the common ground, a proposition α; and *q* entails, again together with the common ground, $\neg\alpha$. There will be no contradiction in the common ground after the processing of an *aber*-clause, since "aside

from p and q, only $\neg\alpha$ is added to the context", and "α belongs to the working sheets of the computation of the meaning of the utterance, but does not affect the new common ground created by the utterance" (Koenig & Benndorf, 1998, p. 372).

2.4.4 Implications in non-actual possible worlds

Accounts of contrast based on possible world semantics generally take the problem of contradiction seriously and propose various solutions. These include Francez's (1995) and Meyer & van der Hoek's (1996) contrastive logics[6] as well as Winter & Rimon's (1994) and Toosarvandani's (2014) specifications of contrast.

Francez's (1991/1995) 'contrastive logic' and Meyer & van der Hoek's (1991/1996) 'modal contrastive logic' associate contrast with 'unexpectedness' or 'surprise'. Francez proposes a 'bilogic' with two distinct structures of interpretation: φ *but* ψ is interpreted on a pair of structures $<A,S>$, where A stands for the 'actual' and S for a 'standard' world. $(\varphi \wedge \psi)$ holds in A, whereas $(\varphi \rightarrow \neg\psi)$ holds in S. Francez thinks that this dual structure is necessary because "attempting to interpret both aspects in one structure, by letting, for example, φ *but* $\psi =_{\text{def}} (\varphi \wedge \psi) \wedge (\varphi \rightarrow \neg\psi)$ leads to an immediate contradiction." (p. 726)

Meyer & van der Hoek (1991/1996) propose a similar analysis, but in an extended version of the modal logic S5 rather than in a bilogic. φ *but* ψ amounts to $L(\varphi \supset P\neg\psi) \wedge A(\varphi \wedge \psi)$, where L is the necessity operator, $\supset$ is the implication operator, A is the actual world, and P is a set of expected words, which may exclude the actual one. The first conjunct marks a strict implication: φ implies $\neg\psi$ as an expectation in all the ontologically conceivable possible worlds.

Both versions of contrastive logic share the conviction that a sentence in the form of ϕ *but* ψ conveys that ϕ holds both in the actual world and the expected world(s), and that ψ holds only in the actual world and not in the expected one(s). The implication from the first conjunct, $\neg\psi$, can remain in the non-actual world(s) without causing contradiction with ψ in the actual world. As Meyer & van der Hoek (1996, p. 310) explain, "results of expectations still retain their informative value and are not overridden by the actual information (...) otherwise the meaning of the contrastive sentence $p \wedge q$ *but* $\neg q$ (...) would exactly be the same as that of the non-contrastive sentence $p \wedge \neg q$, quod non, obviously."

According to Winter & Rimon (1994), in a contrastive utterance, a "proposition r establishes contrast between two (ordered) propositions p and q iff $\Diamond(p \rightarrow \neg r) \wedge (q \rightarrow r)$" as a presupposition." The implication of $\neg r$ by S_1 is a 'weak' one, close to 'default implications' involved in conditionals like "normally, if ... then ..." (p. 375). Since the possibility operator ($\Diamond$) picks a non-actual world, the conjunction $\Diamond(p \rightarrow \neg r) \wedge (q \rightarrow r)$ does not yield a contradiction. The weak implication of $\neg r$ is 'canceled' by the strong implication of r, ensuring the 'argumentative superiority' of S_2. Winter and Rimon (1994) also cast their analysis into Contrastive Data Logic that they develop after Veltman's (1986) Data Logic: The implication from S_1, $\Diamond(p \rightarrow \neg r)$, is evaluated relative to an 'information state' s, and the one from S_2, $(q \rightarrow r)$, relative to a state s', which grows from s with the addition of the second conjunct (q).

Toosarvandani (2014) proposes a monosemist specification for *but*. Like Winter & Rimon (1994), he argues that in the 'counterexpectational' use of *but,* the implication from S_1 must be weak relative to the one from S_2, because "[i]f both implications were of equal strength, every *but* sentence would be a contradiction." Yet, similar to Meyer & van der Hoek, he takes the modal force of the implication from S_1 as not possibility but necessity: The presupposition of φ *but* ψ is the conjunction $(\varphi \rightarrow \sigma) \wedge (\psi \rightarrow \neg\sigma)$, where the implications entail epistemic necessity in accordance with Kratzer's (1981, 1986, 1991) semantics for indicative conditionals. Although both implications are relative to a 'realistic modal base', the 'ordering source' in the former one is 'stereotypical', so that its domain of quantification includes all and only the most normal or expected worlds, and excludes the actual world. In indirect denial, the implication from S_2 is also weak yet stronger than that from S_1, hence S_2 retains its relative argumentative superiority.

[6] Francez's paper first appeared in 1991 as a technical report. Meyer & van der Hoek's paper is also based on a version that first appeared in 1991.

2.4.5 Contrasting contents as contextual alternatives

Some studies of contrast grant a central role to salient information in the conversational context, formalizing it in terms of alternative answers to contextual questions (e.g., Roberts, 1996; Ginzburg, 1996) or alternative propositions that yield information-structural contrast (e.g., Rooth, 1992; Beaver & Clark, 2008).

Lagerwerf (1998) draws attention to the role of contextual questions in identifying the denied content in expressions of 'Concession' ('indirect denial' as labeled here). Kruijff-Korbayová & Webber (2001, 2007) show that 'concession' (covering both direct and indirect denial) is sensitive to information structure distinctions that they formalize in terms of 'alternative sets'. Jayez (2003) allows alternative premise sets in the specification of 'opposition' his dynamic semantic framework. Spenader & Maier's (2009) treatment of contrast holds that a contextually salient question in discourse ('the issue') "reduces the possible implications to a reasonable set of similar world-knowledge based inferences." (p. 1713) As mentioned in the previous section, these treatments adopt nonmonotonic logic to prevent a contradiction. Toosarvandani's (2014) possible worlds account also incorporates a 'questions under discussion' (QUD) mechanism that guides the implications from S_1 and S_2.

Two other accounts based on contextual alternatives, Umbach (2004, 2005) and Olmos & Ahern (2009), seem to allow incompatible sets of premises and conclusions in one single information state, differing only in their information-structural value. Umbach (2004) provides a focus-based treatment for *but,* identifying it as an "anti-additive" connector: "first, an alternative is added to those under discussion and, secondly, this alternative results in a false proposition when combined with the background, therefore requiring negation". Umbach (2005) develops her previous account of contrast, this time excluding the 'correction' use of *but*: A contrastive utterance evokes an Expected Alternative (EA) provided by the second conjunct and a Sister Alternative (SA) provided by the first conjunct. A sentence in the form C_1 *but* C_2 (i) asserts a "conjunction of the ordinary meanings" of C_1 and C_2, (ii) presupposes that EA and SA "constitute the set of alternatives under discussion", and (iii) entails that only the SA follows from the background context of C_1, which excludes EA. Critically, the SA is not removed or canceled from the overall informational state: "the *but*-sentence induces a quaestio suggesting that the alternatives under discussion hold simultaneously." (Umbach 2005, p. 217).

Olmos & Ahern (2009) argue that the Spanish *aunque* and *pero* and their English counterparts *although* and *but* signal the possibility of deriving alternative implications from "what was said before". Sentences with these markers simultaneously refer to both 'P+not-Q' and 'P+Q' , where P is the content from the first, and Q, from the second clause. This dual reference also triggers the hearer's inferences as to higher-level explicatures about the propositional attitudes of the speaker.

2.5 Summary, problems and prospects

Most descriptive accounts of EC, while providing valuable insights as to the nature of EC, do not explicitly deal with the problem of contradiction. Those that propose remedies to this problem can be categorized into the following four groups:

1. Accounts that prevent a contradiction by removing a defeasible implication derived by nonmonotonic logic (Lagerwerf, 1998; Jayez, 2003; Kruijff & Korbajova, 2007; Spenader & Maier, 2009; Asher, 2013; Robaldo & Miltsakaki, 2014),
2. Accounts that suspend an implication before any contradiction arises (Iten, 2000 for *although*; Hall, 2004 for *although* and *but*; Koenig & Benndorf, 1998 for the German *aber*),
3. Accounts that take the implication from S_1 as a one that holds in some non-actual possible world(s) or context(s) of evaluation (Francez, 1991/1995; Meyer & van der Hoek, 1991/1996; Winter & Rimon, 1994; Toosarvandani, 2014),
4. Accounts that allow the contradictory contents to coexist as contextual alternatives in one informational state (Umbach, 2014, 2015; Olmos & Ahern, 2009).

Some problems and challenges faced by these approaches are presented below.

2.5.1 Problems with nonmonotonic reasoning accounts

Accounts based on nonmonotonic logic take the denial performed by an EC utterance as an instance of belief revision or update. Yet, while belief revision is useful in a hearer-oriented specification of meaning, it does not characteristically identify EC or other types of denial. As emphasized in dynamic

semantics, every utterance comes with a context-change potential. Moreover, a belief or judgment does not have to be derived by a nonmonotonic implicational process in order to be defeasible: Everything we know, assume, or guess is subject to revision, to second W. V. O. Quine. People augment, change, or drop their beliefs due to sensory experience, linguistic interaction, or rational consistency. Hence, especially in a speaker-oriented conception of meaning as adopted here, a revision or update cannot be part of the meaning of an utterance; it can only be a possible consequential (perlocutionary) effect of any kind of utterance on any kind of cognitive content.

Of course, the implicational/inferential aspects of meaning involve some degree of indefiniteness due to their implicit nature. They can hence be 'canceled' by subsequent utterances. Yet this is a general characteristic of pragmatically conveyed meaning (see Section 3.2), which is not specific to markers of contrast or denial.

A specific challenge for the assumption that EC, or denial in general, 'removes' a content from a shared epistemic context is that the targeted content and its implications remain accessible for later referencing. For example, in (21) below, both A and B can plausibly continue with a sentence like "if he was, he would have told me.":

(21) A. I think John is sick.

B. No/But he isn't.

Another challenge for nonmonotonic accounts is particularly apparent in monological uses of EC. In such accounts, the cancellation of an implication is triggered by the need for logical consistency. But the question of how contradictory implications are afforded by a certain knowledge state in the first place, especially in monological discourse, remains a puzzle. It is of course possible that the speaker changes her mind in the midst of her utterance, for instance, due to some immediate evidence or remembrance (see the examples in Section 4.3.4), but this is obviously an exceptional case in communication. This paper adheres to the natural assumption that a language user (or a cognitive agent in general) strives to remain consistent in her beliefs. This will be referred to here as the *principle of rational consistency*.

Last but not least, nonmonotonic logic is very costly. As explained by Asher (2013), who is one of the leading proponents of nonmonotonic reasoning, it proliferates logical consequence mechanisms and enormously complicates the formal apparatus. The principle of parsimony —Occam's Razor— will recommend the avoidance of nonmonotonic logic in the presence of empirically adequate monotonic alternatives.

2.5.2 Problems with suspension-based accounts

Solutions based on suspending implications from S_1 share the following challenge with nonmonotonic accounts: How does a certain epistemic context afford contradictory contents without violating the principle of rational consistency? Also, even if a speaker really intends to refrain the addressee from adding an available implication to the shared informational context, how can she really achieve this? In fact, as illustrated in (21) above, interlocutors can continue to refer to the implication from S_1 of an EC utterance, which must have been hidden from view if suspension was true.

2.5.3 Problems with accounts based on contextual alternatives

Accounts of EC based on contextual alternatives provide pragmatic mechanisms (such as alternative propositions or QUD) that go beyond general Gricean pragmatics in explaining the convergence of the speaker's implications and the hearer's inferences. Those that do not use nonmonotonic cancellation mechanisms, namely Umbach (2004, 2005) and Olmos & Ahern (2009), allow both the relevant content from S_1 and its negation to hold simultaneously in one information structure. Yet again, this assumption, if not qualified with mechanisms that prevent contradiction, undermines the principle of rational consistency. In modeling EC, different contexts of evaluation, such as alternative ordering sources or contextual shifts, seem necessary for integrating both the content from S_1 and its negation by S_2.

2.5.4 Problems with possible worlds accounts

To my knowledge, Francez (1991/1995) was the first to propose a non-actual context of evaluation for the implication from S_1. Yet, his account does not state how exactly the 'standard' world relates to the 'actual' one, and does not even yield the empirically required asymmetry of contrast: S_1 *but* S_2 comes to be equivalent to S_2 *but* S_1.

Other possible worlds accounts revised in Section 2.4.4 yield a semantic asymmetry for S_1 *but* S_2. In Meyer & van der Hoek (1991/1996), the entailment or implication from S_2 stems from what is known in the actual world, while the implication from S_1 is a 'default' implication from the background. In other words, the implication from S_1 holds only in the expected worlds, which exclude the actual one. In a similar vein, Winter & Rimon (1994) argue that the implication from S_1 holds in a non-actual possible world. And in Toosarvandani's (2014) solution, the stereotypical ordering source presupposed by the implicit necessity operator in S_1 excludes the actual world. In short, the explanations of Meyer & van der Hoek, Winter & Rimon, and Toosarvandani all hinge on the assumption that the conjunction entailed by an EC utterance does not yield a contradiction because the content implied by S_1 does not hold in the actual world.

A potential challenge for these accounts is that in natural language, *nec/pos p but not p* yields a contradiction, as illustrated in (16) and (17) above.[7] Restricting the antecedent of the implication from S_1 to exclude the actual world, or simply locating this implication in a non-actual possible world *can* make *nec/pos p but not p* consistent. Yet, such actual-world-excluding possibilities or necessities can only be communicated *when a contextual shift is overtly signaled*, as with the underlined elements below:

(22) Sue thinks that John must be here. *But* he is not.

(23) John is expected to be in his office on mondays. *But* today he is not.

(24) John could/must have been here. *But* he is not.

Furthermore, a necessary, possible, expected, or normal state of affairs *can* also hold in the actual world:

(25) It is necessary/possible/expected/normal that John is here. And indeed, he is.

The first sentences in (22) and (23) can similarly be continued with an affirmation of their propositional content, yet a subsequent denial of this content *will* create a contradiction. It is only after a counterfactual sentence like (24) that such an affirmation will not be allowed, and a simple denial *will not* create a contradiction.

In general, then, the lack of contradiction in an EC utterance cannot be explained just by assuming that the denied content from S_1 holds only in a non-actual world or worlds, whether these are expected, stereotypical, or arbitrarily possible worlds. In other words, the exclusion of the actual world from the world(s) of evaluation of the implicational relation is not a sufficient condition. Only when this/these world(s) are not compatible with, hence *counterfactual* relative to the current one, that a contradiction does not arise. Winter & Rimon's (1994) following example, for instance, is similar to (24) above in that the concessive clause includes counterfactual marking:

(26) The coin wasn't in the drawer even though it could have been there.

Also, even though the relevant content from S_1 describes a normal or stereotypical world in typical instances of EC, this is not necessary. The epistemic context of evaluation referred to in (22), i.e., Sue's knowledge state, does not have to be a normal or stereotypical one. In the corpus example in (27) below, it is a content from S_1, rather than one from S_2, which is deemed 'surprising'. In the constructed example in (28) too, S_1 describes an atypical (actually, counterfactual) world where the sun rises from the west:

(27) Surprisingly, some people think it is possible to score simply by sweeping the opponent, *but* this is not the case.

---

[7] Winter & Rimon (1994) give the example below to show that *pos p* and *not p* can be contrasted in natural language. Yet, what is at stake here is not epistemic modality but an inherent or circumstantial possibility that belongs to the content level.

> It is possible for us to swim; nevertheless, we don't. (Winter & Rimon, 1994)

(28) If the earth revolved in the opposite direction, the sun would rise from the west, *but* this is impossible.

In the typical uses of EC where the denied content is a contextual implication too, we have no reason to stipulate that it is a default implication from normal or stereotypical worlds. In the toy example below, the relevant implication (that 'the speaker and his friends do not need to eat to live') resides in an unusual (actually, again, counterfactual) world inhabited by zombies:

(29) Zombies don't have to eat to live, *but* we have to.

Finally, possible worlds accounts of EC all assume that the denied content in an EC utterance is a contextual implication from S_1. Yet, as the examples (8), (22), (24), and (26-28) above have already shown, this content can also be overtly expressed. Section 4.3 provides many other examples of such direct expression in S_1.

2.5.5 Prospects for a new dynamic semantic specification for EC

The discussion in the previous section already hints at a counterfactuality-based account for EC. Section 4 will provide further empirical evidence for a general specification for EC in terms of the *denial of a content by deeming its epistemic context counterfactual (*Section 5).

As stated in the summary in Section 2.3, not only possible worlds accounts, but most of the previous specifications for EC focus on cases where S_2 denies a contextual implication from S_1. Many also do not apply to all the different uses of EC, including its dialogical and discourse-initial uses, and uses with non-assertive segments. The next section describes the analytic framework in which a general specification of EC will be couched. This framework recognizes multiple levels in the meanings of utterances and of discourse, equips possible worlds semantics with dynamic context shifts, and sketches a judgmental logic that affords implications from both assertive and non-assertive clauses.

3. The analytic framework

This section outlines *mmDRT*, a tentative multimodal extension to DRT. I hope that this somehow lengthy elaboration will be tolerated, in consideration of Winter & Rimon's (1994, p. 376) remark that "in order to be more useful, a formalization of a theory for phenomena as complex as contrast and implication should start by spelling out the restrictions on a formal system that is to be used as a model for the linguistic facts." Accordingly, the aim here is to depict a metalanguage expressive enough to consistently capture the complex semantic and pragmatic phenomena centrally related to EC. References to related work are given as much as possible, in order to facilitate the reader's potential comparisons with other frameworks.

Full formal specifications for the syntax and interpretation of mmDRT, compositional algorithms for translating natural language sentences into mmDRT, and procedures for Merge and Update will not be attempted here. Also, presuppositional and projective aspects of meaning will often be ignored for simplicity.

3.1 Utterance meaning, discourse structure and common ground

Dynamic semantics takes utterance meaning as an instruction to change a larger information structure, which is assumed to be jointly entertained by the interlocutors. This is called a *discourse representation structure* (DRS) in Discourse Representation Theory (DRT) (e.g., Kamp & Reyle, 1993; Kamp et al., 2010). Many dynamic semantic frameworks also refer to the *common ground* (CG), which includes further background information that the speaker assumes is shared by the interlocutors (e.g., Stalnaker, 1978, 2002; Clark, 1996).

Work in dynamic semantics generally conceives meaning from the perspective of the hearer or interpreter. Yet, speakers must also possess representations of the discourse to be able to make meaningful contributions to it. Hence, a DRS can also reflect the speaker's assumptions regarding the shared information in the discourse. The current framework takes such a speaker-oriented approach to

meaning[8]: Utterance meaning is equated with the speaker's meaning, in a Gricean spirit, as covering what the speaker intends to bring into the current discourse, via conventional strategies and/or implicatures.

3.2 Types of expression

The current framework distinguishes *direct* and *indirect expression* within utterance meaning. Direct expression covers both *overt expression* by conventional strategies and context-independent *entailments*. Indirect expression includes aspects of the speaker's meaning that go beyond the conventional meaning and depend on the specificities of the cognitive and communicative context.[9]

This distinction also applies to the type of meaning traditionally classified as 'implicature.' The term *pragmatic implicature* is used in this paper for any type of *implicit* meaning *intended* by the speaker on the basis of Gricean maxims of communication or equivalent mechanisms of relevance. Grice's (1975) 'conversational implicatures' are paradigmatic instances of pragmatic implicature. The term implicature has also been applied to some conventionally signaled, hence semantic aspects of utterance meaning, already by Grice himself in characterizing 'conventional implicatures'.[10]

The term *contextual implication* is used here to cover whatever an utterance can imply together with its context. Pragmatic implicatures defined above are *intended* contextual implications. Contextual implications that are not communicatively intended but still afforded by utterances are called *potential implications* here.

Contextual implications can be underdetermined for hearers (including us, analyzers) due to their implicit nature. As such, they can be 'canceled' by subsequent utterances of the speaker. Still, they are not equated here with the 'defeasible implications' of nonmonotonic logic. In the judgmental logic developed here, contextual implications differ from other types of implication only in communicative aspects (see Section 3.7).

3.3 Types of reference

Three main types of reference are distinguished here as *new addition, deictic reference* and *anaphoric reference*, in conformity with the commonly acknowledged literature on the referential properties of noun phrases (e.g., Lyons, 1979; Asher, 2001; Recanati, 2011, among others). New addition comprises novel information that the speaker adds to the discourse from her general cognitive context. Deictic (or indexical) reference points to objects or relations that are available in the immediate communicative situation. Finally, anaphoric reference targets entities or conditions that already exist (or are purported to exist) in the DRS. These distinctions are applied not only to nominal reference, but also to reference to higher-order discourse objects, such as propositions and judgments.

The term *presupposition* is used in the literature in divergent ways, and is sometimes used interchangeably with 'conventional implicature' (as exposed, for instance, in Potts, 2015). This paper simply adopts the analysis of presupposition as anaphora (e.g., van der Sandt, 1992; Geurts, 1999): presuppositional expressions are those that refer to conditions that already exist (or are purported to exist) in the DRS.

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[8] Kecskes (2013) observes that, in studies on linguistic pragmatics, the "questions of what the speaker really means, what his commitment is, how s/he signals her/his real intention, etc. have been given less attention."

[9] This 'direct' vs. 'indirect' distinction in meaning basically corresponds to Bach's distinction between 'semantic' vs. 'pragmatic' information: "Whereas semantic information is encoded in what is uttered, pragmatic information is generated by, or at least made relevant by, the act of uttering it." (Bach 2001, p. 22)

[10] In Grice and in many accounts that follow, S1 *but* S2 is analyzed as 'asserting' $p \wedge q$ and 'conventionally implicating' that there is a contrastive relation between p and q. Conventional implicature is taken to be distinct from both the 'truth conditional' and the 'asserted' content, yet is still linked to semantic conventions. Potts (2004, 2015) provides an analysis of conventional implicature which places it under semantic, rather than pragmatic phenomena. In the current framework, conventional implicatures are analyzed in terms of *entailments of multiple conditions*, akin to the 'multiple propositions' account suggested by Bach (1999), Sullivan (2013) and others.

3.4 mmDRT: A multimodal extension to DRT

This section depicts a multimodal extension to DRT, tentatively called *mmDRT* here. mmDRT distinguishes the *temporal*, *epistemic*, *volitional* and *actional* domains in the meanings of utterances and of the discourse, and proposes the following typology of discourse entities:

- Entities in the temporal domain are *times* (of type *t*).
- Entities in the epistemic domain are *thoughts* (of type *h*).
- Entities in the volitional domain are *projections* (of type *r*).
- Entities in the actional domain are *illocutions* (of type *i*).

The following contents are defined for each type of entity:[11]

- *States-of-affairs* (*s*) are contents of times (*t*). Their logical form is *P(e, x)* or *R(e, x, y, …)*, where *e* is an eventuality and *x*, *y*, … are general entities.
- *Propositions* (*p*) are contents of thoughts (*h*). They express temporarily qualified states-of-affairs. Their logical form is *T(s)*.
- *Judgments* (*j*) are contents of projections (*r*). They express epistemically qualified propositions. Their logical form is *E(T(s))*.
- *Attitudes* (*a*) are contents of illocutions (*i*). They express volitionally qualified judgments. Their logical form is *V(E(T(s)))*.

The temporal, epistemic, and volitional domains are each coupled with *centers*, which correspond to 'reference states' in discourse. These centers are, by default, identified with the speaker's 'now', her immediate knowledge state, and her immediate volitional state, respectively. They are then called *deictic centers*.[12] These centers can also be *shifted* to other, non-immediate temporal, epistemic, or volitional states, as elaborated in Section 3.5.

The semantic form of an illocution, *V(E(T(s)))*, defines a hierarchical structure for utterance meaning, where *T*, *E* and *V* are taken as the *modal values* of a multimodal logic. These modal values reflect the positions of times, thoughts, and projections relative to the centers. The entities in each domain are structured as Kripke frames ordered by an accessibility relation of precedence (<)[13]. This ordering relative to the centers yields the *categories of anchoring* listed in Table 1 below. In addition to the basic relations of *actuality* (<), *immediacy* (=) and *potentiality* (>), ≤ and ≥ denote dual reference (*actual-immediate* and *potential-immediate*, respectively), ≈ is a shortcut for a *quantificational* relation, and * denotes *genericity*, all with respect to the current centers:

	Temporal (T)	Epistemic (E)	Volitional (V)
<	ANTERIOR	CERTAIN	ACCEPTED
≤	PERFECT	INFERRED	ASSERTED
=	SIMULTANEOUS	IMMEDIATE INFORMATION	IMMEDIATE INTENTION
≥	PROSPECTIVE	CONJECTURED	WANTED

[11] Similar considerations regarding connections among beliefs and intentions can be found in Kamp's (1990) and Kamp et al.'s (2010) treatments of propositional attitudes. The current classification of abstract entities has precursors like Lyons' (1977, pp. 442-447) 'minimal ontological assumptions', Hobb's (1998) 'reified entities', Asher's (1993) 'typology of abstract objects', and Temürcü's (2007, 2011) semantic space for tense, aspect and mood markers.

[12] In terms of possible world semantics, times, thoughts, and projections are 'worlds' of different types, and the deictic centers correspond to the 'worlds of evaluation' in the respective domains.

[13] When it is necessary to refer to ranges or intervals rather than singular entities, these frames will be conceived as van Benthem's (1991) 'interval structures', where singular entities are taken as point-like intervals. Capital letters will be used for ranges, and the subinterval relation will be represented by the double subset operator ⋐. For example, *t1* ⋐ *T1* will mean that the time point denoted by *t1* is included in the range denoted by *T1*.

>	POSTERIOR	HYPOTHETICAL	ENVISIONED
≈	RECURRENT	PROBABLE	ASSERTABLE
*	ATEMPORAL	GENERAL INFORMATION	GENERAL STATEMENT

Table 1. *Categories of anchoring.*

The categories of anchoring that are most relevant for this paper are elaborated in what follows and in Section 3.6.

In accordance with the main tenets of the Speech Act Theory (e.g., Austin, 1962; Searle, 1965, 1975), a full utterance is taken as conveying the intention of the speaker to perform a certain illocutionary act. This *illocutionary intention* is captured by the volitional anchoring category IMMEDIATE INTENTION. Assertive utterances are analyzed as entailing ASSERTED, which combines an explicit ACCEPTED content with an implicit IMMEDIATE INTENTION (e.g., that of stating, claiming, insisting, etc.). Directive (or, prescriptive) utterances are analyzed as entailing WANTED, which combines an explicit ENVISIONED content again with an implicit IMMEDIATE INTENTION (e.g., that of issuing an order, making a request, expressing a wish, promising, etc.). Questions are analyzed as requests for information, hence also as expressing WANTED. Finally, expressives and declarations (as defined in Searle, 1975, pp. 356-361) are analyzed as directly expressing an IMMEDIATE INTENTION.

This framework allows one to semantically analyze every utterance as expressing one category from each domain of anchoring, even when these are tacitly entailed. For example, all prescriptive (or, directive) utterances are analyzed as involving a HYPOTHETICAL value in the epistemic domain. Below are mappings of some English sentences onto the categories of anchoring:

(30) John took a train at five.

≤(<(<(take(john, train)))) (V: ASSERTED, E: CERTAIN, T: ANTERIOR)

(31) John may be here.

≤(≈(=(here(john)))) (V: ASSERTED, E: PROBABLE, T: SIMULTANEOUS)

(32) Take a train.

≥(>(≥(take(2^{sg}, train)))) (V: WANTED, E: HYPOTHETICAL, T: PROSPECTIVE)

The state-of-affair (*s*) that resides at the content level, for example the one represented as 'take(john, train)' in (30), is referred to as the *profiled content* of the utterance, as in Langacker's (1987, 2008) Grounding Theory[14].

The categories listed in Table 1 only reflect general specifications for anchoring relations. More specific distinctions can be indicated between slashes, as follows:

(33) ≤(<(</five/(take(john, train)))), for (30)

≤(≈/◇/(=(here(john)))) or simply ≤(◇(=(here(john)))), for (31), where ◇ denotes epistemic possibility.

Anchoring relations themselves can also be profiled. A predicate that denotes an anchoring relation takes as a complement a higher-order discourse object. For example, an epistemic predicate like *be possible* takes a proposition in the form *T(s)*, a volitional predicate like *want* takes a judgment in the form *E(T(s))*, and an illocutionary predicate like *ask* takes an attitude in the form *V(E(T(s)))* as a complement:

(34) It is possible that John is here.

≤(<(=(possible(=(here(John))))))

(35) Jack may have wanted to take a train.

[14] Anchoring relations can be seen to correspond to the semantic ingredients of 'grounding predications', which "indicate the relationship of a designated entity to the ground or situation of speech, including the speech event itself, its participants, and their respective spheres of knowledge." (Brisard, 2002, p. xi)

≤(◇(<(want(Jack, >(≥(take(Jack, train)))))))

(36) Jack will ask Mary to take a train.

≤(< (>(ask(Jack, Mary, >(>(≥(take(Mary, train))))))))

More explicit specifications for anchoring relations are given in DRT's box notation: Profiled states-of-affairs (*s*) are represented as *content-level conditions*, propositions (*p*) as *temporal conditions*, judgments (*j*) as *epistemic conditions*, and attitudes (*a*) as *volitional conditions*. The respective contexts correspond to *times*, *thoughts*, *projections*, and the *discourse* (*d*) itself. The meaning of an utterance, which is an illocution of type *i*, is accordingly conceived as an *mmDRS* intended to contribute to the contents of the discourse (*d*).

The general schemes for the meanings of a discourse (*d*) and of an utterance (*i*) are given in Figure 1 below. Each sub-DRS and each condition are named and represented as discourse referents, as in SDRT (Lascarides & Asher, 1993) and PDRT (Venhuizen et al., 2013; Venhuizen, 2015). The center (reference state) in each domain is marked with a downarrow operator, which is borrowed from hybrid logic (e.g., Blackburn, 2000). The immediate (deictic) centers are conceived as 'contextual parameters' in the way of Kaplan (1989) and indexed with a zero (t_0, h_0, and r_0):

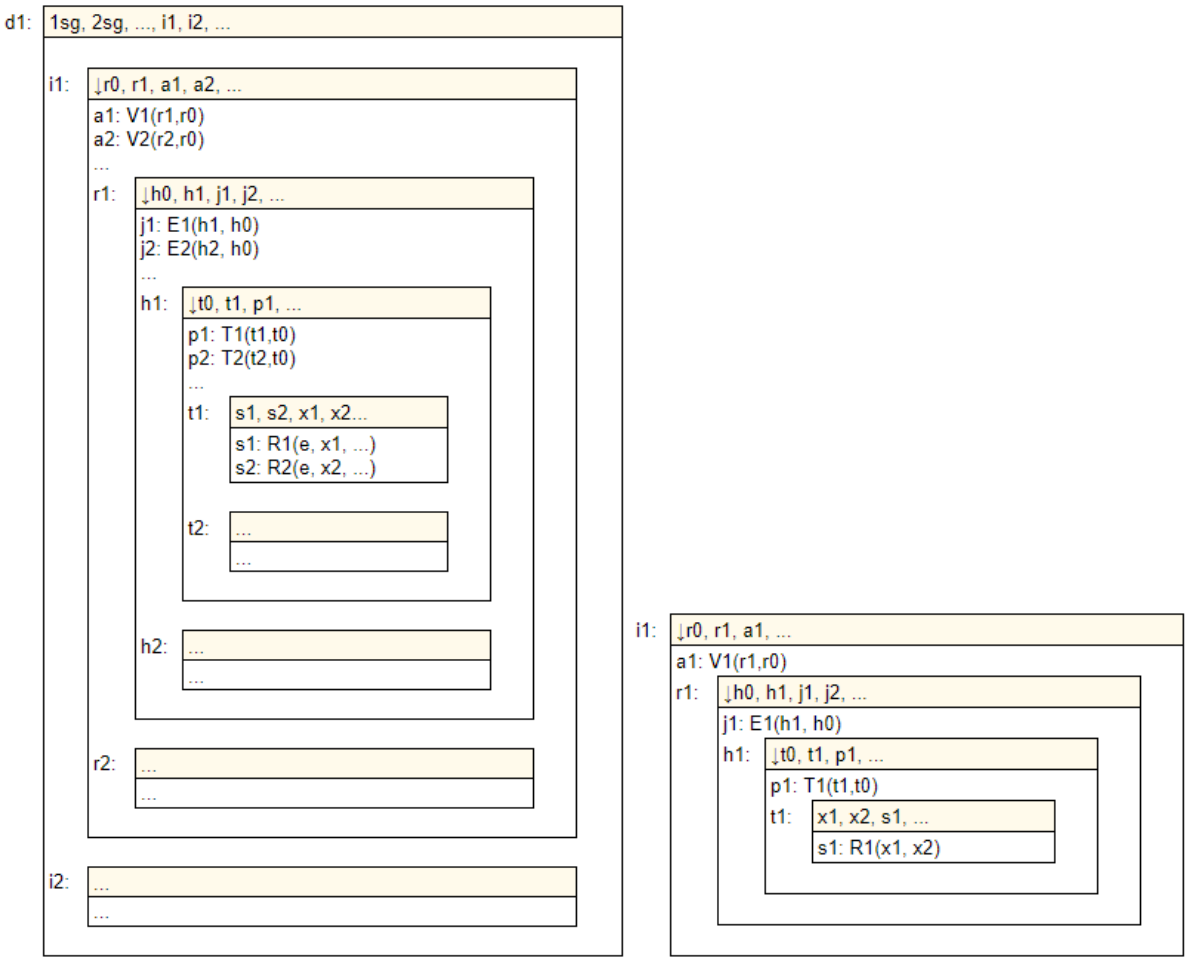
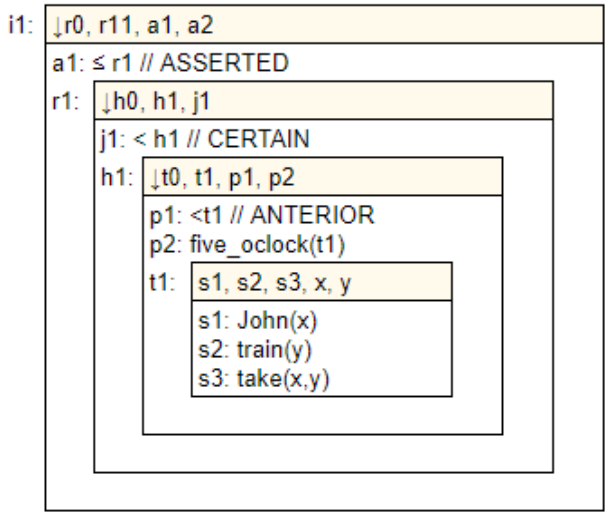


Figure 1: Semantic structures for discourses (*d*) and simple utterances (*i*) in the box notation.

Below is a multimodal DRS for an English sentence. A relation *R* of a higher-order entity *x* to a center is simply represented as 'Rx' rather than explicitly as 'R(x, x_0)' or 'x$R x_0$'. For instance, '>t1' in a temporal context is short for 't1 > t_0':

(37) John took a train at five.



3.5 More on center shifts

Since Reichenbach (1947), it has been widely acknowledged that the temporal value of an utterance depends on two contextually determined time points: the deictically fixed 'utterance time' and the discursively set 'reference time'. The reference time can coincide with the utterance time, but it can also be shifted to coincide with past or future time points. This mechanism, variously taken as 'deictic shift', 'perspectival shift', or 'displacement', also provides a foundation for anaphoric treatments of tense (Kamp & Rohrer, 1983; Partee, 1984; Weber, 1988; de Mulder & Vetters, 2002; Smith, 2003; Kamp et al., 2010, pp. 198-208). Roberts (1989) provides a similar treatment of modality in an extended DRT framework (see also Stone & Hardt, 1999; Geurts, 1999, 2019 for comparable treatments).

mmDRT applies this idea of variable reference states to all three of the temporal, epistemic, and volitional domains. As already introduced above, the *time of utterance* (t_0), the speaker's *immediate knowledge state* (h_0), and the speaker's *immediate volitional state* (r_0) serve as *deictic centers* in the three domains of anchoring. These centers can be discursively shifted to other, non-immediate times, epistemic states (thoughts), or volitional states (projections). The idea is that speakers do not always relativize semantic contents (states-of-affairs, propositions, judgments, or attitudes) to the reference states in the communicative contexts; they can explicitly or implicitly take other perspectives.

References to non-deictic, shifted centers are *anaphoric*. In the minimal narrative below, the temporal center is shifted to a past time, and the past form 'had' anaphorically refers to that time point. The anaphoric component, '</five/', is indicated by a subscript in the semantic representation:

(38) At five, John came home.

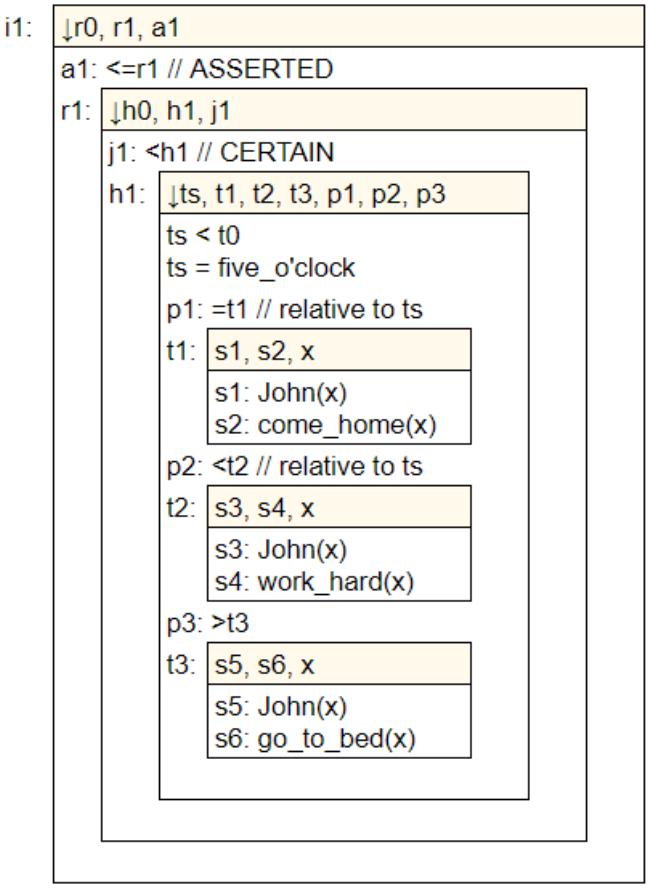
$$\leq(<(<_{</\text{five}/}(=(\text{here}(\text{john})))))$$

Such linear, single-sentence representations are inadequate in capturing temporal anaphoric dependencies across multiple sentences, e.g., when (38) is followed by other sentences, as in (39) below. The pluperfect from *had worked* indicates that the event of 'John's working hard' precedes a temporal center (reference time) in the past, which is anaphorically determined by the time of 'John's coming home'.

(39) At five, John came home. He had worked hard. He went to bed early.

The box below shows the mmDRS for this mini discourse. The temporal center shift is handled in the spirit of Kamp & Rohrer (1983), Kamp & Reyle (1993, chapter 5), and Kamp et al. (2010, Section 3.5). The downarrow binder (↓), borrowed from hybrid logic (e.g., Blackburn, 2000), marks a temporal center shift to t_s, which is indicated to be a past (ANTERIOR) time by the first two conditions in h_1. The

condition p_2 indicates that the time of 'John's working hard' (t_2) precedes t_s, and p_3 indicates that the time of 'John's going to bed' (t_3) follows t_s:[15]



Conditional sentences are analyzed similarly, as inducing an epistemic center shift to a hypothetical or counterfactual thought (to be expanded in Section 3.11).

3.6 Epistemic categories and epistemic modality

Thoughts[16], i.e., states or 'worlds' in an epistemic frame, are structured as ordered frames (e.g., Stalnaker, 1968; Lewis, 1973). They are construed here as sets of arbitrarily many singular propositions as elements. It is assumed that any singular proposition p_s can hold only in one single thought within a given frame:

(40) if $p_s \in h_1$ and $p_s \in h_2$, then $h_1 = h_2$.

Among the epistemic anchoring categories listed in Table 1, only four are of central import for the analyses in this paper: CERTAIN (<), HYPOTHETICAL (>), IMMEDIATE INFORMATION (=) and PROBABLE (≈). Below are the satisfaction definitions for these values[17]. For a singular proposition p_s and thoughts h_r and h_1:

(41)

a. $=(p_s)$ is satisfied in h_r iff $p_s \in h_r$.

[15] The identity of *x*'s (the referent of the proper name *John*) in the three temporal contexts is deliberately ignored here. This can be captured by a presupposition projection to a higher-level DRS, as in Venhuizen's (2015) PDRT, but this would unnecessarily complicate the analyses with regard to the aims of this paper.

[16] The term *though* is not strictly intended as a subjective-mentalistic term, it only names a type of abstract object that is useful in modeling semantic phenomena.

[17] The epistemic model sketched here is rooted in possible world semantics, yet is importantly different from the standard models used in the semantic analysis of modality and conditionals (e.g., Lewis, 1981; Kratzer, 1991; von Fintel & Gillies, 2007, etc). Here I will not expand on these differences and their implications due to space limitations.

b. $<(p_s)$ is satisfied in h_r iff $\exists h_1$ such that $h_1 < h_r$ and $p_s \in h_1$.

c. $>(p_s)$ is satisfied in h_r iff $\exists h_1$ such that $h_r < h_1$ and $p_s \in h_1$.

PROBABLE (≈) corresponds to the traditional category of epistemic modality, comprising possibility ($\Diamond$) and necessity ($\Box$). For a proposition *p* and thoughts h_r and h_1:

(42) Weak modality

a. $\Diamond(p)$ is satisfied in h_r iff $\exists h_1$ such that $h_r < h_1$ and $=(p)$ is satisfied at h_1

b. $\Box(p)$ is satisfied in h_r iff $\forall h_1$, $h_r < h_1$ and either $=(p)$ or $<(p)$ is satisfied at h_1.[18]

In modeling the knowledge state of a cognitive agent, the issue of which propositions will be included in which thoughts, which will also determine the actual order of the frame, will depend on the contingencies of the agent and the adopted degrees of reduction and abstraction.[19]

Epistemic necessity markers such as the English *necessarily* or *must* are known to typically express weaker commitment than personal certainty (e.g., Kratzer, 1991, p. 645). The above definitions yield this result by restricting the domain of quantification to HYPOTHETICAL thoughts.[20] They define *weak modality* in the sense that they express the estimations of a speaker from the perspective of her current, contingent knowledge state. A speaker can also signal *strong modality*, i.e., quantification over all the thoughts in a certain epistemic frame:

(43) Strong modality

a. $\blacklozenge(p)$ is satisfied in h_r iff $\exists h_1$ in the epistemic frame such that $=(p)$ is satisfied at h_1.

b. $\blacksquare(p)$ is satisfied in h_r iff $\forall h_1$ in the epistemic frame, either $=(p)$ or $<(p)$ is satisfied at h_1.[21]

Below is an mmDRT representation for a sentence with weak epistemic modality:

(44) John may take a train tomorrow.

[18] This actually amounts to saying that p holds at the thought that immediately follows h_r —the closest world that follows h_r. An alternative definition would be:

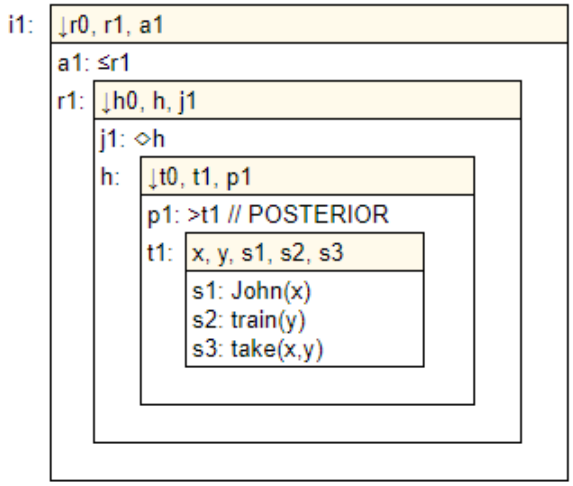
$\Box(p)$ is satisfied in h_r iff $p \in h_1$ such that $h_1 \triangleright h_r$

where $\triangleright$ stands for the 'immediately follows' relation. More accurate formulations may require the use of branching possibilities, but the simpler ordered frames depicted here should suffice for the current purposes.

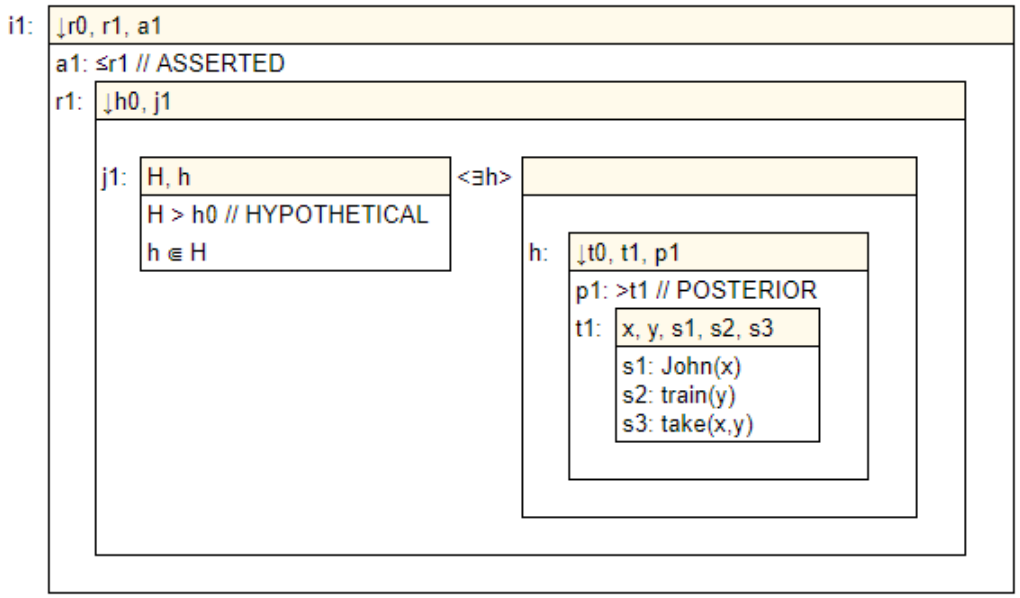
[19] Problems as to whether there is a limit to the range of hypothetical thoughts under consideration, how the hypothetical worlds are populated, and cross-world identities among contents have been extensively discussed in the possible worlds semantics literature. This paper will not elaborate on these points due to space limitations.

[20] A full comparison with Kratzer's treatment of modality is not possible here, yet it can be seen that the temporal, epistemic, volitional domains define 'modal bases' in Kratzerian terms, and Kratzer's 'ordering source' is captured by center shifts.

[21] This definition entails that the proposition holds at the leftmost or root thought (world), hence is CERTAIN in all of the following ones.



or in an expanded analysis:



I will often single out judgments within illocutions and use simpler linear representations:

j_1: ◇(>(take(John, train)))

3.7 Logical implication and its pragmatic variants

Logical implication taken as a relation of consequence among judgments and represented with a regular arrow (→). It can be overtly expressed in English by connectives or discourse markers, including *therefore*, *so*, *then*, *since, because*, etc.:

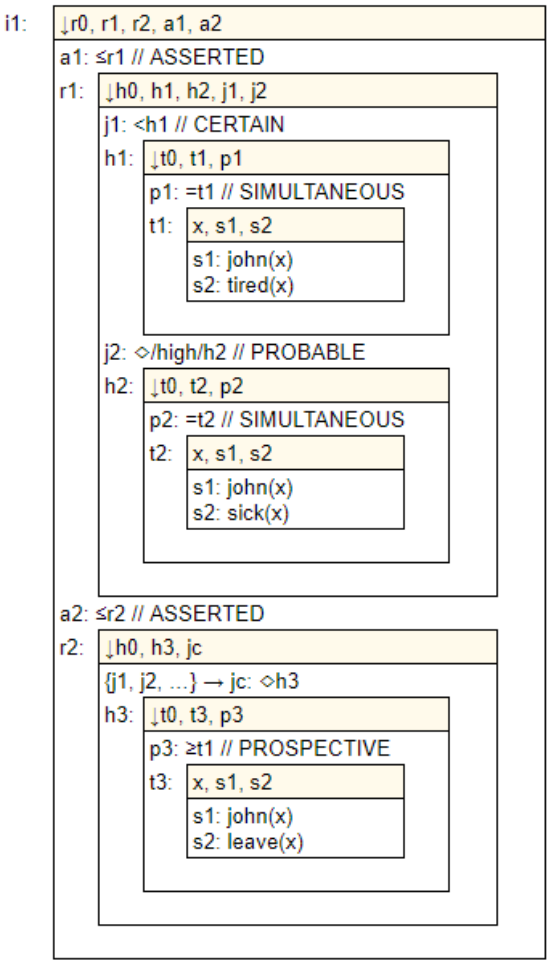
(45) John is tired and he is probably sick. *So/Therefore* he may leave.

$\{ j_{p1}$: <(=(tired(john))), j_{p2}: ◇/high/(=(sick(john))), … $\} \rightarrow j_c$: ◇(≥(leave(John)))

The curly braces enclose the set of premises, which can be simple or complex judgments in the current epistemic frame. The three dots mean that the premises can include more than the explicitly specified ones. Both the premises and the conclusion can be less-than-certain (modal), as illustrated in the reasoning exemplified above. In fact, any of these judgments can be qualified with any of the epistemic anchoring categories given in Table 1.

Within the grounded and interpreted system of mmDRT, a linguistically expressed implication adds to the discourse what is implicitly entailed in the background cognitive context. As such, it amounts to neither material implication nor conditionality.

The discourse resulting from (45) is represented below. Again, the projective behavior of the proper name *John* is ignored for simplicity:



As defined in Section 3.2, an implication which is implicit in communication is called a *contextual implication*, and it can be either unintended (a *potential implication*) or intended (a *pragmatic implicature*). Potential implications are denoted with an arrow with a tilda (⇏), and pragmatic implicatures with an arrow with a plus (⇸):

(46) A. 'John is poor.' ⇏ 'John is not happy', e.g., with a background premise like 'poor people are unhappy'.

B. "There is a good concert in the hall tonight." ⇸ 'I invite you to join me', e.g., in a suitable communicative and cognitive context.

Entailment (⇒) is taken as a strict implication: $j_1 \Rightarrow j_2$ means that j_2 holds (is satisfied) in all the epistemic states (thoughts in the current epistemic frame) in which j_1 holds. Finally, a triple arrow (⇛) denotes an *overt expression*. It is actually an entailment operator that maps sentences of an object language to those in the metalanguage. As such, it amounts to a translation operator that maps fully-anchored illocutions. For example:

(47) "John is tired" ⇛ ≤(<(=(tired(John))))

These different operators (→ for implication in general, ⇒ for entailment, ⇏ for potential implication, ⇸ for pragmatic implicature, and ⇛ for translation) do not denote logically different types of implication. Only one type of logical implication is recognized, which reflects the basic rational process of deriving conclusions from a set of premises. The different arrows only denote communicative differences. In particular, none of these operators describe a nonmonotonic, defeasible implication operator. A contextual implication can be restated as an entailment by making its implicit (background) premises explicit. Pragmatic implicatures are no different; they only include Gricean

communicative assumptions among their background premises. Finally, the translation operator denotes nothing but a higher-level entailment relation between sentences in different languages.

3.8 Negation

In the theory of anchoring relations and in mmDRT, negation amounts to the *exclusion* of a content (a discourse condition) from a higher-order entity (a DRS).

At least since Russell's (1905) Theory of Descriptions, it is known that negation can take scope over a whole proposition (wide-scope or external negation), or over a constituent (narrow-scope or internal negation). These two types correspond, respectively, to *propositional* and *situational* negation in mmDRT. Discarding the presuppositionality of the definite NP, the two possible mappings for Russell's example below will be:

(48) The King of France is not bald.

Situational negation: ≤(<(=(¬bald(King)))) ('The King is currently not bald')

Propositional negation: ≤(<(¬=(bald(King)))) ('The King is not currently bald')

In standard systems of modal logic, negation can take scope over a modal (¬◇p, ¬□p) or vice versa (◇¬p, □¬p). These are captured here as *judgmental* vs. *propositional* negation:

(49) John may not have arrived.

≤(◇(¬≤(arrived(John)))) ('possibly not')

(50) John cannot have arrived.

≤(¬◇(≤(arrived(John)))) ('not possible')

The current multimodal framework actually affords four semantic structural positions for negation (at the temporal, epistemic, volitional, and illocutionary levels), in addition to possible constituent negations at the content level. Languages may use different strategies to distinguish these types of negation, but it is also possible that one negative sentence, such as

(51) John did not speak at five.

in English, can convey different types of negation. (51) can express a *situational negation*, which can roughly be paraphrased as 'What happened at five was that John did not speak':

i_1: ≤(<(</five/(¬s))) (excludes a situation from a time)

The second possible reading is *propositional negation*; roughly, 'It is certain that John's speaking at five was not the case':

i_2: ≤(<(¬</five/(s))) (excludes a proposition from a thought)

The sentence in (51) does not seem to directly express a *judgmental negation*; which would be afforded by a sentence like 'It is not certain that John spoke at five':

i_3: ≤(¬<(</five/(s))) (excludes a judgment from a projection)

A third interpretation of (51) is *illocutionary negation,* which corresponds to Horn's (1989) metalinguistic negation*;* roughly, 'I'm not saying that John spoke at five' (e.g., "John *shouted* at her"):

i_4: ¬≤(<(</five/(s))) (excludes an attitude from an illocution)

These four illocutions can easily be seen to be in a one-directional entailment hierarchy, i.e., $i_1 \Rightarrow i_2 \Rightarrow i_3 \Rightarrow i_4$. Such cross-level entailments concerning negation and different anchoring categories apparently call for closer investigation. For now, it will be sufficient to observe that the following chain of entailments holds for assertive utterances, where *s* is any state-of affair and *T* is any temporal relation:

(52) <(T(¬s)) ⇒ <(¬T(s)) ⇒ ¬<(T(s))

3.9 A judgmental logic and some axioms

In Section 3.4, a *proposition* was defined as a temporally qualified state-of-affair, and a *judgment*, as an epistemically qualified proposition. In the previous studies on contrast, the relevant contents of the two segments have been identified as propositions. mmDRT incorporates a *judgmental logic* in which implicational relations are defined among judgments (Section 3.7) rather than among propositions.[22]

The sentences of this logic reflect relations at the epistemic level of mmDRSs. Given the propositional signs $P \in \{ p_1, p_2, \neg p_1, \neg p_2, \ldots \}$ and a set of labels for epistemic values $E \in \{ =, <, >, \leq, \geq, \Diamond, \blacklozenge, \Box, \blacksquare, * \}$, the set of well-formed formulas is defined as:

(53) $L_j := E(P) \mid \neg\varphi \mid (\varphi \wedge \psi) \mid (\varphi \vee \psi) \mid (\varphi \rightarrow \psi)$

The judgmental scheme *E(P)* requires that each atomic formula include one category of epistemic anchoring. As such, judgments are already interpreted relative to an implicit context of evaluation (center), with a range of epistemic values beyond truth, falsity, and indeterminacy. This makes this modal system an *interpreted* one, different from standard systems, which take modal propositions on a par with bare propositions, allowing formulae like $p \wedge \Box q$ or $\Diamond p \rightarrow p$.

A full formal interpretation for this judgmental logic is not attempted here. Some syntactic axioms that follow from the structure of the ordered epistemic frame and from the definitions given in Section 3.6 will be sufficient for the derivations needed for the analyses:

From the epistemic perspective of a rational agent,

Axiom 1: $>(p) \Rightarrow \Diamond(p)$

A hypothetical proposition is a possible one.

Axiom 2: a. $\Box(p) \Rightarrow \Diamond(p)$

A necessary proposition is a possible one.

Axiom 3: a. $<(p) \Rightarrow \neg\Diamond(p)$, b. $\Diamond(p) \Rightarrow \neg<(p)$

A proposition can be certain or possible, but not both.

Axiom 4: a. $\Diamond/high/(p) \Rightarrow \neg\Diamond/low/(p)$, b. $\Diamond/low/(p) \Rightarrow \neg\Diamond/high/(p)$

A proposition can have a high or low likelihood, but not both.

Axiom 5: a. $\Box(p) \Rightarrow \neg\Diamond(\neg p)$, b. $\Diamond(p) \Rightarrow \neg\Box(\neg p)$ (also, $\blacksquare(p) \Rightarrow \neg\blacklozenge(\neg p)$, b. $\blacklozenge(p) \Rightarrow \neg\blacksquare(\neg p)$)

If a proposition is necessary, its negation is not possible. If a proposition is possible, its negation is not necessary.

Axiom 6: $<(\neg p) \Rightarrow \neg E(p)$, where E is any epistemic value

A certainly false proposition is excluded from the whole epistemic frame.

Axiom 7: $\Diamond(\neg p) \Rightarrow \neg<(p)$

A possibly false proposition is not certainly true.

Axiom 8: $\blacksquare(p) \Rightarrow <(p)$

A strongly necessary proposition is certainly true.

Axiom 9: $E(p) \Rightarrow \blacklozenge(p)$, where E is any epistemic value

If a proposition is in the epistemic frame, it is strongly possible.

[22] Smith (2009) presents arguments to the point that even Frege saw logic as investigating relations among judgments. A version of judgmental logic is presented in Pfenning & Davies (2011). Epistemic or doxastic logics (e.g., Hintikka, 1962; Meyer & van der Hoek, 1991/1995; Lindström & Rabinowicz, 1999), logics of knowledge and probability (e.g., Fagin et al., 2004) and interpreted systems (e.g., Porter, 2004) can also be seen as variants of judgmental logic.

3.10 Denial

Denial is simply taken as judgmental negation. This identification can be justified by different ways people can elaborate on their denials:

(54) A. John is home.

i_1: ≤(j_1: <(p_1: =(s_1: at_home(John))))

$i_1 \Rightarrow_o j_1$: <(p_1) ('$\Rightarrow_o$' for 'overtly entails'; i_1 overtly entails j_1.)

B. No …

a. He is not home.

j_{2a}: <(¬p_1) $\Rightarrow_6$ ¬<(p_1) **:= ¬$\mathbf{j_1}$** ('$\Rightarrow_6$' for entailment due to Axiom 6)

b. He may not be home.

j_{2b}: ◇(¬p_1) $\Rightarrow_7$ ¬<(p_1) **:= ¬$\mathbf{j_1}$** ('$\Rightarrow_7$' for entailment due to Axiom 7)

c. It's unlikely that he is home.

j_{2c}: ◇/low/(p_1) $\Rightarrow_{3b}$ **:= ¬$\mathbf{j_1}$** ('$\Rightarrow_{3b}$' for entailment due to Axiom 3b)

d. He cannot be home.

j_{2d}: ¬◈(p_1) $\Rightarrow_6$ ¬<(p_1) **:= ¬$\mathbf{j_1}$** ('$\Rightarrow_6$' for entailment due to Axiom 6)

An analysis of a categorical denial as in (54Ba) directly as '¬<(p_1: =(at_home(John)))' would be misleading, since this would mean that the proposition is taken to be *not certain*, which would allow its possibility. Yet in such categorical denials, speakers normally intend to exclude a proposition from the whole of the current epistemic frame, not only from CERTAIN but also from HYPOTHETICAL thoughts, effectively yielding strong impossibility ¬◈(p_1), i.e., 'it is *not the case* that John is home'. This reading is afforded by the propositional negation '<(¬=(at_home(John)))', which, by Axiom 6, entails '¬<(=(at_home(John)))', which amounts to the denial of A's judgment in (54A).

3.11 Conditionals and counterfactuality

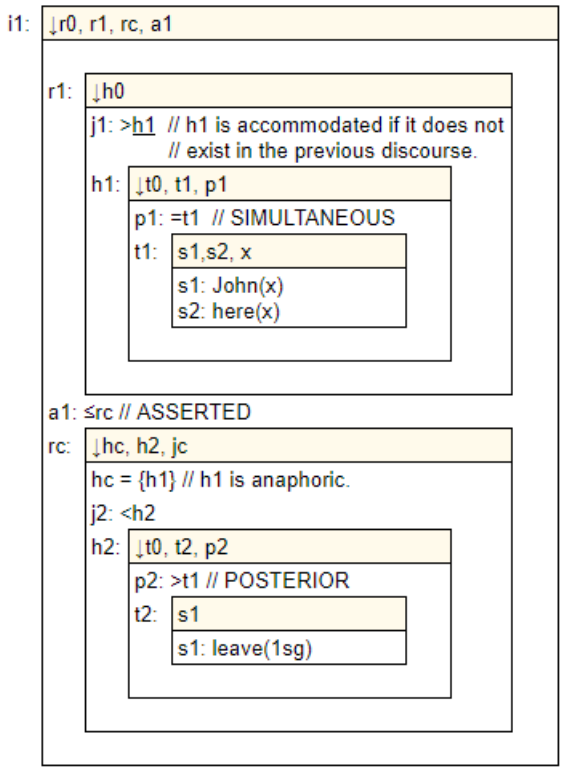
A dynamic suppositional analysis of conditionality is adopted here, similar in spirit to the accounts of Gillies (2012), Yalcin (2012), Starr (2014), Carter (2021) and Ciardelli (2021). The *if*-clause (the antecedent) in a conditional construction such as the English *if A, C,* shifts the epistemic center to a suppositional context, and the consequent clause *C* adds discourse conditions to that context.

A hypothetical context is achieved by adding a possible (HYPOTHETICAL) judgment to the current context as immediately holding information, and making minimal belief revisions to retain rational consistency. A counterfactual suppositional context is achieved by adding an excluded (negative) judgment to the current context, and again, making minimal belief revisions to retain rational consistency. The information provided by the consequent clause *C* added to these new contexts.

The prejacent of a conditional is often a judgment that is already available in the previous discourse. In such cases, the type of conditional is anaphorically determined by the epistemic value of the prejacent relative to the current epistemic center: Modal prejacents yield *hypothetical conditionals*, and negative ones yield *counterfactual conditionals*. In fact, all conditional antecedents can be taken as presuppositional: When the prejacent is not already there in the discourse, it is accommodated.

Below is an mmDRT representation of a hypothetical conditional. The downarrow binder indicates an epistemic center shift. The prejacent j_1 is HYPOTHETICAL (>) relative to the current epistemic center (h_0). Accordingly, the center (h_c) of the suppositional context (r_c) is HYPOTHETICAL relative to h_0. The propositional content of the prejacent immediately holds (=) in h_c. The conditions expressed in *C* are added to the suppositional context r_c. If j_1 does not exist in the previous discursive context, it is accommodated together with its context, r_1.

(55) If John is here, I will (definitely) leave.



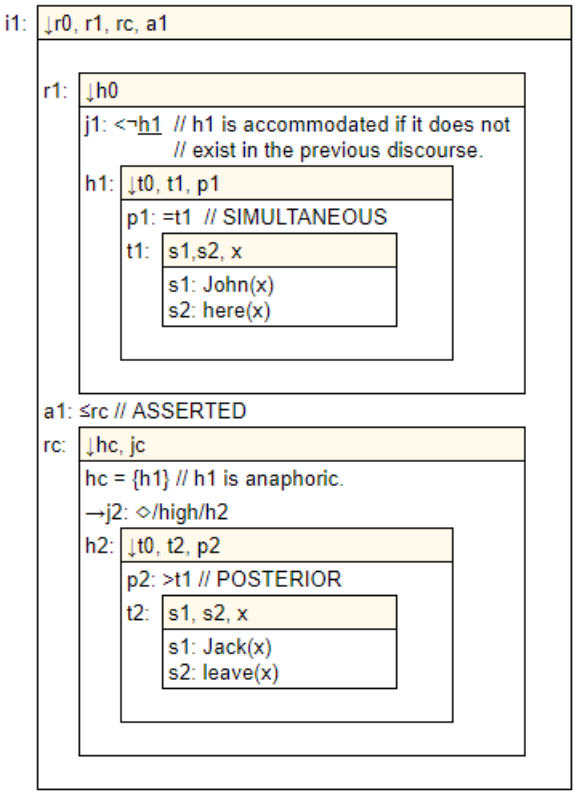
The prejacent j_1 in the above example could also be an epistemically possible or necessary one. In that case it would be represented as '$\Diamond h_0$' or '$\Box h_0$'. Also, the consequent *C* could express a less-than-certain (modal) judgment relative to the suppositional context. Then the epistemic value of h_2 would be identified as $\Diamond$ or $\Box$ rather than CERTAIN (<).

Unlike most treatments in logic and natural language semantics, conditionality is neither equated with nor strictly associated with implication here. An implicational (or relevance) link can also be meant between the antecedent and the consequent (e.g., Douven, 2017). This can be captured with an additional implication operator ($\rightarrow$; see Section 3.7) before the consequent judgment, which is j_2 in the example above.

Counterfactual conditionals are treated uniformly with hypothetical ones. The antecedent in the following sentence presupposes (and accommodates if necessary) that 'John was not here'. The only difference from a hypothetical conditional is that the prejacent has a negative value in the current epistemic context. The suppositional context is then 'certainly excluded' (<¬) from the current epistemic context:[23]

(56) If John was here, Jack would (probably) leave.

[23] This uniform treatment marks a difference from Kratzerian semantics for conditionals and makes the current proposal closer to a Stalnakerian conception (see, e.g., Korzukhin 2013). A comprehensive comparison of the current analyses with other possible world treatments and suppositional accounts is not possible here and is left for future work.



The difference between just a negative judgment and a counterfactual context is minimal, yet significant from a dynamic perspective: Only the latter involves an epistemic center shift, so that new discourse conditions (judgments) can be added to it.

4. An empirical inquiry for a descriptive specification of EC

This section analyzes various utterances with the English contrastive marker *but*, using the analytic framework exposed in the previous section. It investigates the different ways S_1 and S_2 express contrasting contents. It focuses on data that has received relatively little attention in the literature, including sentences in which S_1 directly expresses the content denied by S_2, and sentences where one or both of the segments are in non-assertive moods. It uses the judgmental logic sketched in Section 3.9 to derive possible entailments and implications from S_1 and/or S_2.

4.1 The contrasting contents from S_1 and S_2 as judgments

A *judgment* is defined in Section 3 as an epistemically qualified proposition. Below are analyses that point to the need to invoke judgments rather than just propositions in describing EC.

In an EC utterance with *but*, the implication from S_1 can be denied by an S_2 which can express different epistemic values for a propositional content. In (57) below, S_2 challenges the potential implication from S_1 (that 'the differences will be remarkable') with a statement of possibility:

(57) [S_1: There will be some differences] *but* [S_2: they may be too slight to be noticed by the customers.] (BNCweb, A0C 957)

In (58), the implication from S_1 (that 'they are likely to go away') cannot be categorical, since it is already based on a modal premise. And S_2 denies this implication with a judgment of probability[24]:

(58) [S_1: They might fade into the background] *but* [S_2: but they are unlikely to go away.] (BNCweb, A5A 177)

[24] Dascal & Katriel (1977), in their analysis of the Hebrew contrastive markers, similarly show that *aval* can cancel "the modal force" of a previous clause or utterance.

In the dialogical EC example below, B's statement (S_1) challenges A's prediction that 'it'll get worse' with an a statement of possibility:

(59)

A. There already is a bottle-neck — [S1: it'll get worse.]

B. But [S2: the situation may change.] (BNCweb, KRM 1032)

S_1 and/or S_2 can express contrasting evaluations with overt epistemic predicates too.[25] In the example below, S_1 explicitly conveys an evidential judgment, and S_2 expresses a doubt towards the same propositional content:

(60) [S_1: Now it looks as if not all of that will be called,] *but* [S_2: we can't be sure at this stage.] (BNCweb, HYE 234)

In all the examples given above, S_1 and S_2 convey different epistemic evaluations towards the same propositional content. This already shows that the 'proposition' talk about EC is too restricted; a uniform characterization of EC is only possible by acknowledging that S_2 denies a judgment afforded by S_1, be it a modal or categorical one. This means that S_2 effectively performs a *judgmental negation* in the form $\neg(E(p))$, rather than a propositional one in the form $E(\neg(p))$ (see Sections 3.8 and 3.10).

In the analyses that follow, the relevant judgment from the first conjunct (S_1) will be labeled as j, and its negation by S_2 as $\neg j$. In indirect denials, where both j and its negation are contextually implied, there will always be some indeterminacy as to the denied content (as also stated by Lagerwerf, 1994, pp. 34-38; Iten, 2000, p. 231, among others). In such cases, identifying a plausible implication from S_1 will suffice for the current purposes. The analyses will use the anchoring categories (modal values) defined in Sections 3.4 and 3.7 above. References to the axioms given in Section 3.9 will be provided as subscripts to the entailment operator (e.g., $j_1 \Rightarrow_6 j_2$ means that j_1 entails j_2 by Axiom 6). Finally, $i_1 \Rightarrow_o j_1$ means that the illocution i_1 overtly entails j_1 in its semantic structure. Below are two sample analyses, one for direct denial (61) and one for indirect denial (62):

(61) [S_1: John is tall], *but* [S_2: he is no good at basketball.] (Lakoff, 1971)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $<(p_1$: *(tall(John)))) (S_1 translates ($\Rrightarrow$) into the semantic metalanguage as i_1.)

$i_1 \Rightarrow_o j_1$: $<(p_1)$ (i_1 overtly entails ($\Rightarrow_o$) that John is certainly tall.)

$j_1 \nRightarrow \Diamond$/high/$(p_2$: *(good_at_basketball(John))) **:= j** (j_1 potentially implies ($\nRightarrow$) that John is likely to be good at basketball.)

$S_2 \Rrightarrow i_2$: $\leq(j_2$: $<(\neg p))$ (S_2 translates ($\Rrightarrow$) into the semantic metalanguage as i_2.)

$i_2 \Rightarrow_o j_2$: $<(\neg p)$ (i_2 overtly entails ($\Rightarrow_o$) that John is certainly not good at basketball.)

$j_2 \Rightarrow_6 \neg\Diamond$/high/$(p_2)$ **:= ¬j** (j_2 entails that it is not likely that John is good at basketball, by Axiom 6.)

(62) [S_1: It's raining,] *but* [S_2: I'm going to take an umbrella.] (Winter & Rimon, 1994)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $<(p_1$: =(rain())))) (S_1 translates ($\Rrightarrow$) into the semantic metalanguage as i_1.)

$i_1 \Rightarrow_o j_1$ (i_1 overtly entails ($\Rightarrow_o$) that it is certainly raining.)

$j_1 \nRightarrow \Diamond$/high/$(p_2$: $\geq$(get_wet(1^{sg}))) **:= j** (j_1 potentially implies that it is likely that 1^{sg} is going to get wet.)

$S_2 \Rrightarrow i_2$: $\leq(j_2$: $<(p_2$: $\geq(S_1$: take(1^{sg}, umbrella)))) (S_2 translates ($\Rrightarrow$) into the semantic metalanguage as i_2.)

$i_2 \nrightarrow j_3$: $\Diamond$/low/(p_2) (i_2 pragmatically implicates ($\nrightarrow$) that it is unlikely that the speaker is going to get wet.)

$j_3 \Rightarrow_{4a} \neg\Diamond$/high/$(p_2)$ **:=¬j** (j_3 entails that it is not likely that the speaker is going to get wet, by Axiom 4a.)

[25] Bednarek (2006, p. 17) states that *but* can "express both factual and evaluative information" in what she calls its 'epistemic' uses.

4.2 *j* and ¬*j*: judgments in context

As is widely acknowledged, *j* is typically a contextual implication derived from the contents of S_1 together with some of its background assumptions (e.g., Meyer & van der Hoek, 1996; Lagerwerf, 1998, among others). In (61) for instance, *j* is implied by S_1 together with the background relation 'tall people are generally good at basketball'. In (62), the relevant background assumption is that 'people are likely to get wet when it is raining.' In S_2 of (62) too, a similar implicit premise is involved in the derivation of ¬*j*, namely, that 'it is unlikely that people get wet when they carry an umbrella.'

The context sensitivity of EC markers is also evident when S_1 and/or S_2 span across multiple utterances in discourse, as is the case, for instance, for S_1 in example (7). *j* can also refer to evidential information in the communicative context when S_1 is syntactically null, as in Rouchota's example given in (9).

In short, *j* and ¬*j* are generally afforded by multiple judgments, which may include overtly expressed contents as well as those available in the cognitive, discursive, or communicative contexts. This means that EC in general operates on *epistemic contexts* (loosely, sets of judgments) rather than on singular judgments. The contexts that afford *j* and ¬*j* will henceforth be labeled as E_1 and E_2, respectively. Whether E_1 and E_2 are just different sets of premises or contexts tied to different perspectives will be discussed in Section 5.

4.3 Types of direct vs. indirect expression by S_1 and S_2

This section explores different ways of direct and indirect expression of *j* and ¬*j* by the first and second segments of an EC utterance.

4.3.1 S_1: Direct expression of *j* with counterfactual marking

In the previous literature on EC, cases where the denied content (*j*) is directly conveyed by S_1 have been sporadically mentioned, yet not reflected in any general specification of EC. In the corpus examples below, *j* is overtly expressed as a counterfactual judgment. The subscript NEG indicates an anaphoric reference to a counterfactual context, in accordance with the center shift mechanism described in Section 3.5:

(63) [S1: Uncanny lights could have blazed in the windows,] *but* [S2: they did not.] (BNCweb, GUM 983)

$S_1 \Rrightarrow i_1: \leq(j_1: \Diamond_{NEG}(p_1: <(s_1: \text{blaze(lights)})))$

$i_1 \Rightarrow_o j_1: \Diamond(p_1)$ **:= j** (in a counterfactual epistemic context)

$S_2 \Rrightarrow i_2: \leq(j_2: <(\neg p_1))$

$j_2: \Rightarrow_{6} \neg\Diamond(p_1)$ **:= ¬j**

(64) [S1: A great number of equestrian statues must have existed]. *But* [S2: I couldn't find any.] (BNCweb, HWB 282)

$S_1 \Rrightarrow i_1: \leq(j_1: \Box_{NEG}(p_1: <(s_1: \text{exist\_many(statues)})))$

$i_1 \Rightarrow_o j_1: \Box(p_1)$ **:= j** (in a counterfactual epistemic context)

$S_2 \Rrightarrow i_2 \nrightarrow j_2: \Diamond/\text{high}/(\neg p_1)$

$j_2: \Rightarrow_{5b} \neg\Box(p_1)$ **:= ¬j**

4.3.2 S_1: Direct expression of *j* with profiled anchoring relations

In monological uses of EC, *j* can also be directly expressed as the complement of an epistemic or evidential predicate profiled (explicitly referred to) by S_1:

(65) [S_1: People still think that the JMU does the regulating,] *but* [S_2: this is not the case.] (BNCweb, CBT 3412)

$S_1 \Rrightarrow i_1: \leq(j_1: <(p_1: =(s_1: \text{think(people, } p_2: *(\text{regulate(JMU)}))))))$

$i_1 \Rightarrow_o j_1: <(=(\text{think}(2^{sg}, p_2)))$

$j_1 \Rightarrow <(p_2)$ **:= j** (The predicate *think* entails its content as a certain judgment, in the possible knowledge state of the addressee.)

$S_2 \Rrightarrow i_2$: $\leq(j_2: <(\neg p_2))$

$i_2 \Rightarrow_o j_2$: $<(\neg p_2) \Rightarrow_6 \neg<(p_2)$ **:= ¬j**

In this example, the predicate *think* can be replaced with one that entails less certainty, such as *guess* or *doubt*. Then *j* can be identified as '$\Diamond(p_1)$', and the overtly expressed judgment in S_2 will still entail the negation of *j* by Axiom 6. Below is another example where *j* is an evidential judgment:

(66) [S_1: It may appear that the dependence thesis entails the no difference thesis] *but* [S_2: this is not the case.] (BNCweb, ANH 173)

The following English corpus example from Bednarek (2006) can be analyzed similarly. The proposition 'Islamic Jihad operations are directed from Syria' holds in the belief states of the Western diplomats, while S_2 pragmatically implicates that this is not certain:

(67) [S_1: Western diplomats believe many Islamic Jihad operations are directed from Syria], *but* [S_2: yesterday the terror group claimed its figures were not based at Ein Sahev.] (Bednarek 2006)

j can also be the content of a volitional attitude or illocutionary act profiled in S_1. For example, in (68), the profiled wish entails the possibility that '2sg might peep once', and S_2 denies this with a pragmatic implicature.

(68) [S_1: You'd like to peep, just once,] *but* [S_2: this is forbidden by the laws of a now fixed routine.] (BNCweb, C8X 378)

$S_1 \Rrightarrow i_1$: $\leq(<(=(\text{want}(2^{sg}, j_1: >(p_1{:}>(\text{s: peep}()))))))$

$i_1 \Rightarrow_o j_1$: $>(p_1) \Rightarrow_1 \Diamond(p_1)$ **:= j** (The volitional attitude *would like to* entails its content as a possibility, in the epistemic state of the 2^{sg} subject.)

$S_2 \Rrightarrow i_2 \nrightarrow j_3$: $\neg\Diamond(p_1)$ **:= ¬j**

Similarly, in (69) and (70), S_2 denies the judgmental contents of the illocutionary acts profiled in S_2:

(69) [S_1: They told me I was in Thailand with him] *but* [S_2: I have never been to Thailand in my life.] (BNCweb, CH6 6860)

(70) '[S_1: My friends all say what a great draw it is,] *but* [S_2: but I'm not sure,]' he said. (BNCweb, A99 474)

One may insist that *j* is indirectly expressed (contextually implied) in these examples, arguing that a person's belief, wish, or verbal act can imply their contents. This seems to be possible, and many examples will be given in Section 4.4.9), but this cannot be a general account: The attitudes profiled in (71) and (73) below cannot even probabilistically imply their contents:

(71) We are under the illusion that motivation ends without desire, *but* this is not so. (BNCweb, B21 301)

(72) # We are under the illusion that motivation ends without desire, so/therefore this may be the case.

(73) You may not know it, *but* I haven't had a thing to eat since eight o'clock… (BNCweb, A73 2254)

(74) # You may not know that I haven't had a thing to eat since eight o'clock, so/therefore this may be true.

4.3.3 S_1: Direct expression of *j* in dialogical uses

The direct expression of *j* is probably most common in dialogical uses of EC. Here is an example from Asback-Schnitker (1978):

(75) A. [S1: You went out with Peter last night.]

B. *But* [S_2: I didn't go out with him.] (Asback-Schnitker 1978: 78)

$S_1 \Rrightarrow i_1$: ≤(j_1: <(p_1: <(go_out(B, with_Peter))))

$i_1 \Rightarrow_o j_1$: <(p_1) **:= j**

$S_2 \Rrightarrow i_2$: ≤(j_2: <(¬p_1))

i_2: $\Rightarrow_o j_2$: <(¬p_1) $\Rightarrow_6$ ¬<(p_1) **:= ¬j**

In Zeevat's (2012) example below, replicated from (8), S2 indirectly denies *j*, which is again overtly expressed by the first interlocutor:

(76) A. [S_1: The Smiths will be coming over tonight.]

B. *But* [S2: John is in Paris.] (Zeevat 2012)

$S_1 \Rrightarrow i_1$: ≤(j_1: <(p_1: >(come_over(the_Smiths))))

$i_1 \Rightarrow_o j_1$ **:= j**

$S_2 \Rrightarrow i_2 \nrightarrow$ ¬<(p_1) **:= ¬j**

4.3.4 S_1: Direct expression of *j* in real-time epistemic updates

In monological discourse, it is possible that a speaker intentionally contradicts a previous utterance of hers, due to a change of mind, remembering, or the emergence of new evidence. Such cases are labeled here as *real-time epistemic updates*, as they indicate a real change in the speaker's knowledge state. Peterson (1986) gives the following example for what she calls a "change of mind" use of *but*. While this example is from a child, it could be uttered by any competent adult speaker of English.

(77) [S_1: I never spill anything] *but* [sometimes I get a little accident where I spill.] (Peterson 1986)

$S_1 \Rrightarrow i_1 \nrightarrow j_1$: <($p_1$: ≤(¬spill($1^{sg}$, x)) **:= j**

$j_1 \Rightarrow_{52}$ ¬<(p_1: ≤(¬spill(1^{sg}, x))

$S_2 \Rrightarrow i_2 \Rightarrow j_2$: <($p_1$: ≤(spill($1^{sg}$, x))

$j_2 \Rightarrow_{52}$ ¬<(p_1: ≤(¬spill(1^{sg}, x)) **:= ¬j**.

4.3.5 S_1: Is *j* modal or categorical?

In many of the examples given so far, *j* is identified as a modal (less-than-certain) judgment, e.g., in (57-58) and (61-64) above. But S_1 can also express *j* as a categorical (certain) judgment, as is overtly done in (65) and (75-77). In the following constructed example too, the counterfactual conditional in S_1 expresses a definitive conclusion, as indicated by the adverb *certainly*:

(78) [S_1: I would have certainly passed if the regulation had not changed] *but* [S_2: it changed.]

S_1 (its consequent clause) $\Rrightarrow i_1$: ≤(j_1: $<_{NEG}$(p_1: $>_<$(pass(1^{sg})))))

$i_1 \Rightarrow_o j_1$: <(p_1) **:= j** (in a counterfactual epistemic state)

$S_2 \Rrightarrow i_2 \nrightarrow$ <(¬p_1) ⇒ ¬j_1 **:= ¬j**

4.3.6 S_1: Constraints on the direct expression of *j*

We have seen that *j* can be directly expressed by S_1 when (i) S_1 is marked as counterfactual (Section 4.4.1), (ii) S_1 profiles an epistemic attitude from a non-deictic perspective (Section 4.4.2), (iii) S_1 is uttered by another interlocutor in a conversation (Section 4.4.3), and (iv) the speaker experiences (or purports to experience) a real-time epistemic update during her speech (Section 4.4.4).

What is common in all these cases is that *j* is relative to an epistemic center that is different from the one taken in S_2. In other words, the epistemic contexts of *j* and ¬*j*, namely, E_1 and E_2, are associated with different epistemic centers. When this is not the case, a direct expression (overt expression or entailment) of *j* by S_1 is not allowed:

(79) # It is a cat *but* it is not.

(80) # It is a cat *but* it is not an animal.

(81) # John believes that it is a cat *but* he thinks that it is not an animal.

The same constraint holds when S_1 is non-assertive. The imperative S_1 in (77), for instance, has the semantic form ≥(>(≥(go(s2g)))) (see also the example in 32), hence entails a HYPOTHETICAL (>) epistemic value. Its judgmental content can then neither be certainly false (<¬) —by Axiom 6— nor certainly true (<) —by Axioms 1 and 3b:[26]

(82) # Go *but* you will not go / # Go *but* you will go.

In general, then, S_2 cannot deny a judgment that is directly expressed in S_1 when the two segments take the same epistemic perspective.

4.3.7 S_1: *j* as a contextual implication of a profiled anchoring relation

An epistemic or volitional attitude profiled in S_1 can also serve as a premise for the contextual implication of *j*. In (83) below, "knowing" is construed as causally leading to the conclusion that 'he probably did something'. This contextual implication (⇏) is based on a background causal relation such as 'when one knows what (s)he wants, (s)he is likely to find it':

(83) [S_1: I knew what I wanted] *but* [S_2: I couldn't find it.] (BNCweb, A08 903)

$S_1 \Rrightarrow i_1 \Rightarrow_o j_1$: <($p_1$: <(know($1^{sg}$, what_$1^{sg}$_wants)))

$i_1 \nRightarrow j_2 \Rightarrow \Diamond$/high/($p_2$: <(find($1^{sg}$, what_$1^{sg}$_wants))) **:= j**

$S_2 \Rrightarrow i_2 \Rightarrow j_2$: <($\neg p_2$)

$j_2 \Rightarrow_6 \neg\Diamond$/high/($p_1$) **:= ¬j**

In the following example, the subject's wish profiled in S1 contextually implies that 'he may have succeeded to become a vet', on the basis of a background causal assumption like 'when one wants something, it is likely to happen'. This implication is indirectly denied by S2:

(84) [S_1: He had wanted to be a vet;] *but* [S_2: all his plans had come to nothing.] (BNCweb, A3X 142)

$S_1 \Rrightarrow i_1 \nRightarrow j_1$: $\Diamond(p_1$: $>_<$(become(3^{sg}, vet))) **:= j**

$S_2 \Rrightarrow i_2 \nrightarrow \neg\Diamond(p_1)$ **:= ¬j**

4.3.8 S_1: *j* as a contextual implication of a non-assertive clause

Both assertive and non-assertive moods can afford contextual implications from S_1. In (85) below, the imperative form in S_1 potentially implies that the speaker allows the addressee to stay more than a few minutes, and this is denied by S_2:

(85) [S_1: Go on;] *but* [S_2: don't stay more than a few minutes.] (BNCweb, AT7 2070)

$S_1 \Rrightarrow i_1$: ≥(j_1: >(p_1: >(go_on(2^{sg}))))

$j_1 \nRightarrow j_2$: $\Diamond(p_2$: =(allow(1^{sg}, >(>(p_1: >/long/(stay(2^{sg})))))))) **:= j**

$S_2 \Rrightarrow i_2 \nrightarrow j_3$: <($\neg p_2$))

$j_3 \Rightarrow_6 \neg\Diamond(p_2)$ **:= ¬j**

In the dialogical example below, A's interrogative sentence in S_1 conveys a proposal, which potentially implies that some of the addressees will accept the proposal, and B denies this on his/her part with a pragmatic implicature:

(86) A: [S_1: Does anyone want to go?]

---

[26] Imperatives are analyzed also as entailing WANTED (≥) in the volitional domain (see the example in (32)), which explains the semantic ill-formedness of:

Go *but* I don't want you to go.

B: *But* [S_2: it's difficult to get there.] (BNCweb, KLS 512)

4.3.9 S_2: Direct denial by explicit judgmental negation

Below is an example for the denial of *j* by an explicit judgmental negation in S_2. The judgment potentially implied by S_1, that 'it is certain that the coins mark an encroachment' is directly excluded by S_2:

(87) [S_1: That coins were minted in the names of bishops and churches is clear] *but* [S_2: it is not certain that they mark an encroachment into a royal preserve.] (BNCweb, HY0 1272)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $<(p_1$: $<(\text{minted(coins)}))))$

$i_1 \Rightarrow_o j_1 \nRightarrow j_2$: $<(p_2$: $=(\text{mark(coins, encroachment)}))$ **:= j**

$S_2 \Rrightarrow i_2$: $\leq(j_3$: $\neg<(p_2))$

$i_2 \Rightarrow_o j_3$ **= ¬j**

S_2 can also entail (or strictly imply; see Section 3.7) $\neg j$ in its overt content. Such entailments can be of various types, as illustrated in the following subsections.

4.3.10 S_2: Denial by entailment from lower levels of negation

Below are some examples where the negative marker on S_2 signals a propositional negation rather than a judgmental one (see Section 3.8 for the difference). In the following example, the negative marker *not,* which follows the modal element *may,* targets a proposition ('it is possible that not p_1') rather than a judgment. This propositional negation in turn entails a judgmental negation ('it is not possible that p_1'), which amounts to the denial of *j*:

(88) [S_1: Cambridge poised to take early lead in Boat Race] *but* [S_2: may not be able to stay there.] (BNCweb, AHC 1755)

$S_1 \Rrightarrow i_1 \nRightarrow j_1$: $<(p_1$: $\geq(\text{lead(Cambridge, race)}))$ **:= j**

$S_2 \Rrightarrow i_2 \Rightarrow_o j_2$: $\Diamond(\neg p_1) \Rightarrow_7 \neg<(p_1)$ **:= ¬j**

S_2 in this example could be 'will probably not be able to stay there', or 'will certainly not be able to stay there'. Then the overt entailment from i_2 would be $\Diamond/\text{high}/(\neg p_1)$ or $<(\neg p_1)$, both of which would further entail $\neg<(p_1)$ by Axioms 7 and 6, which is the negation of the implication from S_1.

S_2 in the example below expresses a *situational negation* by the negative polarity item *never*: It excludes the profiled event from all past times. Again, this lower level negation entails a judgmental negation through the chain of entailments given in (52):

(98) [S_1: I have been a nurse for ten years] *but* [S_2: I have never seen a bullet wound.] (BNCweb, CH2 13339)

$S_1 \Rrightarrow i_1 \nRightarrow j_1$: $\Diamond/\text{high}/(p_1$: $\leq(s_1$: $\text{see}(1^{sg}, \text{bullet\_would})))$ **:= j** ('The speaker is likely to have seen a bullet wound', in a possible knowledge state of the addressee. *****)

$S_2 \Rrightarrow i_2 \Rightarrow j_2$: $<(p_2$: $\leq(\neg s_1))$

$j_2 \Rightarrow_{52} j_3$: $<(\neg p_1)$

$j_3 \Rightarrow_6 \neg\Diamond/\text{high}/(p_1)$ **:= ¬j**

In the following constructed example, S_2 temporally relocates the potential implication from S_1, that 'the speaker may have attended the club for 12 months', by specifying the duration as 2 months:

(89) [S_1: I subscribed to the sports club for 12 months,] *but* [S_2: I attended only for 2 months.]

$S_1 \Rrightarrow i_1 \nRightarrow j_1$: $\Diamond(p_1$: $</12\_\text{months}/(s_1$: $\text{attend}(1^{sg}, \text{club})))$ **:= j** (in a possible knowledge state of the addressee.)

$S_2 \Rrightarrow i_2$: $\leq(j_2$: $<(p_2$: $>/2\_\text{months}/(s_1))) \Rightarrow_o j_2$

$j_2 \Rightarrow j_3$: $<(\neg p_1)$ (by temporal reasoning: 2 months does not include 12 months.)

$j_3 \Rightarrow_{6} \neg<(p_1)$ **:= ¬j**

4.3.11 S_2: Denial by entailment from profiled attitudes and illocutions

In the examples (58), (60), (67), and (70) given in Section 4.2, a profiled anchoring relation in S_2 assigns a different epistemic value to the propositional content of *j*. Below is another such example from the corpus and its analysis:*******

(90) [S_1: Says on the picture it will come to North Wales,] *but* [S_2: I doubt it.] (on whether or not it will snow in North Wales) (BNCweb, KCN 434)

$S_1 \Rrightarrow i_1 \Rightarrow j_1$: $<(p_1$: =(snow())) **:= j** (in the epistemic state of the 3rd person subject.)

S_2: $\Rrightarrow i_2 \Rightarrow j_2$: $>(p_1)$ ('Doubting *p*' entails that *p* is very unlikely.)

$j_2 \Rightarrow_{1} \Diamond(p_1) \Rightarrow_{3b} \neg<(p_1)$ **:= ¬j**

In the following example, *j*, the implied content from S_1, namely, that 'the speaker is not likely to play next Saturday', is denied by the judgmental content entailed by the statement of hope in S_2:

(91) [S_1: A specialist has said I could be out six weeks.] *But* [S_2: I hope to play next Saturday!] (BNCweb, K4T 3083)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $<(=(s_1$: say(everyone, j_2: $<(p_1$: ¬>$(s_2$: happen(x))))))

$i_1 \Rightarrow_o j_1$

$j_1 \Rightarrow j_2$: $<(p_1)$ **:= j** (the act *söyle* 'say' entails its judgmental content as a certainty in the belief states of 'everyone'.)

$S_2 \Rrightarrow i_2$: $\leq(j_3$: $<(=($fear$(1^{sg}, j_4$: $\Diamond(\neg p_1)$)))))

$i_2 \Rightarrow_o j_3$

$j_3 \Rightarrow j_4$: $\Diamond(\neg p_1)$ (*hope* entails its judgmental content as a possibility.)

$j_4 \Rightarrow_{7} \neg<(p_1)$ **:= ¬j**

In the constructed example below, S_2 expresses an explicit performative with an illocutionary verb, which directly denies a potential expectation from S_1:

(92) [S_1: It deserves some wine as an accompaniment,] *but* [S_2: I advise keeping off alcohol for a bit.] (BNCweb, JYC 1487)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $>(=($difficult(task))))

$i_1 \nRightarrow j_2$: $\neg=(p_1$: =advise$(1^{sg}, 2^{sg}$, $>(p_2$: $>($try$(2^{sg}$, task))))) **:= j** ('The speaker will advise the addressee to drink wine', in a possible epistemic state of the addressee.)

$S_2 \Rrightarrow i_2 \Rightarrow j_3$: $=(p_1)$ **:= ¬j**

4.3.12 S_2: Denial by entailment from non-assertive clauses

As already exemplified in (32) and (85), non-assertive utterances are also analyzed in mmDRT as entailing epistemic values towards their propositional contents. In the following example, S_1 affords the contextual implication that 'Chinese herbal medicine works', and the the interrogative S_2 excludes this by entailing that this is merely HYPOTHETICAL:

(93) [S_1: Katy chose to turn to the mysterious art of chinese herbal medicine.] *But* [S_2: is it working?] (BNCweb, J1M 111)

$S_1 \Rrightarrow i_1$: $\leq(j_1$: $<(p_1$: =(¬forget(1^{sg})))))

$i_1 \nRightarrow j_2$: $<(p_2$: =(working(Chinese_medicine))) **:= j** (in a possible epistemic state of the addressee.)

$S_2 \Rrightarrow i_2$: $\geq$/question/$(j_3$: $>(p_2$: =(working(Chinese_medicine))))

$i_2 \Rightarrow >(p_2) \Rightarrow_{1} \Diamond(p_2) \Rightarrow_{3b} \neg<(p_2)$ **:= ¬j**

Similarly, in a plausible analysis of the following example, S_1 potentially implies that the speaker wants the addressee(s) to bring their bodies into touch with the floor, and S_2 denies this with an entailment of the imperative form:

(94) [S_1: Lower your body to the floor] *but* [S_2: but do not touch it.] (BNCweb, A0W 197)

$S_1 \Rrightarrow i_1$: $\geq(j_1$: $>(p_1$: $\geq($lower$(2^{sg}$, body$))))$

$i_1 \nRightarrow j_2$: $<(p_2$: $=($want$(1^{sg}$, $>($p3: $\geq($touch$(2^{sg}$, floor$)))))$: **= j** (in a possible epistemic state of the addressee.)

$S_2 \Rrightarrow i_2$: $\geq(j_3$: $=($want$(1^{sg}$, $>($p3: $\geq(\neg$touch$(2^{sg}$, floor$)))))$

$j_3 \Rightarrow \neg j_2$ = **¬j** (‘wanting one not to do something’ entails ‘not wanting one to do something.)

4.3.13 S_2: Denial by entailment from a sub-clausal constituent

Sub-clausal segments can also afford contrasting judgments. In the following example, S_2 denies the implication from S_1, that ‘the movie is not striking’:

(95) Another [S_1: flawed] *but* [S_2: striking] recent movie is DOA … (BNCweb, A8F 15)

$S_1 \Rrightarrow i_1 \Rightarrow j_1$: $<(p_1$: $=(s_1$: flawed(movie)))

$j_1 \nRightarrow j_2$: $<(p_2$: $=(s_2$: ¬striking(movie))) **:= j**

$S_2 \Rrightarrow i_2 \Rightarrow j_3$: $<(p_3$: $=(\neg s_2))$

$j_3 \Rightarrow_{52} j_4$: $<(\neg p_2)$ (by the chain of upward entailments given in (52))

j_4: $\Rightarrow_6 \neg<(p_2)$ **:= ¬j**

4.3.14 S_2: Indirect denial by pragmatic implicature

In the following constructed dialogue, both A’s invitation and B’s decline of it are indirectly expressed by Gricean conversational implicatures:

(96) A. [S_1: There is a concert in the hall this evening.]

B. *But* [S_2: I have to study for the exam.]

A speaker of the following utterance too can be declining an invitation by a pragmatic implicature (as defined in Sections 3.2 and 3.7):

(97) [S_1: She invited me to the concert] *but* [S_2: I have to study for the exam.]

In fact, all indirect denials by S_2 must be accomplished via pragmatic implicatures, because speakers *intend* a denial in choosing to use an EC utterance. For instance, in Winter & Rimon’s (1994) example, S_2 does not just potentially imply ($\nRightarrow$) that the speaker and friends did not eat; it implicates ($\not\mapsto$) so:

(98) [S_1: We were hungry] *but* [S_2: the restaurants were closed.] (Winter & Rimon, 1994)

$S_1 \Rrightarrow i_1 \nRightarrow j_1$ $<(p_1$: $<($eat$(1^{pl})))$ **:= j** (in a possible epistemic state of the addressee.)

$S_2 \Rrightarrow i_2 \not\mapsto j_2$: $<(\neg p_1) \Rightarrow \neg<(p_1) = j_1$ **:= ¬j**

A non-assertive S_2 can also implicate the denial of *j*. In (99) below, S_1 allows the contextual implication that the speaker will be happy to receive letters from the addressee. This is denied by S_2, whereby the speaker requests the addressee not to write to him/her. S_2 here is not taken to entail (strictly imply) a request because an imperative form can also be used for an order, an advice, or a warning, among other illocutionary acts. This illocution is hence analyzed as a pragmatic implicature:

(99) [S_1: I wish you well,] *but* [S_2: do not write to me again.] (BNCweb, AE0 2051)

$S_1 \Rrightarrow i_1$: $\nRightarrow j_1$: $<(p_1$: $\neg=($give_advice$(1^{sg}$, $2^{sg}))))$ **:= j** (in a possible epistemic state of the addressee.)

$S_2 \Rrightarrow i_2$: $\not\mapsto <(\neg p_1) \Rightarrow_6 \neg<(p_1)$ **:= ¬j**

Can S_1 also express *j* as a pragmatic implicature? This seems to be possible in dialogical uses of EC, as in the constructed example below, where A sarcastically implicates that the weather is bad:

(100) A. [S_1: Nice weather!]

B. *But* [S_2: it's not that bad!]

Yet, in most cases of monological EC where S_2 seems to deny an implicature from S_2, as in (101) below, one can at best identify *j* as a *potential* implicature, not a real one. Because if *j* (that 'the speaker invites the addressee to the concert') was a real (intended) implicature, then the speaker wouldn't deny it by S_2. It seems that a speaker can deny her own intended pragmatic implicature only if she changes her mind in real-time, as in (102):

(101) [S_1: There is a concert in the hall this evening,] *but* [S_2: I do not invite you.]

(102) [S_1: There is a concert in the hall this evening …] *but* [S_2: forget about it.]

4.4 Summary of the empirical inquiry

In this section I analyzed different types of direct and indirect expression of the contrasted contents, covering various monological, dialogical, and discourse-initial uses of EC. Below is a summary of the main conclusions:

- EC contrasts judgments (epistemically qualified propositions) rather than bare propositions. (Section 4.1)
- The contrasted judgments *j* and ¬*j* belong to different epistemic contexts, E_1 and E_2, which can afford incompatible contents. (Section 4.2)
- An EC-clause (S_2) can deny not only contextual implications, but also directly expressed (overt or entailed) contents from S_1. In monological uses of EC, this is only possible when S_1 is marked as counterfactual, when it belongs to another interlocutor in a conversation, when it profiles a non-immediate cognitive attitude, or when there is a real-time epistemic update from S_1 to S_2. (Sections 4.3.1-4.3.4). Such cases also reveal that EC does not always entail a simple, local conjunction of the overt contents of S_1 and S_2.
- Whether directly or indirectly conveyed, *j* can be modal or categorical. (Section 4.3.5)
- S_2 can directly deny *j* with an overt judgmental negation, but most instances of direct denial involve entailments due to exclusions or relocations at various semantic levels. (Section 4.3.10-4.3.13)
- The indirect expression of ¬*j* by S_2 is always a pragmatic implicature. In contrast, *j* cannot be expressed by S_1 as a real (intended) implicature in monological uses of EC unless there is a real-time epistemic update. (Section 4.3.14)

5 The specification, its implications, and analyses in mmDRT

5.1 A counterfactuality-based specification for EC

Section 2.5 had already concluded that the difference between the epistemic contexts of *j* and ¬*j* (E_1 and E_2) must be stronger than just being alternative sets of premises, in that they should be *counterfactual* with respect to each other. The analyses provided in Section 4, especially the data where S_1 expresses *j* with explicit counterfactual marking, as in (63) and (64), are in line with this conclusion. In other cases where *j* is directly expressed too (dialogical uses, uses with profiled epistemic relations, and uses that involve real-time updates), there are obvious syntactic or discursive cues that E_1 is non-actual relative to E_2. It is only when *j* is contextually implied that the character of E_1 is totally implicit. Yet in these instances of EC too, a lack of contradiction can only be accounted for if E_1 is taken as counterfactual (as defined in Section 3.11) with respect to E_2. Thus, I suggest the following general specification, primarily for EC as expressed by the English *but*, and arguably for any EC marker in any language:

(103) In an EC-utterance, S_2 deems the epistemic context of S_1 (E_1) *counterfactual* with respect to the current one (E_2), by introducing information that directly or indirectly denies a judgment expressed or implied in the previous discourse.

This specification is meant to apply to all the connective, sentence-initial, and discourse-initial uses of an EC marker, as well as their use with non-assertive segments.[27]

It was shown in Section 2.4 that accounts of EC based on simple conjunction face a problem of contradiction. The specification in (103) above presents a new, empirically motivated solution to this problem: While ¬*j* is added to the current epistemic context, *j* is added to one that is counterfactual with respect to it. A contradiction does not arise because these incompatible contents do not reside in the same local context. To illustrate, the relevant content from the first conjunct in Lakoff's example in (69), identified as 'j: ◇/high/(*(good_at_basketball(John)))', or the one in the dialogical example in (78), identified as 'j: <(<(go_out(B, with_Peter)))', are placed in contexts (E_1) that are counterfactual with respect to the current one (E_2). mmDRT representations for these and other examples are provided in Section 5.2 below.

A contradiction arises in an EC utterance only when both *j* and ¬*j* are directly expressed, *and* there is no indication that E_1 is distinct from E_2. Such utterances, like those in (13-17), force the EC marker to accept contradictory contents in the same local context, which goes against both the conventional meaning of the EC marker and the principle of rational consistency (Section 2.5.1). In this case a contradiction will arise even when *j* is modal, unless E_1 is counterfactual with respect to E_2, as illustrated in (16-17). This is correctly predicted in the judgmental logic presented in Section 3.9, as ◇(p) ∧ ¬<(p) and □(p) ∧ ¬<(p) are contradictions due to Axioms 2 and 3.

Additional evidence for a counterfactuality-based meaning for EC comes from the fact that all instances of S_1 *but* S_2 can be paraphrased with the schema "*A content j from S_1 could be concluded/conceded if there was no contrary information conveyed by S_2.*" Below are some examples, which do not sound very natural because *but* is already available for more perspicuous expression:

(61) John is tall, *but* he is no good at basketball.

> *John is tall, so one could conclude that he is probably good at basketball if one didn't have evidence to the contrary.*

(62) It's raining, *but* I'm going to take an umbrella.

> *It's raining, so you could conclude that I will probably get wet if you didn't know that I'm going to take an umbrella.*

(76) A. The Smiths will be coming over tonight

B. *But* John is in Paris.

> *I could concede that the Smiths would be coming over tonight if I didn't know that John is in Paris.*

Conversely, each counterfactual conditional statement in the form *If A then B* can be *redundantly* followed with a *but*-clause that includes ¬*A (so* ¬*B)*:

(104) If he was alive, he would be here. *But* he is dead (, so he cannot be here).

Similarly, counterfactual wishes can always be followed, again redundantly, by a *but*-clause that expresses the negation of the wished content:

(105) I wish he was here, *but* he is not.

According to the specification in (103) S_2 deems the epistemic context of S_1 counterfactual *as a whole*. In the following example from the lyrics of *Hey You* by Pink Floyd (1979), the *but*-clause explicitly declares the whole story of Pink's "fantasy":

---

[27] Explicit counterfactual marking on the first segment of an EC utterance has been sporadically mentioned in the previous literature. Blakemore (2002, p. 113) gives the example in (a), Winter & Rimon (1994) the one in (b), and Iten (2000, pp. 229-230) the one in (c), but only as very specific instances of EC that support their general arguments, without exploring their implications for a counterfactuality-based general account:

(a) Tom meant to be here, but his car broke down.

(b) The coin wasn't in the drawer even though it could have been there.

(c) I would have liked to go on holiday this year, but I couldn't afford it.

(106) David Gilmour (as Pink): [S_1: Hey, you! / ... / Would you help me to carry the stone? / Open your heart, I'm coming home.]

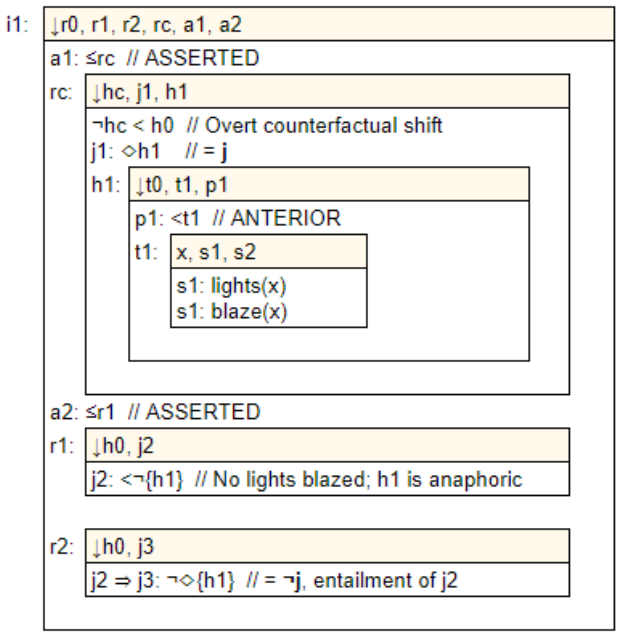
Roger Waters (as the narrator): *But* [S_2: it was only fantasy …]

5.2 Representing EC in mmDRT

This section presents mmDRT analyses for five sample EC-utterances. In all these analyses, ¬*j* is added to the current epistemic context and *j*, to a counterfactual one, in accordance with the specification given in (103).

In the first example below, replicated from (63), *j* is overtly expressed as counterfactual:

(63) [S_1: Uncanny lights could have blazed in the windows,] *but* [S2: they did not.]



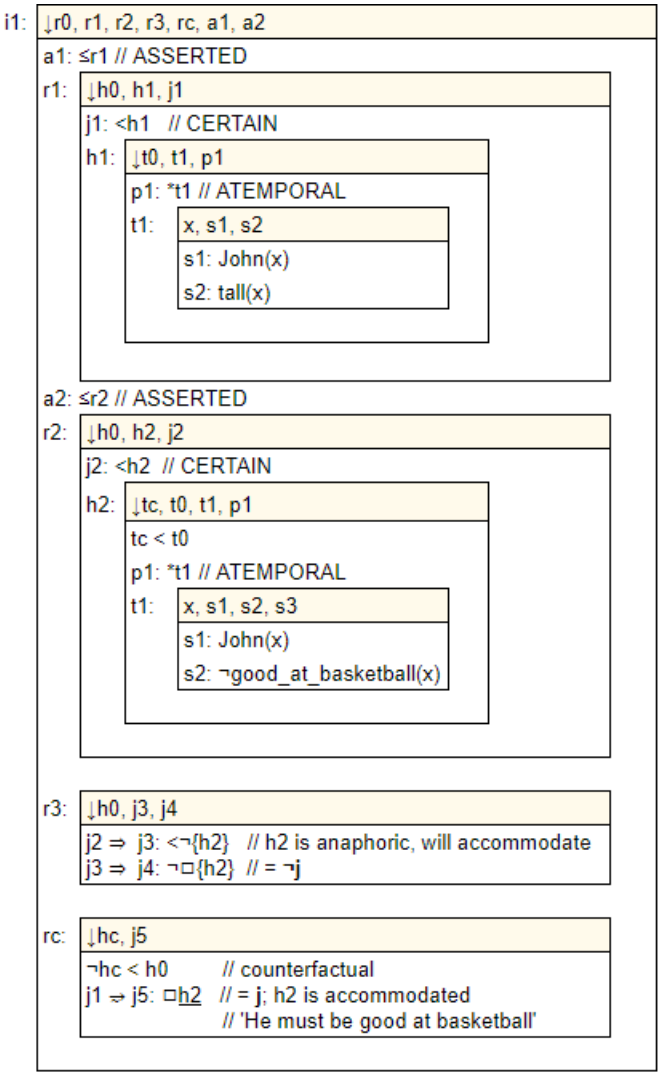
Below is a possible order for the additions of the conditions to their contexts, which may guide a compositional construction process for the mmDRS:

1. The overt judgmental content of S_1 (j_1 **= *j***) is added to a counterfactual context (E_1), which is centered by h_c.
2. The overt judgmental content of S_2 (j_2) is added to the current, deictic epistemic context (E_2), centered by h_0. j_2 anaphorically refers to h_1 in E_1.
3. j_2 entails j_3 (= **¬*j***) by Axiom 6.

This analysis also captures the fact that the contents of r_c and r_1 are being asserted, while the content of r_2 (the entailment from the overtly asserted content j_2), is not.

In the analysis of Lakoff's (1971) example below, *j* is potentially implied by S_1, and is directly denied by an entailment of S_2:

(61) [S_1: John is tall], *but* [S_2: he is no good at basketball.] (Lakoff, 1971)



Here is a possible order for the additions of the relevant judgments: (j) is added

1. The overt judgmental content of S_1 (j_1) is added to the deictic epistemic context (E_2), which is centered by h_o.
2. The overt judgmental content of S_2 (j_2) is added to E_2.
3. j_2 entails j_3, which is anaphoric to a counterfactual context. Since h_2 is not in the discourse yet, it will be accommodated. j_3, in turn, entails j_4 (= $\neg j$) by Axiom 6.
4. The counterfactual context is created (E_1, centered by h_c).
5. j_1, which is also accessible in r_c, potentially implies ($\nRightarrow$) j_5 (= j), where h_2 is accommodated.

Note that r_1 and r_2 index the same epistemic context (E_2), as both of them have the immediate thought h_0 as their centers. They are represented as separate boxes because they are asserted separately by S_1 and S_2. E_2 is also indexed by r_3, yet the contents of r_3 are not asserted.

This analysis doesn't say anything about how the entailment from S_2 ($\neg j$ in E_2) is determined, given that it is not overtly expressed. This question is more apparent in indirect denials by S_2, as in the example below, where both j and $\neg j$ are contextually implied. Below is an analysis of Winter & Rimon's (1994) example. This issue of how the interlocutors converge on the relevant implicit content is addressed by accounts that recruit salient questions in the communicative context, such as the QUD (see Section 2.4.5).

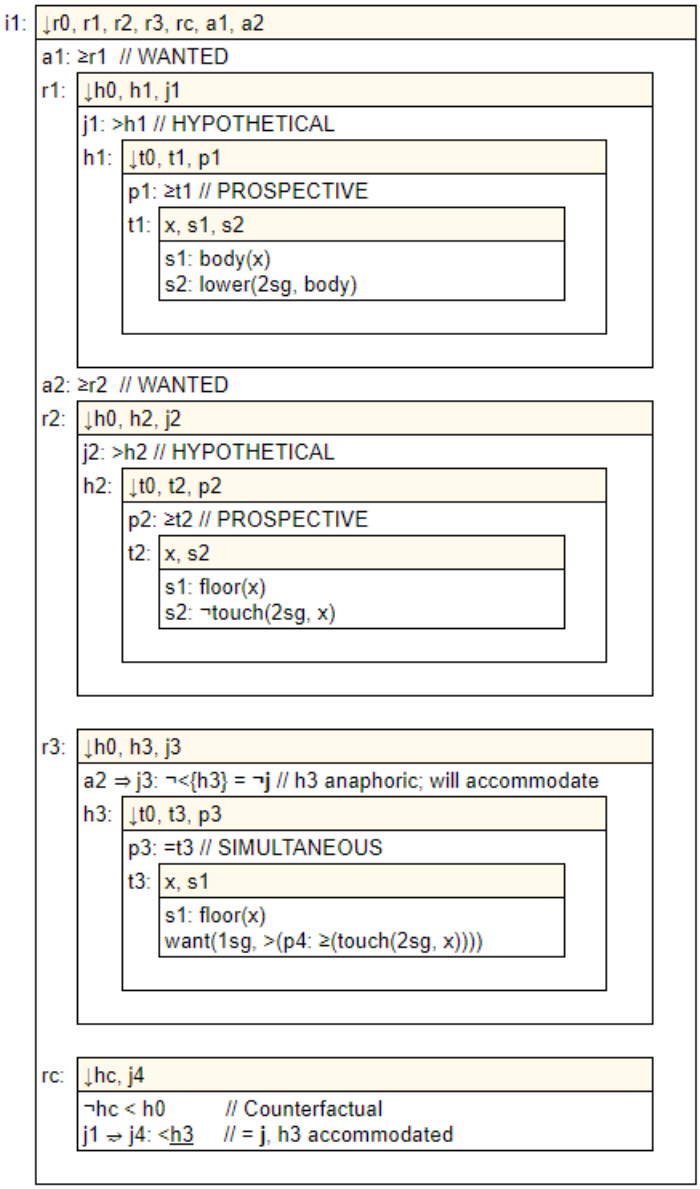
(62) [S_1: It's raining] *but* [S_2: I'm going to take my umbrella] (Winter & Rimon, 1994)

Here are the possible steps of construction for this mmDRS:

1. The overt judgmental content of S_1 (j_1) is added to the deictic epistemic context (E_2), which is centered by h_0.
2. The overt judgmental content of S_2 (j_2) is added to E_2.
3. The assertion of r_2 (a_2) pragmatically implicates $j_{3,w}$(= **¬j**), which is anaphoric to a content from E_1. Since h_3 is not in the discourse yet, it will be accommodated.
4. A counterfactual E_1 is created (centered by h_c).
5. j_1, which is also accessible in r_c, potentially implies (⇏) j_4, which entails j_5 (**= *j***), where h_3 is accommodated.

The following analysis concerns an EC utterance with non-assertive segments, replicated from (94):

(94) [S_1: Lower your body to the floor] *but* [S_2: but do not touch it.]

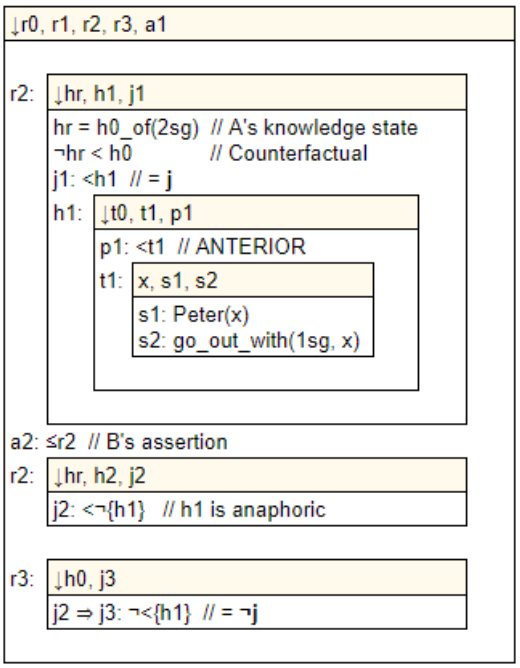


1. The overt judgmental content of S_1 (j_1) is added to the deictic epistemic context (E_2), which is centered by h_0.
2. The overt judgmental content of S_2 (j_2) is added to E_2.
3. a_2 (the assertion of r_2) entails j_3 (**= *¬j***), which is anaphoric to a content from a counterfactual context. Since h_3 is not in discourse yet, it will be accommodated.
4. The counterfactual context (E_1) is created, which is centered by h_c.
5. j_1, which is also accessible in E_1, potentially implies j_4, (**= *j***), where h_3 is accommodated.

Finally, below is an analysis concerning a sentence-initial use of *but* in a dialogue, replicated from (75):

(75) A. [S1: You went out with Peter last night.]

B. *But* [S_2: I didn't go out with him.]



1. A counterfactual epistemic context (E_1) is created, of which the center (h_r) is the current knowledge state of the other interlocutor (A), which is retrieved from the communicative context by the h_0*_of()* function. The overt judgmental content of S_1 (j_1 **= *j***) is added to E_1.
2. The overt judgmental content of S_2 (j_2) is added to the deictic epistemic context E_2, which is centered by h_0. h_1 in j_2 is anaphoric to a content from E_1.
3. j_2 entails j_3 (**= ¬*j***), by Axiom 6.

Analyses for the discourse-initial uses of *but* and its uses with profiled anchoring relations are not given here due to space limitations. The analyses suggested above will hopefully point to how these can be handled too.

6. Discussions and conclusion

I have proposed a counterfactuality-based specification for *epistemic contrast* (EC) in a dynamic semantic framework that incorporates ordered frames in the domains of time, belief, and volition. This specification covers all the monological, dialogical, and discourse initial uses of EC markers, as well as manifestations of EC with non-assertive segments. Rather than using nonmonotonic logic, I proposed a theoretically more parsimonious account that recognizes only one type of logical implication with communicative variants. In this account, EC-clauses target and deny judgments –rather than merely propositions– that can be directly expressed or contextually implied.

The analyses presented in this paper suggest that the standard Frege-Grice analysis of S_1 *but* S_2 as asserting a simple conjunction of two propositions should be qualified. When S_1 directly expresses the content denied by S_2 (j), the overt contents of S_1 and S_2 are not conjoined in the same local epistemic context. Furthermore, since a local conjunction of incompatible contents is never at stake in felicitous uses of EC, a contradiction never arises at all. Therefore, neither nonmonotonic logic nor any other defeasible or weak implication mechanism is needed in the specification of EC.

The current account is closest in spirit to those that relegate the denied content from S_1 to (a) non-actual world(s) (Francez, 1991/1995; Meyer & van der Hoek, 1991/1996; Winter & Rimon, 1994; Toosarvandani, 2014). It is particularly compatible with Francez's proposal, which invokes two different 'worlds of evaluation'. Yet, Francez does not specify how these worlds are related and does not even yield an asymmetry between S_1 and S_2. The current proposal, by identifying E_2 as the *current*

epistemic context (reference state) and E_1 as being *counterfactual* with respect to E_2, yields the empirically required asymmetry. This asymmetry also accounts for the 'argumentative superiority' of S_2, since this requirement obviously makes E_2 more 'realistic' as compared to E_1.

Meyer & van der Hoek (1991/1996), Winter & Rimon (1994) and Toosarvandani (2014) all posit some kind of epistemic modality as an inherent component of EC. Yet this is not justified by cases where the denied content is categorical, as in the examples (65), (75-78). Meyer & van der Hoek and Toosarvandani also argue that the relevant content from S_1 holds only in normal or stereotypical worlds, but this is not always the case, as exposed in Sections 2.5.4 and 5.1. Winter & Rimon (1994, pp. 388-389) also suggest that S_2 is evaluated in an information state (s) that grows from a previous one (s'). Yet it is shown here that E_1 and E_2 can differ in many other ways: E_1 can be associated with a previous knowledge state of the speaker, as in (77), but it can also be relative to the addressee(s), as in (68), to other people, as in (65), or to a general perspective, as in (66).

Among the accounts based on contextual alternatives, the specification provided in (103) is most similar to that of Umbach (2005), in which the implication from S_1 follows from a set of background assumptions that exclude the information contributed by S_2. However, Umbach's proposal allows logical inconsistency, since contradictory judgments hold simultaneously in a given epistemic context. The present account avoids this by placing the denied content in a counterfactual context.

The analytic framework used here distinguishes temporal, epistemic, volitional, and actional levels, in addition to the content level, in the semantic structure of utterances. As such, it is comparable to accounts that recognize different levels (Sweetser, 1990; Lang, 2000; Crevels, 2000; Lagerwerf, 1998) or types (Robaldo & Miltsakaki, 2014) of contrastive linking. In fact, judgments as defined here can be implied by temporal or causal relations, or relations that hold in a potentially infinite number of different source domains at the content level. Yet, this is not taken here to indicate that EC itself can operate at different semantic levels. Like implication or denial, the EC relation is defined over judgments; hence eventually operates at the epistemic level.

The possibility of contrasting overtly expressed contents from S_1 and S_2 (Sections 4.3.1-4.3.4) suggests that there is nothing inherently inferential in the conventional meaning of EC markers. Yet EC interacts with various pragmatic phenomena (e.g., direct expression vs. contextual implication; new, deictic vs. anaphoric reference; contextually salient questions in discourse, etc.), and these interactions obviously call for further investigation. The implications of the current analysis for discourse relations other than EC may also be worth exploring in future studies.

In conclusion, I tried to present a general semantic-pragmatic specification for EC, which also solves the problem of contradiction between the two segments of a contrastive utterance: S_2 in an EC-utterance places an accessible judgment into a counterfactual epistemic context rather than removing or suspending it. In this novel dynamic characterization, neither implication nor epistemic modality are essential ingredients of EC, but they typically interact with it.

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