Presupposing the Logical Description Grammar of (van Leusen and Muskens 2003), we present an analysis of corrections in discourse. In line with (Asher 1995) it is argued that the defining characteristic of corrections is *incompatibility*: corrections require the presence of a contextually supported alternative to the corrective claim such that the two are inconsistent in the context of interpretation. A large range of accommodation and pragmatic strengthening effects is accounted for in terms of this requirement.

We examine the relation between incompatibility, the update effect of corrections, felicity conditions on informative, consistent, and local updating, and focus interpretation. Corrections induce nonmonotonic updates of the context. Allowing the update effect of discourse contributions to be underspecified, we argue that the nonmonotonicity of updates induced by corrections is a consequence of the interaction of the incompatibility requirement and the general felicity conditions on updating. Furthermore, we propose that under certain assumptions about focus interpretation, incompatibility in corrections can be taken to be established via information structural constraints.

**Introduction**

In this paper we focus on corrections in discourse, and investigate their relation to the context of interpretation. Consider

(1)  
A: *Anna ate spaghetti.*  
B: *No, she ate a salad.*

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Participant B’s contribution is a correction. His utterance serves to provide an alternative (Anna ate a salad) for what participant A just claimed (Anna ate spaghetti). By uttering the correction participant B conveys that in his view the contextually available alternative is incorrect and must be replaced by the alternative he provides himself. The correction can be paraphrased as ‘Anna did not eat spaghetti, she ate a salad.’ Not only are the two alternatives contrastive in the sense that in an ordinary context eating spaghetti and eating a salad are distinct or complementary activities, they are also incompatible in the sense that according to participant B, in the situation under consideration only one of these activities took place: if Anna ate a salad then she did not eat spaghetti, and the other way around.

What is it, that makes B’s utterance into a correction? No discourse contribution carries a label on its back saying it is a correction, or an answer to a question, or anything else. A language user will hypothesize that a given discourse contribution has a particular function on the basis of what he presupposes to be the defining characteristics of different types of contributions. We shall argue, in line with (Asher 1995), that the main defining characteristic of corrections is incompatibility: for a discourse contribution to be felicitous as a correction, there must be a contextually supported alternative to the corrective claim such that the two are inconsistent given the context of interpretation.

Given the complexity of the data, and in the light of the question what felicity conditions and constraints make up a theory of discourse interpretation at all, it is not obvious that incompatibility is essential for corrections. Adopting a dynamic perspective on discourse semantics, we aim to provide an examination of the relation between the incompatibility requirement, the update effect of corrections, and various parameters governing the interpretation of discourse in general, such as conditions on informative and consistent updating, and focus interpretation. We take for granted that corrections and denials induce nonmonotonic updates. The analysis is couched in a discourse model, presented in (van Leusen and Muskens 2003), which combines discourse grammar with underspecified representations. The model uses a compositional DRT for semantic representation language, and allows for monotonic and nonmonotonic updates of the context of interpretation.

After some discussion of the linguistic properties of corrections in section 1 and a brief introduction to the discourse model in section 2, we start our analysis with an investigation of the role of some general conditions on felicitous updating in the interpretation of corrections in section 3. The impact of conditions on consistent and informative updating is discussed, and a new felicity condition, on ‘local’ updating, is introduced.
In section 4 it is argued that corrections cannot be fully characterised in terms of the interaction of these conditions alone, and it is proposed that corrections come with an additional felicity condition, the incompatibility requirement. Investigating the predictive power of this requirement, however, we find that it not only accounts for what was left to explain, but also for strengthening and accommodation effects previously explained in terms of the consistency condition. It is subsequently argued that this overlap in predictive power disappears when the monotonicity property of updates is allowed to be underspecified a priori. In the case of corrections, nonmonotonicity simply follows from the interaction of the characterising conditions of correction and the felicity conditions on updating included in the discourse theory.

In section 5 the relation between information structure, contrast and incompatibility in corrections is briefly discussed. It is suggested that under certain assumptions about focus interpretation, incompatibility in prototypical corrections can be taken to be established via information structural constraints. The paper is concluded in section 6.

1 The Linguistic Form of Corrections

How do corrections look like? Consider the following example, in which capitals indicate that a lexeme carries a pitch accent, and brackets indicate that a constituent is focused.¹

\[(2) \quad \text{A: John washed the dishes.} \]
\[ \quad \text{B: He didn’t [wash the DISHes], he [cleared up the ROOM].} \]

The utterance made by participant B is a prototypical correction. It is a complex statement consisting of an explicit denial and a continuation, which we shall call the corrective claim. The corrective claim provides an alternative for the information denied by the denial. That information, the proposition ‘John washed the dishes’ in (2), must be, in some sense to be made more precise later, ‘present’ in the discourse context. We shall refer to it as the antecedent of the correction. We use the term denial here just for negative statements which serve to reject contextually available information but which, intuitively speaking, do not offer an alternative for it. Denials contain at least one negation or negative operator.

¹We presuppose familiarity with one or more of the currently available theories of focus interpretation or information structure theory, see e.g. (Kriška 1991), (Rooth 1992), (Steedman 1993), (Valkuví and Vilkuna 1998), or (Kuppevelt 1995).
As for the information structure of the correction in (2), it may be observed that the focus in the denial corresponds to what is, intuitively speaking, the offensive material in the antecedent of the correction and that the focus of the corrective claim corresponds to the value that is the correct one in the eyes of the speaker. The two foci are contrastive. The particular intonation contour and type of pitch accent used in the denial and the corrective claim trigger specific constraints on their interpretation; we will not zoom in on this, but presuppose a theory of intonation along the lines of (Pierrehumbert and Hirschberg 1990). In the rest of this paper we only mark the information structure of examples when this facilitates understanding them.

Various parts of a correction can be left out when what is present is sufficient to determine the corrective force of the contribution. For one, the denial need not be overtly expressed, and may just be marked by the presence of the discourse particle ‘No’ as in the following example.

(3)  
A: *John washed the dishes.*
B: *No, he cleared up the room.*

In fact, both ‘No’ and the overt denial can be left out:

(4)  
A: *The Argentinians won the match.*
B: *The French did!*

Even the corrective claim can be left out:

(5)  
A: *Some of our M.P.’s are completely incompetent.*
B: *I wouldn’t say [*SOME] are incompetent.*

Sharing a common prejudice that our Members of Parliament are not very competent, we readily infer that participant B means to convey that *all* of them are incompetent. The denial in (5) features a L+H pitch accent, presumably L*+H. According to (Pierrehumbert and Hirschberg 1990) L+H accents evoke the salience of a scale (which would be ‘some < all’ in the case of (5)) and L*+H is often used to convey lack of speaker commitment to a given scalar value. Thus, prosodic features support the inference of the corrective claim.

Finally, corrections in English can also be expressed by means of a ‘not ... but ... ’ coordinating construction, as in

(6)  
A: *John washed the dishes.*
B: *He didn’t wash the dishes but cleared up the room.*
It is clearly intended here that John cleared up the room *instead of* washing the dishes. Some languages distinguish between connectives or constructions for corrective and contrastive use. For example, German would use `nicht ...sondern ...’ in the above case and reserve `aber’ for noncorrective contrast. Spanish similarly distinguishes between ‘no ...sino ...’ and ‘pero’, see e.g. (Rudolph 1996). English, however, uses ‘but’ both in the corrective ‘not ...but ...’ construction and as a connective conveying various types of contrastive relations.

Consequently, we must be careful to distinguish combinations of denial and corrective claim from *contrastive list* constructions like the following:

(7) A: *Did John wash the dishes and clear up the room?*

    B: *He didn’t wash the dishes, but he did clear up the room.*

In this case, it is not intended that John cleared up the room instead of washing the dishes. He might have done both, but as it turned out he only cleared up the room. Although one conjunct of the construction is a denial and the other a contrastive alternative to what is denied, the contrastive alternative does not function as a corrective claim relative to what is denied. See (Umbach 2001) for an illuminating discussion of conjunctions with ‘but’ and their interaction with information structure.

The corrections discussed in this section are part of a larger class of contradictory discourse contributions consisting of a denial and a continuation which is not necessarily a corrective claim. The continuation may be anything that can be coherently interpreted relative to the denial. For lack of space we will not talk about this larger class of discourse contributions, and concentrate on contributions containing a corrective claim. These are commonly viewed as prototypical cases of correction, and as such must form the basis of any analysis of correction.

2 Discourse Grammar and Underspecification

The discourse model that we presuppose can be described as a discourse grammar captured in an underspecification formalism. It is a so-called *Logical Description Grammar* for discourse, defined in (van Leusen and Muskens 2003), building on (Muskens 2001) and (Gardent and Webber 1998, Duchier and Gardent 2001).

The discourse model distinguishes two levels of analysis: the level of possibly underspecified *discourse descriptions* and the level of the annotated *tree structures* or *models* that ‘fit’ or verify these descriptions. For
any given stretch of discourse a discourse description is generated. This is a set of statements in a logical language describing the syntactic, semantic, and to some extent pragmatic relations characterising the discourse processed so far. Discourse descriptions figure as ‘underspecified representations’ of the discourse. They represent the language user’s knowledge of the discourse processed so far. The discourse grammar itself is also a set of logical statements, a logical theory representing the grammatical knowledge of the language user.

A language user may reason about the models or tree structures that verify a given discourse description given the discourse grammar. The tree structures feature as fully specified representations of the discourse processed so far. Since a discourse description can have more than one verifying tree model, the syntax and semantics of the discourse may remain underspecified. What is particularly relevant for this paper is that the discourse meaning, represented by the semantic value of the root in the verifying tree models, can be underspecified.

Discourse is processed incrementally and every discourse contribution is taken to induce an incrementation of the discourse description built up so far. These incrementation steps are monotonic, even when the discourse contribution concerned is a correction or a denial. An incrementation step never leads to the retraction of a statement from the discourse description, it only leads to a further specification of the tree model of the discourse under consideration. When we refer to corrections as nonmonotonic updates of the context of interpretation, we are referring to their update effect on the discourse meaning. Corrections induce nonmonotonic updates in the sense that there are statements φ entailed by the discourse meaning which, after the correction has been processed, are no longer entailed by the resulting discourse meaning.

In this paper we are only concerned with the update effect of discourse contributions on the discourse meaning, and leave a discussion of the interaction with discourse syntax for another occasion. We will use the term context or context of interpretation to refer to what is called the discourse meaning in (van Leusen and Muskens 2003). Contexts, like discourse meanings, can be underspecified. Any given discourse contribution which is interpreted relative to a context C induces an update C[u] of the context, where u denotes the semantic content of the contribution. We use C↑[u] and C↓[u] to distinguish monotonic updates from nonmonotonic ones (‘downdates’). When the monotonicity property is underspecified we use C[u]: this can be either a monotonic or a nonmonotonic update.

The context is built up from the contents of what participants say in a
discourse. As participants may disagree on certain points, it is not necessarily the case that all of the contextual information is believed or supported by each of the participants. Rather, at any point in a conversation the context represents what is currently proposed for acceptance as common ground by the most recent speaker. The discourse model does not tell directly how a given contribution changes the attitudes or commitments of the participants in a given conversation, but it defines, somewhat more abstractly, pre- and postconditions of acceptance on discourse contributions made relative to arbitrary contexts of interpretation.

The semantic representation language employed in (van Leusen and Muskens 2003) is a fine-grained variant of compositional DRT. Every discourse constituent comes with a semantic value and these values are in CDRT format. In particular, discourse meanings and sentence meanings are DRSs. Correspondingly, in this paper, contexts are DRSs, and the semantic contents of discourse contributions are DRSs as well. Furthermore, we make use of some operations on DRSs defined in (van Leusen and Muskens 2003). $K \oplus K'$ denotes the merge of two DRSs $K$ and $K'$, $K \sqsubseteq K'$ denotes the inclusion of a DRS $K$ in a DRS $K'$, finally $K \vDash K'$ denotes that a DRS $K$ entails a DRS $K'$.

Monotonic updates of the context can simply be defined in terms of the merge operator: $C \uparrow[u] = C \oplus u$. But what about nonmonotonic ones? Following (Gärdenfors 1988) we assume that various conditions must be satisfied for an update to be a succesful revision of the context of interpretation. Gärdenfors’ notion of revision corresponds to our $C\vDash[u]$, so what we are talking about here are the appropriateness conditions of $C[u]$.

Obviously, we want $u$ to be accepted in the context, so the output context should entail $u$: $C[u] \vDash u$. Furthermore, the update should preserve consistency. In case $u$ is not consistent with $C$, information must be retracted from $C$ so that updating the reduced context $C'$ with $u$ is consistent. On a principle of informational economy, we do not want to retract more information from $C$ than is necessary to prevent inconsistency, hence $C'$ must be maximal. Using the inclusion relation $\sqsubseteq$ to model retraction, we define: $C[u] = C' \oplus u$, for a $C'$ such that $C' \sqsubseteq C$ and $C' \oplus u$ is consistent, and there is no $C''$ such that $C' \sqsubseteq C'' \sqsubseteq C$ and $C'' \oplus u$ is consistent.

In principle retraction is nondeterministic: there may be more than one maximal DRS $C'$ included in $C$ which is consistent with $u$. This is unproblematic in our description grammar formalism: the update effect of a discourse contribution can be underspecified. This is just one form of am-

\[3\vDash \] is an object level approximation of $\vDash$. 

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bigness or semantic underspecification allowed by the grammar. When $C$ is consistent with $u$ there is a single maximal $C'$ for which the conditions hold, namely $C$ itself. In this case the update is monotonic. Otherwise, the update is nonmonotonic; it follows that $C \upharpoonright [u]$ if and only if $C \vDash \neg u$.

Belief revision theory as proposed in (Gärdenfors 1988) focuses on logical or epistemic constraints on revision and retraction. Approaching the matter from a discourse semantic point of view, these constraints can be complemented by various linguistic conditions on appropriate nonmonotonic updating.

In the context of our discourse grammar formalism, one of these conditions is that the reduced context $C'$ must be a proper DRS. A nonmonotonic update should not lead to the unbinding of previously bound discourse referents. Furthermore, there is a strong discourse syntactic constraint on the contextual information that comes in for retraction: only information that is locally available to an update given its attachment to the discourse tree structure can be retracted. The ‘locality condition’ which will be specified in section 3.3 can be seen as the semantic reflection of this constraint. What matters at this point is that the description grammar formalism is an open, constraint-based system, which supports the integration of the logical or epistemic constraints and the linguistic ones in a single discourse theory.

3 General Felicity Conditions at Work

So what is it, that makes a discourse contribution into a felicitous correction? Starting out from the assumption that corrections in one way or another involve a denial of a contextually available antecedent, it could be claimed that all we need to characterise corrections is an account of general felicity conditions on appropriate updating, and that whatever is left to explain then is a matter of interaction with information structural constraints, triggering contrast. Given the complexity of the data it is not at all clear beforehand that an additional felicity condition like incompatibility is necessary to characterise corrections. Hence in this section we investigate how far we can get without the incompatibility condition.

As a preliminary we identify two properties that are specific for corrections. The first is that a correction requires a contextually supported antecedent (section 3.1), the second that its interpretation either explicitly or implicitly involves a denial of the antecedent (section 3.2). After that we

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4Compare treatment of denial as ‘reverse anaphora’ in DRT proposed in (van der Sandt and Maier 2003).
turn to the predictions triggered by three general felicity conditions in the domain of corrections. Two of these are **consistency** and **informativity** (section 3.4). These are well-known conditions on felicitous updating, which can be traced back to the Gricean maxims on cooperative conversation. In addition we introduce **locality** (section 3.3), which might be seen as a form of ‘relevance’ particularly suited to discourse grammatical surroundings.

### 3.1 The Context Provides an Antecedent

For a correction to be felicitous the context of interpretation must provide a suitable antecedent. The following example illustrates this.\(^5\)

\[\text{(8)}\]

\[\begin{align*}
\text{A: } & \text{I'm going home, I don’t feel well.} \\
\text{# B: } & \text{No, he left this morning.}
\end{align*}\]

In the context established by participant A’s utterance in (8) it is not clear what the correction uttered by participant B is meant to correct. It might be the propositional content of the preceding utterance but then we fail to make sense of the corrective claim. No suitable antecedent is available, nor can it be accommodated (Lewis 1979) without some highly specific priming of the context of interpretation in (8). Hence, the correction is infelicitous.

What it means for a proposition to be a ‘suitable’ antecedent will be captured indirectly through the properties and felicity conditions to be specified further on, each of them constraining the relation between the antecedent and the corrective claim in one way or another. A more tricky issue is what it means for the context of interpretation to ‘provide’ an antecedent. In the examples discussed so far, the antecedent of the correction is simply the semantic content of the preceding utterance. However, as the following example shows, this is not necessarily so.

\[\text{(9)}\]

\[\begin{align*}
\text{A: } & \text{John has got a nice Labrador.} \\
\text{B: } & \text{As far as I know, he hasn’t got a dog, he’s got a cat.}
\end{align*}\]

The antecedent of the correction (‘John has got a dog’) is an **entailment** of the preceding statement in the context of interpretation.

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\(^5\)We use # to indicate maximal infelicity, i.e., although it need not be completely impossible to accommodate a context which supports an acceptable reading of the utterance under consideration, it is very hard to do so. ? indicates that it takes an effort to ‘get’ an acceptable reading but it is certainly available given the accommodation of a suitable context.
Apart from entailment, various forms of pragmatic inference may take part in producing the antecedent. The antecedent can be a presupposition or an implicature triggered by the preceding utterance, the strengthening of the semantic content of the preceding utterance with e.g. a scalar implicature, or just an implicature on its own. It can also be a proposition made ‘salient’ or ‘topical’ through the preceding utterance. It can even be some aspect of the linguistic form of the preceding utterance (so-called metalinguistic negation or denial). Finally, propositions open for correction can be introduced in the context of interpretation through (nonlinguistic) occurrences in the utterance situation. All of this is extensively discussed in e.g. (Horn 1989, van der Sandt 1991, Carston 1996, Geurts 1998) and (van Leusen 1997).

Thus, the idea that the context of interpretation entails the antecedent of the correction can only be maintained if we accept that contexts can be strengthened through various forms of pragmatic inference and accommodation. Using $C \models^a a$ to indicate that a context $C$ entails $a$ given potential pragmatic strengthening of $C$, we formulate the first of our felicity conditions of correction as follows:

[ant] For any correction updating a context $C$ there is an antecedent $a$ such that $C \models^a a$.

Remember that in our discourse theory, contexts are underspecified semantic objects. The possible pragmatic strengthenings of a context of interpretation are viewed as potential specifications of the underspecified context. In other words, the context is ambiguous between strengthened and unstrengthened versions. Corrections, by requiring the presence of a suitable antecedent, have a disambiguating effect: pragmatic extensions which do not provide a suitable antecedent are eliminated as potential models of the context. When there is no pragmatic extension relative to which the requirement can be satisfied, the correction is predicted to be infelicitous.

3.2 Denial of the Antecedent

In one way or another all corrections involve a denial of the antecedent. This is obvious for corrections containing an overt denial and corrections headed by the discourse particle ‘No’. Thus, the relevant testcases for this claim are corrections like the following, containing neither an overt denial nor the
particle ‘No’.\footnote{The particle ‘No’ deserves more attention than we can give it here. Basically, ‘No’ represents, or is combined with a negative sentence, and addresses a yes-no issue. It appears not only with corrections, but also with negative answers to yes-no questions, and confirmations of negative statements. When it features in a corrective discourse contribution, it marks the presence of a denial and can be viewed as an elliptic denial.}

(10) A: *The Argentinians won the match.*

B: *The French did!*

In the context of (10) the correction can be paraphrased as ‘the Argentinians did not win the match, the French did.’ So although it is not explicitly expressed, a denial is part of what the correction means in its context.

For the time being we will simply assume that a denial of the antecedent is part of the semantic content of a correction in context, whether it is overtly present or not. This is noncommittal in the sense that it does not say anything about the particular relation between the denial and the corrective claim—except that they are both there. Later on we shall argue that there is more to it than that, and that the corrective claim *implies* the denial of the antecedent. The analysis will then be strengthened with the incompatibility condition. The treatment of cases like (10) can subsequently be simplified. At this point, however, we define the update effect of corrections as follows.

**update effect** The update effect of a correction relative to a context $C$ and an antecedent $a$ is $C \downarrow [\neg a] \uparrow [b]$, where $\neg a$ corresponds to the content of the denial when it is overtly present, and $b$ to the content of the corrective claim when overtly present.

This says that corrections are complex updates, first updating the context of interpretation nonmonotonically by the denial of the antecedent and subsequently updating the resulting context monotonically by the semantic content of the corrective claim. The denial is identified as the cause of the nonmonotonicity. It induces the retraction of the antecedent and the acceptance of its negation. In the context established by the denial the corrective claim induces the acceptance of its semantic content. Notice that the retraction of the antecedent does not necessarily imply that the whole of the antecedent is removed from the context. It means that sufficient information is removed from the context to ensure that the antecedent is no longer entailed by it.
3.3 Locality

Consider again (1), here repeated as (11)

(11) A: Anna ate spaghetti.
    B: No, she ate a salad.

The correction can be paraphrased as ‘Anna did not eat spaghetti, she ate a salad’. Crucially, the correction only makes sense if participant B is talking about the same spatio-temporal situation as participant A, e.g. a particular evening when A, B and Anna were having dinner in an Italian restaurant. Participant A claims that in that situation Anna ate spaghetti, while B claims that what she ate on that occasion was a salad.

The phenomenon that a discourse contribution ‘anchors to’ or ‘is about’ some specific situation or some specific type of situation might be viewed as a form of domain restriction, see for example (von Fintel 1994). There is an implicit domain of situations which are relevant to the contribution and which are partially described by it. The phenomenon is not restricted to corrections but is shared by all types of discourse contributions.

It is important to notice that these situations or settings are generally speaking specific, and must be ‘neither too small nor too big’ for the contribution to make sense in the discourse context relative to which it is interpreted, compare discussion in (Krifka 1989). Although for any given example it can be made clear in an informal discussion approximately what ‘the right size’ of the situation is, its size is essentially underspecified. The only thing a formal semantics of discourse interpretation can do to capture it, however fine-grained the semantics is, is to set limiting conditions to the size of the situation. It can do so by positioning it relative to other situations assumed to be present in the discourse context.

For example, in the case of a correction, the antecedent and the corrective claim are rival descriptions of a possibly complex eventuality within some common local setting. The corrective claim is implicitly anaphoric to a locally relevant setting or type of setting in which the antecedent is situated as well. Corrections do not add any further structure to that setting. Neither do they ‘move’ to a different local setting.\(^7\)

\(^7\) Not even when spatio-temporal or modal properties are disputed. Compare

(12) A: Anna ate in ‘l’Industrie’.
    B: No, she ate in ‘da Paolo’.

B is talking about the same local setting as participant A in the sense that they both describe the restaurant where Anna ate on a given occasion, whichever it may be. They
Other discourse contributions may behave differently in this respect. For instance, list constructions zoom in on a common local setting. Compare

(13)  
A: *Anna ate spaghetti.*
B: *She ate a salad too.*

Clearly, participant B is referring to the same local setting, e.g. a dinner in an Italian restaurant, about which participant A is talking. Participant B’s statement adds information about that situation: there wasn’t just an event of Anna eating spaghetti, but also one of Anna eating a salad. Unlike a correction, the list construction in (13), expressed by ‘too’, adds referential structure to the common local setting. It distinguishes between two subsumed but distinct spatio-temporal settings in which, respectively, Anna ate spaghetti, and Anna ate a salad. Hence, the two statements cannot be descriptions of one and the same eating event. This carries over to the contrastive list construction discussed in section 1.

In order to account for these facts we propose to include a felicity condition on ‘locality’ in the discourse theory. The condition links a discourse contribution to the contextual information which is specifically relevant for its interpretation. Presupposing an eventuality-semantic variant of CDRT we formulate it as follows.

\[ \text{loc} \] For a context \( C \) and a discourse contribution resulting in an update \( C[u] \) there is a local spatio-temporal-modal setting or type of setting \( s \) such that the semantic content of the contribution is situated in \( s \) and \( s \) is bound in \( C \). We indicate this by \( C[u^s] \).

We envisage an implementation in our grammar formalism in which every discourse contribution links up anaphorically to the relevant local setting or type of setting. The binder must be an accessible discourse referent declared in \( C \). Discourse syntax governs the selection of the binder, and resolves the anaphor to the local setting of the discourse unit in the discourse parse tree to which the tree structure representing the contribution attaches. In the case of corrections it enforces that the antecedent and the corrective claim are situated in the same local setting, so we have \( C \downarrow [\neg a^s] \downarrow [b^s] \). The interaction with constraints specific to the particular types of discourse contributions accounts for the differences between e.g. corrections and list constructions.

identify it differently by referring to different restaurants.
The effect of the locality condition is that it forces other felicity conditions to apply to locally situated and hence highly specific contextual information. This is desirable, since otherwise these conditions would be much too strong. For example, for the correction in (11) the informativity condition (see below) would require that the context does not support the existence of any event of Anna eating a salad. In interaction with the locality constraint this is weakened to the more reasonable requirement that the context does not support the existence of an event of Anna eating a salad within the relevant local setting.

3.4 Consistency and Informativity

In dynamic approaches to discourse interpretation, the Gricean maxims on quality and quantity usually turn up in the guise of conditions on consistent and informative updating. All contexts of interpretation must be consistent, and every update must add new information to its context of interpretation. We formulate these felicity conditions as follows. For a context $C$ and a discourse contribution resulting in an update $C[u^s]$,

$C$ and $C[u^s]$ must be consistent.
$u^s$ must be informative relative to $C$: $C \models u^s$.

What is the impact of these conditions on the interpretation of corrections? Take the consistency condition. For corrections it implies, among more, that $C \vDash \neg a^s$ must be consistent. Since $\models b^s$ is monotonic it follows that the semantic content of the corrective claim must be consistent with the denial of the antecedent in context. So whatever the antecedent is, it cannot be a logical consequence of the corrective claim in the relevant context: $C \vDash \neg a^s \models b^s \Rightarrow a^s$.

There is a class of strengthening and accommodation effects which can be explained in terms of this constraint. Consider the following example. Two potential readings of the correction are given in (14a) and (14b). One of these is marked as unacceptable by means of $\dagger$.

(14) A: Susan bought a car.
? B: No, she bought a Ferrari.

a. $\dagger$ ‘Susan did not buy a car, she bought a Ferrari.’

b. ‘Susan did not buy an ordinary car, she bought a Ferrari’.

In a standard everyday context a Ferrari is a car. So if in the relevant local setting Susan bought a Ferrari, it follows that she bought a car. Accepting
that Susan bought a Ferrari in a context in which it is denied that she bought a car results in an inconsistent context. Thus, the consistency requirement is flouted. This explains why reading (14a) of the correction is unacceptable in ordinary contexts. The reading would be acceptable in a context in which it does not follow, at least not in the relevant local setting, that a Ferrari is a car. Since that kind of context is rather exceptional, however, it takes a strong effort to accommodate it, and the reading is hardly available.

In contrast, the correction is felicitous for the reading in (14b). This reading selects a scalar interpretation of A’s statement, in which it is pragmatically strengthened to mean ‘Susan bought an ordinary car’. This then serves as the antecedent. In ordinary contexts, a Ferrari is not just any car but a very expensive, fast, and glamorous one, an extreme on the scale of cars to be coveted. So if Susan bought a Ferrari it does not follow that she bought an ordinary car. Hence the consistency condition is satisfied. Notice in passing that the informativity requirement is satisfied in both readings.

There is another class of strengthening and accommodation effects, occurring with corrections in which, conversely, the corrective claim threatens to be a logical consequence of the antecedent in the context. These strengthening effects cannot be explained in terms of the consistency condition, however. Consider

\[(15) \quad A: \text{Mary invited Al, Tim and Joe.} \]
\[? \quad B: \text{No, she invited Tim and Joe.} \]

a. ‘Mary did not invite Al, Tim and Joe, she invited Tim and Joe’.
b. ‘Mary did not invite Al, Tim and Joe, she invited just Tim and Joe’.

In the felicitous reading of the correction paraphrased in (15b) Tim and Joe exhaust the individuals invited by Mary in the local setting under consideration. The corrective claim is pragmatically strengthened to mean ‘Mary invited Tim and Joe and she invited nobody else.’ In fact both the antecedent and the corrective claim are interpreted exhaustively: the appropriate reading can also be paraphrased as ‘The (total of) individuals Mary invited were not Al, Tim and Joe, but Tim and Joe.’ So it seems fair to say that in the felicitous reading both the context, providing the antecedent, and the corrective claim are pragmatically strengthened.

The reading in (15a), in which neither the context nor the corrective claim is pragmatically strengthened, is infelicitous. Since (15a) is perfectly consistent this cannot be accounted for in terms of a violation of the consistency condition. Intuitively, the problem with (15a) seems to be that the corrective claim does not provide any new information relative to the
antecedent; it is not clear in what sense replacing the antecedent by the semantic content of the corrective claim will make a difference. In the felicitous reading (15b) replacing the one by the other does make a difference. As it turns out, however, the informativity condition as it is formulated above explains neither the unacceptability of (15a) nor the strengthening effects in (15b).

For corrective claims \([\text{inf}]\) requires \(C \downarrow \neg a^* \not\vdash b^\ast\), but this fails to capture the required link between the antecedent \(a\) and the corrective claim \(b\). The reason is that the context of interpretation of the corrective claim, i.e. \(C \downarrow \neg a^*\), does not entail the antecedent any longer. What we need to account for the strengthening effects in (15) is informativity of the corrective claim relative to the antecedent in the original or ‘global’ context of interpretation \(C\). An additional clause in the informativity condition saying that in the case of corrections \(C \not\vdash b^\ast\) would do the job. We leave the matter pending now. As will become clear in the next section, the strengthening effects illustrated by (15) can be accounted for in terms of the incompatibility condition.

In sum, we have seen that the consistency condition explains a certain type of strengthening and accommodation effects in corrections, namely those in which, otherwise, the antecedent would be a logical consequence of the corrective claim and the speaker of the correction, by denying the antecedent, would contradict himself. Similarly, as the reader may check for himself, the consistency condition constrains the resolution of anaphora occurring in corrections by excluding resolutions that would result in inconsistent readings. Furthermore, while there is a class of strengthening effects which seem to call for an explanation in terms of informativity, the informativity condition as formulated above does not account for these effects.

### 4 The Missing Ingredient: Incompatibility

In the preceding section the impact of general felicity conditions on local, consistent and informative updating in the domain of corrections was discussed. As a preliminary, it was assumed that corrections require a contextually supported antecedent and that the update effect of a correction consists in a nonmonotonic update of the context of interpretation by the denial of the antecedent followed by a monotonic update by the corrective claim. The analysis explains certain strengthening and accommodation effects occurring in corrections, but it leaves some other strengthening effects unaccounted for.
A brief consideration of our bench-mark example is sufficient to show that there is still some ingredient missing from our characterisation of corrections in context.

(16)  A: Anna ate spaghetti.
     B: No, she ate a salad.

Intuitively speaking there is a specific relation between the antecedent of the correction and the corrective claim. In interpreting the correction we accommodate that there is a unique event of Anna eating a particular dish within the local setting. Participant A claims that that dish was spaghetti, participant B claims that it was a salad. Since, in normal contexts, spaghetti and a salad are different dishes, the two claims are incompatible. The antecedent and the corrective claim are interpreted as rival, or mutually exclusive claims about some common local setting.

How does this come about? For one, it is not the locality condition which enforces this interpretation. As a consequence of the locality condition the corrective claim and the antecedent are situated in a common local setting, e.g. a dinner in a restaurant at which A, B and Anna were present. Even when the local setting referred to is just the first course of the dinner, however, it is not ruled out that (for some odd reason) Anna had both spaghetti and a salad as a first course. Furthermore, the corrective claim is informative relative to the context updated with the implicit denial of the antecedent and it is consistent with it. Hence, the interpretation of the antecedent and the corrective claim as rival descriptions of a single event within the common local setting must be due to some further constraint.

In accordance with (Asher 1995)\(^8\) we propose that the missing ingredient is incompatibility: for a correction to be felicitous, the corrective claim must be inconsistent with the antecedent in the context of interpretation.

Exploring the explanatory power of the incompatibility condition (section 4.1) we will find that it gives us more than we have bargained for in the sense that it not only accounts for the incompatibility effect featuring in (16) and for the strengthening effects left pending in the preceding section.

\(^8\)Asher provides a treatment of correction within Segmented DRT, a version of DRT which represents the topical structure of discourse. In his view, “...If we accept B’s response [a correction], we are not just accepting what he says, but we are also negating what A said. So Correction(\(\alpha, \beta\)) should entail \(\lnot^B \alpha \land^B \beta\)” (\(\alpha\) and \(\beta\) are constituents of a SDRS). The impact of this requirement is comparable to our update effect. In addition, Asher’s definition of the semantics of corrections includes the requirement that \(\beta\) is inconsistent with \(\alpha\). That corresponds to our incompatibility condition.
but also for all the strengthening and accommodation effects previously explained in terms of the consistency condition. Although this does not lead to incorrect predictions, it is unwanted as a form of theoretical over-kill. We subsequently argue (section 4.2) that the overlap in predictive power disappears when the assumption that the monotonicity property of updates is given beforehand is dropped, i.e., when the monotonicity property is underspecified. The nonmonotonicity of the updates induced by corrections is a consequence of the interaction of the collected felicity conditions.

4.1 Adding the Incompatibility Condition

We add the following requirement to our collection of felicity conditions.

\[ \text{inc} \] For a context \( C \) and a correction resulting in an update of \( C \):

\[ C[b^s] \not\models a^s, \] where \( a \) and \( b \) are as before.

This says that the context resulting from updating \( C \) with the corrective claim must entail the denial of the antecedent. It follows that the corrective claim is inconsistent with the antecedent in the context of interpretation \( C \). Notice that the condition expresses a nontrivial link between the antecedent and the corrective claim. Since \( \text{ant} \) says that \( C \not\models a^s \) and \( \text{con} \) ensures that \( C \) is consistent, it follows that \( C \not\models a^s \). So the denial of the antecedent is not independently supported by \( C \).

An immediate consequence of accepting \( \text{inc} \) is that the update effect of corrections defined in section 3.2 can now be formulated more straightforwardly in terms of their visible lexical content. For corrections consisting of an overt denial followed by a corrective claim we still have \( C \not\models [\neg a^s] \models [b^s] \), but for corrections featuring just a corrective claim we introduce \( C \not\models [b^s] \). The incompatibility condition accounts for the implicit presence of a denial. Similarly, the update effect of corrections like (5) in which only a denial is overtly present can be defined as \( C \not\models [\neg a^s] \). We assume that the implicit corrective claim is pragmatically inferred.

The incompatibility condition explains why, in all corrections, the antecedent and the corrective claim are interpreted as mutually exclusive claims about a common local setting. In general, the incompatibility condition accounts for any strengthening or accommodation effect that makes the antecedent and the corrective claim of a correction into inconsistent propositions in the context of interpretation. Most of the time the corrective claim and the antecedent are not intrinsically inconsistent; they are inconsistent only as descriptions of a specific local setting in a given context of
interpretation. To illustrate this, compare

(17) A: Pete is a car-owner.
? B: No, he is a baker.

(18) A: In the play, Pete is a car-owner.
B: No, he is a baker.

There is something odd about the correction in (17). The problem is not that we cannot identify the antecedent: given the discourse context of the correction in (17) it is clear that it is intended to mean ‘Pete is not a car-owner, he is a baker’. Neither is the correction in that reading inconsistent, nor is the corrective claim uninformative relative to the antecedent. The problem is that we fail to construct ‘being a car-owner’ and ‘being a baker’ as incompatible properties of Pete’s within the common local setting. Why should Pete’s being a baker entail that he is not a car-owner? He could very well be both.

As (18) shows, however, the matter is essentially context dependent. Given the local setting established by the play in (18) it can be accommodated that there is a unique property within the common local setting, namely the property which identifies Pete’s role as an actor in the play. The antecedent and the corrective claim can be understood as incompatible descriptions of that property, if for example it is accommodated that in this play, for one reason or another, car-owners and bakers are rival groups of people. Then it follows that within the local setting if Pete is acting as a baker he is not acting as a car-owner. Thus, a specification of the context is selected in which ‘being a car-owner’ and ‘being a baker’ are contingently inconsistent properties of Pete’s.

The incompatibility condition explains a host of accommodation effects of the kind just exemplified, all of which result in making the corrective claim and the antecedent of the correction inconsistent in the context of interpretation. In addition, incompatibility accounts for the strengthening effects left unexplained in section 3.4. As we said, these effects could be explained in terms of a more sophisticated notion of informativity, which in the case of correction requires that the corrective claim is informative relative to the antecedent in the original context of interpretation, i.e. $C \not\models \models b^s$. But in fact, this requirement is a corollary of the incompatibility condition, so there is no need to extend the informativity condition just to account for corrections.\footnote{\textit{Proof.} Suppose $C \not\models b^s$. Now given the Gärdenfors postulates on revision and minimal}
On top of this, incompatibility explains even more than we expected. As the reader is invited to check for himself, it accounts for all strengthening and accommodation effects, and the effect on anaphora resolution, that were previously accounted for in terms of the consistency condition.

4.2 Underspecification of the Monotonicity Property

There is something unsatisfying about this. Having more than one explanation for the same set of facts weakens our understanding of the data and suggests that heaping together the definitions and conditions as they were formulated so far is somehow too much.

Interestingly, the problem disappears if we realise that there is no a priori need to specify whether an update induced by a given discourse contribution is monotonic or nonmonotonic. An update $C[u]$ is basically a charge to accept $u$ in $C$; under certain conditions this will lead to a nonmonotonic change of $C$, under different conditions to a monotonic one. In principle, the monotonicity property of the update can be left underspecified. Working in an underspecification formalism as we do, and having the felicity conditions for a given type of discourse contribution at our disposal, the right type of update is selected by definition: it is an update that satisfies all conditions.

When the definition of the update effect of discourse contributions is relaxed along these lines the overlap in predictive power disappears, and it turns out to be the incompatibility condition which explains the accommodation effects occurring in the corrections discussed before. We demonstrate this in a moment. First, however, we list the total of the conditions on felicitous updating interacting in the analysis of correction, given underspecification of the monotonicity property of updates.

**Felicity** For a context of interpretation $C$ and a discourse contribution resulting in an update $C[u^s]$, where $s$ is a local spatio-temporal-modal setting or type of setting such that the semantic content of the contribution $u$ is situated in $s$

- [loc] $s$ is bound in $C$
- [con] $C$ and $C[u^s]$ must be consistent
- [inf] $C \not\models u^s$

change it holds for any $u$ that if $C \models u$ then $C = C[u]$, so we have $C = C[b^s]$. With [inc] it follows that $C \not\models \neg a^s$. However given [ant] $C \models a^s$. Since $C$ must be consistent there is a contradiction. Hence $C \not\models b^s$.
• In addition, for corrections, whose update effect is either \( C[\neg a^s][b^s] \) or \( C[b^s] \) or \( C[\neg a^s] \):
  - [ant] (there is an antecedent \( a^s \) such that) \( C \not \supseteq a^s \)
  - [inc] (there is a corrective claim \( b^s \) such that) \( C[b^s] \not \supseteq \neg a^s \)

Now consider how this set of conditions works out for the following example, featuring strengthening effects which would previously be accounted for in terms of the consistency condition.

(19) A: Mary invited Alan.
   ? B: She didn’t invite Alan, she invited Alan and Jamey.
   a. † ‘Mary did not invite Alan, she invited Alan and Jamey.’
   b. ‘Mary did not invite only Alan, she invited Alan and Jamey.’

The correction is only felicitous in the reading paraphrased in (19b). In this reading the antecedent ‘Mary invited only Alan’ is selected from a pragmatically strengthened specification of the context. As we are about to show, this indeed follows from the interaction of the felicity conditions listed above.

Using “quasi logic speak” to abbreviate CDRT representations, the update effect of reading (19a) can be expressed as \( C[\neg inv(m,a)^s][inv(m,a+j)^s] \) and the update effect of (19b) as \( C[\neg inv(m,only a)^s][inv(m,a+j)^s] \). It can easily be seen that (19a) is not acceptable for any specification of the context \( C \). Whether the update induced by the denial is monotonic or not, we will have that \( C[\neg inv(m,a)^s] \not \supseteq \neg inv(m,a)^s \). If consistency is to be preserved, the subsequent update, induced by the corrective claim, can only be nonmonotonic. This means that participant B would be predicted to be making an internally inconsistent statement and to correct himself, so to speak. Fortunately, the incompatibility condition excludes this result. [inc] requires that \( C[inv(m,a+j)^s] \not \supseteq \neg inv(m,a)^s \), and this cannot be satisfied since \( C[inv(m,a+j)^s] \) must be consistent.

Now consider reading (19b). It is clear that (19b) fails relative to an unstrengthened specification of the context, because [ant] cannot be satisfied. Relative to a pragmatically strengthened specification of \( C \) which supports \( inv(m,only a)^s \) [ant] can be satisfied, however. The incompatibility condition is satisfied as well, since \( C[inv(m,a+j)^s] \not \supseteq \neg inv(m,only a)^s \). Furthermore, for both the denial and the corrective claim, the locality and the informativity condition are satisfied.

What about the monotonicity property of the updates? As for the update induced by the denial, [con] prevents that its content \( \neg inv(m,only a)^s \)
is monotonically added to the context, so the update induced by the denial must be nonmonotonic. As for the update induced by the corrective claim, the principle of informational economy introduced in section 2 prevents that a nonmonotonic update takes place when there is no inconsistency and hence no necessity to retract information from the context of interpretation. So it must be monotonic. The correction induces the complex update \( C_\# \equiv \text{inv}(m; \text{only } a)^* \cap \text{inv}(m, a+j)^* \). This fits our intuitive understanding of the contribution.

We conclude that on the basis of the felicity conditions collected above, the correction in (19) is predicted to be felicitous only in reading (19b), for a pragmatically strengthened specification of the context. While the consistency requirement prevents that updates result in nonsensical or overinformative contexts, the incompatibility condition explains the strengthening effects occurring in the interpretation of the correction. The informativity condition does not add much to the analysis. As we saw earlier, however, incompatibility has the effect of making the corrective claim informative relative to the antecedent in the original context of interpretation.

Furthermore, it is a consequence of the interaction of the semantic content of the contribution, the felicity conditions, and the principle of informational economy whether the updates induced are monotonic or nonmonotonic. The discussion of (19) clearly shows that it is the presence of a denial—characterised by \( C[-a^*] \) and \( C \models a^* \)—which given the consistency condition causes the nonmonotonicity of the update induced by the correction. This also goes for corrections consisting of just a corrective claim. Given the incompatibility condition the corrective claim implies a denial, and the implicit denial enforces a nonmonotonic update.

For brevity, we will not work out examples of corrections whose update effect is just \( C[b^*] \) or \( C[-a^*] \). Each of these comes with interesting particulars of its own, though. Examples of the form \( C[b^*] \) highlight the fact that finding an appropriate interpretation of a given discourse contribution is a matter of testing its properties relative to your discourse grammatical knowledge. The grammar will tell you that if it is a correction, there is a contextually supported antecedent such that its semantic-pragmatic content is incompatible with it. But if it is, for example, a contrastive list construction, the elements in the list are compatible with each other given the context. Ideally context and contribution together are sufficiently informative to determine the force of a discourse contribution, but in practice this can be underspecified.

Corrections of the form \( C[-a^*] \), see example (5), raise the question how
pragmatic inference interacts with the felicity conditions of correction in triggering or implicating a corrective claim. For some discussion of this complex issue we refer to (Walker 1996). The case awaits further research in our discourse model.

5 Incompatibility via Information Structure

As with all other types of discourse contributions, the interpretation of corrections is not just constrained by semantic-pragmatic conditions on felicitous updating, but also by information structural properties of the correction. Taking these into account will lead to a more refined analysis of the data. While much can be said about the topic of information structure, what shall be highlighted here is only the relation between focus interpretation, contrast, and the incompatibility requirement.

Restricting our attention to corrective claims and simple focus-background structures, it can be observed that the information structure of the corrective claim induces a ‘parallelism constraint’ relative to the antecedent in the context of interpretation. The background of the corrective claim must in a certain sense be ‘shared’ by the antecedent, and the focus must be contrastive to the parallel element in the antecedent. The following pair of examples illustrates this.

(20) A: Anna ate spaghetti.
    B: No, Anna ate [a SALAD].

(21) A: Anna ate spaghetti.
    # B: No, [ANNA] ate a salad.

In (20) the requirement is satisfied. The background of the corrective claim can be described as ‘Anna ate x’ and this indeed is shared by the antecedent. Furthermore, the focus ‘a salad’ and its parallel element ‘spaghetti’ are distinct, and hence contrastive elements in the context of interpretation. In (21) however, where the background of the corrective claim corresponds to ‘x ate a salad’ and the focus to ‘Anna’ the relation of parallelism cannot be satisfied relative to the antecedent. Hence the correction is infelicitous.\[10\]

\[10\] The parallelism requirement could be implemented in our discourse theory by including a constraint along the following lines: for a context $C$, an antecedent $a$, and a corrective claim with a background or focus frame $\beta(x)^a$, where $x$ is an underspecified value replacing the semantic value of the focus: $C \models a^* \Leftrightarrow \beta(x)^a$. This defines parallelism as a semantic and context-dependent notion, which we believe to be appropriate for cor-
Interestingly, it could be argued that the relation of incompatibility linking the corrective claim and the antecedent is established via focus interpretation. The argument builds on the assumption that the type of focus occurring in corrections both induces contrastive parallelism and triggers an exhaustivity presupposition. The latter was proposed in (Kalman and van Leusen 1993). It is argued in some other places that ‘free focus’, as opposed to ‘comment’ or ‘rheme’, comes with an exhaustivity effect but it is not always taken to be a presupposition. Compare (Szabolcsi 1981), (Svoboda and Materna 1987), and (Vallduví and Vilkuna 1998).

Notice that contrastivity alone is not sufficient to explain that the antecedent and the corrective claim are incompatible alternatives. Anna having a salad may be contrastive to Anna having spaghetti, but that in itself does not imply that if she had a salad she did not have spaghetti. However, if it is assumed that the relevant type of focus triggers an exhaustivity presupposition as well, incompatibility ensues. In the case of (20), focus interpretation of the corrective claim would trigger the presupposition that within the common local setting there is a unique maximal event of the type ‘Anna eating some dish’. Both the antecedent and the corrective claim must be descriptions of that event. At the same time, they are required to be contrastive descriptions of this particular type of event within the common local setting. As contrastive descriptions of one and the same event they are incompatible. Thus, the incompatibility condition is satisfied via information structural constraints.

Given this analysis, differences between corrections and other types of corrective discourse contributions may in part be accounted for on the basis of their distinct information structural properties. For example, in the case of contrastive list constructions like (7) the fact that there is no incompatibility could be explained on the assumption that these constructions do not just feature parallel foci but also parallel contrastive topics. Due to the contrastive topics, distinct local settings are introduced, and satisfying the exhaustivity presuppositions triggered by the parallel foci within distinct local settings does not lead to incompatibility.

In the space of this paper we cannot zoom in on this matter any further. We have seen that the relation of contrast linking the corrective claim to the antecedent in corrections can be accounted for in terms of the interaction of a parallelism constraint and the incompatibility condition. Depending on the sort of information structure theory one is prepared to accept, it

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reactions, compare (Gardent, Kohlhase and van Leusen 1996). The interaction with [inc] explains that $x$ and the focus of the corrective claim are contrastive.
can further be argued that the relation of incompatibility in corrections is established through information structural constraints. The discourse grammar formalism does not enforce a particular approach here; further research in the field of information structure theory will have to show what type of explanation is to be preferred.

6 Conclusion

We presented an analysis of corrections in conversation couched in ‘description grammar for discourse’ as put forward in (van Leusen and Muskens 2003). Taking into account the constraining effect of general felicity conditions on consistent, informative, and local updating, it was argued that the main defining characteristic of corrections is incompatibility: corrections require a contextually supported alternative to the corrective claim such that the two are inconsistent given the context of interpretation. A broad range of accommodation and strengthening effects can be accounted for in terms of this requirement.

The relation between incompatibility, the general felicity conditions and the update effect of corrections was examined. Corrections induce non-monotonic updates. It was argued that, given underspecification of the monotonicity property of updates, the nonmonotonicity of updates induced by corrections follows from the interaction of the incompatibility condition and the collected felicity conditions. Furthermore, the impact of information structural constraints was discussed. It was suggested that under certain assumptions about free or contrastive focus incompatibility in corrections can be assumed to be established via focus interpretation.

The treatment proposed raises certain questions about the coverage of the discourse model and the integration of pragmatic theory in it. For one, corrections affect the attitudes and commitments of the participants in a conversation. We assume that there is a systematic link between the update effect of corrections as defined in this paper and their update effect on what might be called the attitudinal tier of the context of interpretation. Clearly, here’s a topic for further investigation.

Secondly, our analysis builds on the assumption that contexts can be strengthened through various forms of pragmatic inference and accommodation. While strengthened contexts can be modeled elegantly as potential specifications of an underspecified context, ‘pragmatic inference’ is a black box in the analysis, a part of the discourse theory that needs to be filled in. Furthermore, it seems plausible that language users have preferences over
potential specifications of the context, both for the input, and the output context of a given update. To account for such preferences the introduction of ‘weak’ constraints, as in Optimality Theory, may be called for. Again, this calls for further research.

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