A dynamic alternative-pruning account of asymmetries in Hurford Disjunctions

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Abstract. Hurford Disjunctions (HDs) are infelicitous disjuctions whereby one disjunct entails the other [14]. The infelicity of basic HDs has been successfully modeled by several competing approaches [22,18,15,1]. HDs involving scalar items however, are subject to an asymmetry [23]: when the weaker scalar item linearly precedes the stronger one, the sentence seems to be rescued from infelicity. This fact is not readily accounted for by standard approaches, which treat Hurford disjuncts in a symmetric fashion. Fox & Spector [7] and Tomioka [25] proposed two different solutions to that problem and extensions thereof, at the cost of positing a relatively heavy, or somewhat *ad hoc* machinery. Here we propose a novel analysis of the asymmetry in scalar HDs, based the familiar process of alternative pruning. We suggest that exhaustification, which targets the weak disjunct, is based on a set of formal alternatives that is sensitive to previous material. Unlike other approaches, the asymmetry is derived in our account *via* a direct computation, and not a global principle constraining either the insertion of the exhaustivity operator, or the particular shape of the alternative set.

Keywords: Hurford Disjunctions · Scalar implicatures · Alternative pruning.

1 Background

1.1 Hurford Disjunctions

Hurford Disjunctions (henceforth HD) are disjunctions of the form $p \vee q$ where p entails q. Those disjunctions are generally thought to be infelicitous [14]. This is known as Hurford's constraint (henceforth HC) exemplified in (1) below, where *living in Paris* contextually entails *living in France*.

(1) # Rohan lives in **Paris** or **France**

Various constraints have been devised to capture those basic HDs: Non-Triviality [22], Mismatching Implicatures [18,19], Non-Redundancy [15], Logical Integrity [1]. Those constraints impose logical restrictions on the two disjuncts w.r.t. each other and/or the context. Crucially however, those restrictions are symmetric, i.e. do not depend on the ordering of the two disjuncts.

1.2 Singh's asymmetry [23]

The problem

As first noticed by Gazdar, some HDs involving two related scalar items appear to be felicitous [8]. This *obviation* of Hurford's Constraint is exemplified in (2), with scalemates *or* and *and*.

(2) Jolyne ate cookies **or** ice cream, or (else) cookies **and** ice cream.

However, Singh [23] pointed out that those HDs involving scalar items are subject to an asymmetry: a weak-to-strong scalar HD – such as (2) above, or (3a) below – is felicitous, while a strong-to-weak HD is not (3b).

(3) a. Johnny ate **some** or **all** of the cookies. (HD↑)
b. # Johnny ate **all** or **some** of the cookies. (HD↓)

The various principles modeling Hurford's Constraint in the basic case cannot account for this asymmetry, because they are insensitive to the order of presentation of the disjuncts. Since the asymmetry seems to apply only to scalar disjunctions, it must result from an interplay between scalar implicatures and a specific implementation of Hurford's Constraint.

Scalar implicatures in Hurford Disjunctions

Scalar implicatures are inferences associated to scalar items, whereby the literal meaning of the item is enriched with the negation of more informative alternative(s) that belong to the same scale (see e.g. [12]). In the particular case of scalar HDs, the grammatical approach to scalar implicatures ([2,6,24,3], a.o.) seems more appropriate than the Neo-Gricean framework ([12,13,4,5,16], a.o.), because the former, unlike the latter, allows for embedded implicatures.

More specifically, the grammatical view allows for implicatures targeting the *weak* Hurford disjunct. Indeed, this approach posits that the exhaustivity operator Exh, a covert operator whose semantics is akin to that of overt *only*, can be inserted (merged) at the syntactic level. On the semantic side, this operator takes a proposition p (the *prejacent*) and a set of alternatives to that proposition $\mathcal{A}_p$, and returns the conjunction of the prejacent and the grand negation of logically stronger alternatives.[1]

$$\textsc{Exh}(p, \mathcal{A}_p) = p \wedge \bigwedge\{\neg q \mid q \in \mathcal{A}_p \wedge q \Rightarrow p \wedge q \not\Leftarrow p\}$$
(Basic exhaustification)

[1] A more accurate implementation of Exh requires the notion of Innocent Exclusion, which guarantees that the stronger alternatives that are being negated are negated in a non-arbitrary way [6]. This more refined notion however, coincides with the simpler definition we provided in the main text for all the examples we will cover in that paper.

Alternatives may be determined *via* a lexically encoded scale (see e.g. [8]), focus (see e.g. [20]), or a specific question-under-discussion (see e.g. [11]). Under that theory, an occurrence of *some* ($\exists$) embedded within a disjunctive statement may be parsed as $\text{Exh}(\exists, \mathcal{A}_\exists)$. Assuming that the set of stronger alternatives to *some* only contains *all* ($\forall$), $\text{Exh}(\exists, \mathcal{A}_\exists) = \exists \wedge \neg\forall$, meaning, *some but not all*. Since $\exists \wedge \neg\forall$ no longer entails $\forall$, computing embedded scalar implicatures can help rescuing scalar HDs from HC-violation. However, this rescue mechanisms, without further assumptions, applies to both weak-to-strong and strong-to-weak HDs, so the contrast between (3a) and (3b) still remains to be accounted for.

1.3 Previous accounts of the asymmetry

Three competing accounts have been proposed to explain the asymmetric felicity pattern of scalar HDs. In this section, we provide a brief summary of those approaches, explain how they solve the main asymmetry, and point out some of their limits.

Singh's solution

The first solution, adopted by Singh in [23], is to impose additional constraints on the process checking the satisfaction of Hurford's Constraint (let us call this process HC-checking for short). More specifically, Singh suggested that HC-checking should apply incrementally at each point of application of the $\vee$ (*or*) operator. HC-checking is assumed to apply in a somewhat "greedy" fashion, verifying whether the *necessarily unenriched* right-hand-side disjunct, along with the *potentially enriched* left-hand-side disjunct, do not violate HC.

This accounts for the basic contrast in (3), in the following way. In (3a), the two arguments passed to HC-checking are $\text{Exh}(\exists, \mathcal{A}_\exists) = \exists \wedge \neg\forall$ (enriched left-hand-side) and $\forall$ (unenriched right-hand side). Since the disjuncts are mutually exclusive, HC is verified. In (3b) on the other hand, the arguments passed to HC-checking are $\forall$ (left-hand side) and $\exists$ (necessarily unenriched right-hand side). Since $\forall \Rightarrow \exists$, HC is violated. As we see, under that line of analysis, the asymmetry between weak-to-strong and strong-to-weak HDs resides in a timing difference in the application of HC-checking *vs* Exh.

Singh's theory is appealing due to its relative simplicity: HC-checking is applied on-the-fly, with a precise timing w.r.t. the exhaustivity operator. This account however, runs into problems when a basic HD gets embedded within certain kinds of operators, in particular universal ones.

(4) a. Suzi must eat **some** or **all** of the cookies.
$\Box(\exists \vee \forall)$ (HD↑)

b. Suzi must eat **all** or **some** of the cookies.
$\Box(\forall \vee \exists)$ (HD↓)

When both disjuncts of a scalar HD are embedded under a necessity modal, such as *must*, like in (4) above, both orders seem felicitous. This is unexpected under Singh's account, since by default the incremental HC-checking process is not sensitive to the environment surrounding the disjuncts (here, the operator $\Box$).

Fox and Spector's solution

The second solution, explored by Fox & Spector (henceforth F&S) in [7], is to impose additional constraints on Exh, s.t. only the pragmatically enriched weak-to-strong scalar HDs are rescued from HC-violation. To this aim, F&S posit a new Economy principle restricting Exh-insertion based on the notion of *Incremental Weakening* (henceforth IW). This constraint states that Exh should *not* be inserted at a given point of a logical expression if it yields a globally weaker or equivalent meaning. In other words, given a logical expression of the form $\Delta[A]$ where A is a formula and Δ a left-hand-side context for this formula, $^*\Delta[\textsc{Exh}(A)]$ whenever, for any logical continuation Γ of $\Delta[\textsc{Exh}(A)]$, $\Delta[A]\Gamma \Rightarrow \Delta[\textsc{Exh}(A)]\Gamma$ or $\Delta[A]\Gamma \iff \Delta[\textsc{Exh}(A)]\Gamma$.

This implies that Exh is not IW in the first disjunct of (3a), because $\textsc{Exh}(\exists, \mathcal{A}_\exists) = \exists \wedge \neg\forall \not\Leftarrow \exists$.[2] Exh can thus be inserted within the first disjunct, making the resulting two disjuncts HC-compliant. In (3b), Exh applied within the second disjunct is IW (because $\forall \vee \textsc{Exh}(\exists, \mathcal{A}_\exists) = \forall \vee (\exists \wedge \neg\forall) = \forall \vee \exists$.[3] Exh cannot be inserted and the structure remains HC-violating, as desired.

F&S's theory is very powerful and can account for cases such as (4), but at the cost of positing a new, quite complex Economy principle governing Exh-insertion: Incremental Weakening. This principle requires to perform some abstract comparison on *all possible continuations* of the disjunction, with and without Exh, to decide if Exh is weakening – or not. We will also see in Section 3.3 that F&S's account might not make the right prediction in the case of complex "long-distance" scalar Hurford Disjunctions.

Tomioka's solution

Singh's asymmetry has been recently reconsidered by Tomioka in [25]. Tomioka proposed an alternative approach to that of Fox and Spector, based on the observation that Hurford's Constraint does not seem to operate only on disjunctive statements. Rather, a specific implementation of HC is assumed to be active in contrastive environments in general, which include – but are not limited to – disjunctions. A paradigmatic contrastive environment is a conjunctive *but*-statement, as exemplified in (5), taken from [25]. Additionally, it is worth noting that the conjuncts in (5), having different subjects, are logically independent

[2] This trivially extends to any continuation Γ of $\exists \wedge \neg\forall$ / $\exists$.
[3] Again, this trivially extends to any continuation Γ.

from each other, regardless of the presence or absence of an exhaustivity operator. In other words, they cannot be HC-violating in the standard sense. Rather, it seems that the entailment pattern between *scalar items* ($\exists$, $\forall$) – and not whole propositions – is taken to be problematic.

(5) a. Adam did **some** of the homework, but Bill did **all** of it. (HD↑)
b. # Adam did **all** of the homework but Bill did **some** of it. (HD↓)

This observation motivates an novel analysis of Hurford's Constraint in terms of contrastive focus, *via* the so-called CONTRAST ANTECEDENT CONDITION (CAC). The CAC appeals to the notion of *focus semantic value*, as well as that of *ordinary value*, as defined by Rooth in [20]. The ordinary semantic value of an element refers to its regular semantics, while the focus semantic value is defined as the set of propositions identical to the ordinary value, except that the focused element is substituted for a salient alternative of the same type, and at most as complex.

The CAC then states that when an element R is contrastively focused, there must be an antecedent L that precedes R and generates a set of alternatives $\mathcal{A}_L$, s.t. (i) $\mathcal{A}_L$ is a subset of the focus semantic value of L, (ii) its members are mutually exclusive, and (iii) it includes the ordinary value of both L and R.

Tomioka argues that this constraint can be satisfied in the weak-to-strong case, thanks to EXH-insertion; while it cannot be in the strong-to-weak case. Indeed, in the weak-to-strong case (3a), applying EXH to $\exists$ in the first disjunct allows to verify this three-way condition, since $\mathcal{A}_{\text{EXH}(\exists,\mathcal{A}_\exists)}$ can be defined as the set $\{\exists \wedge \neg\forall, \forall, \neg\exists\}$, which includes the ordinary value of the first disjunct $\text{EXH}(\exists,\, \mathcal{A}_\exists) = \exists \wedge \neg\forall$ and the ordinary value of the second disjunct $\forall$, and whose members are mutually exclusive. In the strong-to-weak case (3a), finding a CAC-compliant set of alternatives for $\forall$ is impossible,[4] since it should contain $\forall$ (ordinary value of the first disjunct), but also either $\exists$ (ordinary value of the unenriched second disjunct) or $\exists \wedge \neg\forall$ (ordinary value of the enriched second disjunct). The first option would violate (ii) (mutual exclusivity), and the second option would violate (i), since $\exists \wedge \neg\forall$ is more complex than $\forall$.

This approach is interesting in that it appears well-suited to more general "contrastive" environments, whereby the disjuncts are not in an entailment relation *per se*. However, it posits strong structural constraints on the set of alternatives generated by the first scalar item, in particular, mutual exclusivity (which can be seen as an emulation of HC in the realm of alternatives). Moreover, if HC really amounts to a general constraint on contrastive focus, we expect the disjunctive counterpart of (5), given in (6) – which is also supposed to be a contrastive statement – to exhibit the very same HD-like felicity pattern. Yet, both orders seem fine in that case:

(6) a. Adam did **some** of the homework, or Bill did **all** of it.

[4] In that case, computing $\text{EXH}(\forall,\, \mathcal{A}_\forall)$ does not help either, since $\text{EXH}(\forall,\, \mathcal{A}_\forall) = \forall$.

b. Adam did **all** of the homework or Bill did **some** of it.

This may suggest that Hurford's Constraint cannot be reduced to a constraint between two individual scalemates, but really is about the logical relation between the two *disjuncts*. This implies that HC is *in fine* distinct from a pure constraint on contrastive focus as defined by Tomioka.

The rest of this paper is structured follows. In section 2, we propose an alternative account, *Dynamic Alternative Pruning* (DAP), which exploits some aspects of both Fox and Spector's and Tomioka's approaches. We show that DAP straightforwardly accounts for (3). In section 3, we show that DAP also predicts *obviation* of Hurford's Constraint in certain complex environments. We discuss the particular case of long-distance scalar HDs in more detail towards the end of this section, as DAP and F&S's account make diverging predictions for that kind of structure. In section 4, we conclude by pointing out one potential limitation of DAP.

2 Capturing Singh's asymmetry *via* Dynamic Alternative Pruning

2.1 Motivation and assumptions

We propose an alternative way of deriving HD-related asymmetries, using a lightweight and cognitively justified mechanism we call *Dynamic Alternative Pruning* (DAP). Instead of formulating the asymmetry as a problem of Exh-insertion as F&S do, this account is closer to Tomioka's in that it assumes the asymmetry originates in the set of alternatives passed to Exh. Like F&S's account and unlike Tomioka's however, our approach does not simply rely on a formal contrast between two scalar items. It also retains a standard implementation of Hurford's Constraint.

For the sake of simplicity, we assume the implementation of Exh given in Section 1.2: Exh takes a prejacent p, and alternatives to that prejacent $\mathcal{A}_p$; and returns the conjunction of the prejacent and the negation of stronger alternatives. *Contra* F&S, we posit that Exh is inserted in a systematic way, i.e., it is not subject to any global Economy constraint. We remain theory-neutral about the specific implementation of Hurford's Constraint, i.e., we simply take a disjunction with entailing disjuncts to be HC-violating.

2.2 Dynamic alternative pruning (DAP)

The key difference between our account and the previous accounts is that we assume $\mathcal{A}_p$ is sensitive to specific, previously uttered elements, i.e. it is determined dynamically. More concretely, let us consider a proposition R containing a focused element, typically, a focused scalar item. Let us assume, in the spirit of [20] and (to a certain extent) [25], that R has an ordinary semantic value $[\![R]\!]_o$, and a focus semantic value $[\![R]\!]_f$, defined as the set of propositions identical to $[\![R]\!]_o$, except that the focused element is substituted for a salient alternative of the same type, and at most as complex. We then define the alternatives to R as follows:

$$\boxed{\mathcal{A}_R = \begin{cases} [\![R]\!]_f \setminus [\![L]\!]_o \text{ if } \exists L \prec_{\mathcal{L}} R.\ [\![R]\!]_f = [\![L]\!]_f \\ [\![R]\!]_f \text{ otherwise} \end{cases} \qquad \text{(Dynamic Alternative Pruning)}}$$

Where $\prec_{\mathcal{L}}$ represents "local" linear precedence. A precise definition of what locality means for this operator will be given in the next section. DAP states that whenever a proposition R is preceded by another proposition L s.t. both share the same focus semantic value, the ordinary semantic value of L should be pruned form the alternatives of R. Following Tomioka, we will call L the contrast antecedent of R. However, it is worth stressing that L and R are both taken to be full-fledged propositions, and not bare scalar items (as in Tomioka's account). In what follows, we will use shorthands such as $\exists$ or $\forall$ to denote entire propositions, whenever the disjuncts under consideration are totally parallel (for instance, L = *Lisa ate* ***some*** *of the cookies* and R = *Lisa ate* ***all*** *of the cookies*).

The rationale behind DAP is the following. Exhaustification normally amounts to reasoning about alternative propositions that the speaker *could have used but did not*, either because (1) those are not believed to be true by the speaker, (2) those are judged to be too costly, or (3) those are deemed too precise w.r.t. the current question-under-discussion. In Gricean terms, (1), (2) and (3) roughly correspond to, respectively, the maxims of Quality, Manner, and Relevance [9,10]. Usually, whenever options (2) and (3) can be reasonably ruled out, the listener ends up believing that the alternative under consideration verifies condition (1), i.e., it is not believed to be true.[5] However, if the proposition corresponding to the alternative has already been entertained by the speaker, there is one obvious reason why they would not use it again; namely, that it is redundant. It then seems intuitive to exclude such a proposition from the set of relevant alternatives – which is exactly what DAP is supposed to achieve.

Let us first verify that DAP accounts for the simplest case of scalar HD, namely (3). In (3a), applying Exh to the first disjunct ($L = \exists$ for short) standardly yields $\exists \wedge \neg\forall$, because L has no contrast antecedent and thus, the $\forall$-alternative is still present in $\mathcal{A}_L$. This makes the two disjuncts of (3a) mutually exclusive and the structure is successfully rescued from HC-violation. In (3b), the second disjunct ($R = \exists$ for short) has a contrast antecedent $L = \forall$, so, when

[5] One additional assumption, namely, *opinionatedness*, is in principle required to conclude that the alternative is believed to be *false* by the speaker. This is not extremely important for this discussion, but this distinction is being discussed more in depth in e.g. [21].

Exh is applied in R, the $\forall$-alternative is no longer taken into account (pruned), and exhaustification becomes idle. As a direct consequence, the structure remains HC-violating. This result can be easily generalized to other simple scalar HDs, such as $(p \lor q) \lor (p \land q)$.

2.3 What constitutes a suitable contrast antecedent for DAP?

Pruning alternatives because they would be considered redundant with what has already been entertained in a given context might seem contradictory with the other well-supported claim that alternatives which have been made particularly salient *should* enter the exhaustification process. For instance, in (7), the propositions *I saw Will* and *I saw Robert* are made particularly salient by speaker A, and are both part of the denotation of the question *Have you seen Will?*. The answer of speaker B, *I saw Robert*, seems to strongly exclude the other alternative, namely, *I saw Will*, which suggests that this alternative should *not* be pruned in that context.

(7) A: I expect **Will** and **Robert** to come to the party. Have you seen **Will**?
B: Well, I saw **Robert**. $\rightsquigarrow$ I did not see **Will**.

The same goes for (8), which involves scalar items. If speaker A's utterance was considered to be a suitable contrast antecedent for speaker B's first utterance, then, DAP would predict that $\exists$ should *not* be enriched with $\neg\forall$, contrary to fact.

(8) A: Erina ate **all** of the cookies!
B: No, she ate **some** of them. $\rightsquigarrow$ She did not eat **all** of them.

This suggests that the search space for a contrast antecedent from the point of view of DAP has to be restricted to somewhat "local" propositions, supposedly, those uttered by the same speaker. But there is in fact further evidence that the dependency should in general be more local than this. Consider (9) below, where L is *Erina ate all of the cookies* and R is *Erina ate some of the cookies*, but L and R are not directly combined with each other, due to the embedding of R within a conditional. In that configuration, R seems to be understood as *Erina ate some but not all of the cookies*, which suggests that the alternative $\forall$ was *not* pruned.

(9) Erina at **all** of the cookies, or, if Jonathan was here too, then, she ate **some** of them.

This justifies a very narrow definition of local linear precedence:

$$L \prec_{\mathcal{L}} R \iff \begin{pmatrix} L \text{ linearly precedes } R \text{ and} \\ L \text{ directly combines with } R \textit{ via} \text{ disjunction} \end{pmatrix}$$

(Local linear precedence)

3 Accounting for various cases of HDs

We have seen that DAP accounts for simple scalar HDs. We now turn to more complex instances of HDs, some of them being mentioned in [7].

3.1 HC-obviation by a "distant entailing disjunct"

F&S noticed that Singh's asymmetry vanishes when the scalar items present in the weak and strong disjuncts are separated on their scale by a salient alternative. Those kinds of disjuncts are called *distant entailing disjuncts*, or DED. The context of (10) for instance, is s.t. $\exists$ and $\forall$ are separated by *most* (M), supposedly leading to HC-obviation.

(10) *Context: did John do* ***most*** *of the homework?*

a. John did **some** or **all** of the homework. (HD↑)

b. John did **all** or **some** of the homework. (HD↓)

Under our account, (10a) can be rescued just like (3a); this is because $\exists$ occurs in the first disjunct, L, which does not have any contrast antecedent, and therefore, is subject to standard exhaustification ($\textsc{Exh}(L, \mathcal{A}_L) = \exists \wedge \neg\forall$). This in turn causes the two disjuncts to become mutually exclusive, meaning, HC-compliant. In (10b) on the other hand, $\exists$ occurs within the second disjunct, R. We have $[\![R]\!]_f = \{\exists, \mathrm{M}, \forall\}$, since *most* (M), has been made particularly salient by the question-under-discussion. R however, has a clear contrast antecedent, L, which contains the scalar alternative $\exists$. As a result, we have $\mathcal{A}_R = \{\mathrm{M}, \forall\}$, and thus, $\textsc{Exh}(R, \mathcal{A}_R) = \exists \wedge \neg\mathrm{M} \Rightarrow \exists \wedge \neg\forall$. This makes the disjuncts mutually exclusive, as expected.

3.2 HC-obviation by universal operators

Another interesting case discussed by F&S is that of universally quantified disjuncts such as those in (11). Unlike its non-quantified counterpart (*John solved Problem 1* ***and*** *Problem 2, or he solved Problem 1* ***or*** *Problem 2*), (11b) seems to be subject to HC-obviation.

(11) a. John must solve Problem 1 **or** Problem 2, or he must solve **both**.
$\Box(p_1 \vee p_2) \vee \Box(p_1 \wedge p_2)$ (HD↑)

b. John must solve Problem 1 **and** Problem 2, or he must solve **either**.
$\Box(p_1 \wedge p_2) \vee \Box(p_1 \vee p_2)$ (HD↓)

Let us again see how DAP models HC-obviation in that configuration. In (11a), the first disjunct $L = \Box(p_1 \vee p_2)$ is being enriched by computing

$\textsc{Exh}(\Box(p_1 \vee p_2), \mathcal{A}_{\Box(p_1\vee p_2)})$.[6] We have $\mathcal{A}_{\Box(p_1\vee p_2)} = \{\Box p_1, \Box p_2, \Box(p_1 \wedge p_2)\}$. Since $\Box p_1$ and $\Box p_2$ are the only two alternatives that are stronger than L, L is enriched with $\neg\Box p_1 \wedge \neg\Box p_2$, which breaks the entailment between the disjuncts, since $R = \Box(p_1 \wedge p_2) = \Box p_1 \wedge \Box p_2$ and $\neg\Box p_1 \wedge \neg\Box p_2$ are clearly contradictory. The structure therefore becomes HC-compliant. In (4b), we have $\mathcal{A}_R = \{\Box p_1, \Box p_2, \Box(p_1 \wedge p_2)\} \setminus \{\Box(p_1 \wedge p_2)\} = \{\Box p_1, \Box p_2\}$, since $L = \Box(p_1 \wedge p_2)$ constitutes a contrast antecedent to R. Yet, alternative pruning does not affect exhaustification in that case, since the alternative to R that has been pruned, $\Box(p_1 \wedge p_2)$, is not *stronger* than R. As a result, exhaustification proceeds just like in (11a), and leads to the enrichment $\neg\Box p_1 \wedge \neg\Box p_2$, contradictory with L, as desired.

We have shown here that DAP can account for two cases of complex HC-obviation discussed in F&S. It crucially relied on the fact that the previous disjunct (and none of the alternative it *entailed*) was being pruned. We now turn to the more complex, and not so well-discussed case of long-distance scalar Hurford Disjunctions.

3.3 HC-obviation in "long-distance" scalar HDs

Long-distance Hurford Disjunctions (henceforth LDHDs) have been recently pointed out as a challenge for implementations of Hurford's Constraint by Marty & Romoli [17]. LDHDs as introduced by Marty & Romoli are given in (12):

(12) a. # Rohan lives in **France**, or (else) he lives in London or in **Paris**.
 b. # Rohan lives in London or in **Paris**, or (else) he lives in **France**.

LDHDs differ from standard HDs in that the strong disjunct from the standard HD (e.g., *Paris*) is now embedded in a lower-level disjunction with a term (e.g. *London*) which happens to be contradictory with the weak disjunct (e.g., *France*). This results in a structure that is not predicted to be HC-violating, since the two disjuncts are made non-entailing.

To our knowledge, *scalar* LDHDs such as those in (13) below have not been studied in the literature. Felicity judgments for those structures seem hard to get, probably because of the two levels of disjunction, which may introduce additional parsing difficulties. That is why the judgments reported here definitely need to be verified with more native speakers. We feel however that the sentences in (13)

[6] One could ask why $\textsc{Exh}$ should not be inserted lower in the structure, meaning, below the necessity modal $\Box$ and above the disjunction operator – leading to $\Box((p_1 \wedge \neg p_2) \vee (p_2 \wedge \neg p_1))$. The fundamental reply to this concern remains unclear, as F&S acknowledge. It is however true that the inferences triggered by a "high" $\textsc{Exh}$ seem more accurate when the structure is considered in isolation, as noted by [3].

sound consistently less redundant than those in (12), which, once again, suggests some degree of HC-obviation resulting from exhaustification.[7]

(13) a. John ate **most** of the cookies, or (else) he ate none or **all** of them.
$M \vee (\neg\exists \vee \forall)$

b. John ate **most** of the cookies, or (else) he ate **all** or none of them.
$M \vee (\forall \vee \neg\exists)$

c. ? John ate none or **all** of the cookies, or (else) he ate **most** of them.
$(\neg\exists \vee \forall) \vee M$

d. John ate **all** or none of the cookies, or (else) he ate **most** of them.
$(\forall \vee \neg\exists) \vee M$

If scalar LDHDs are indeed subject to HC-obviation, DAP, and not F&S's Economy principle, happens to make the right prediction. This is due to the fact that, unlike F&S's principle, DAP operates very locally, at the level of the binary $\vee$ operator.

Let us now see in more detail how DAP would operate in the sentences in (13). In (13a) and (13d), it is clear that the weak and strong disjuncts (resp. M and $\forall$) are not directly combined together *via* a disjunctive operator, since the disjunct $\neg\exists$ (*none*) linearly intervenes between them. So, DAP is predicted not to apply in those two structures, and, as a result, M should be enriched with the regular $\neg\forall$ implicature. Both (13a) and (13d) are in turn expected to feature mutually exclusive disjuncts ($M \wedge \neg\forall$ and $\neg\exists \vee \forall$), which causes those two structures to be rescued from HC-violation.

In (13b) and (13c), the two main disjuncts are already non-entailing, due to the presence of $\neg\exists$. However, those two sentences are perhaps more borderline, because they are in principle compatible with an alternative parse, whereby M combines directly with $\forall$.[8] Due to this structural ambiguity, DAP may apply *to some extent* in those sentences. In (13b) on the one hand, DAP would end up not having any effect, because M linearly precedes $\forall$. Therefore, M is predicted to be non-vacuously exhaustified in (13b), causing the two disjuncts to become mutually exclusive. In (13c) on the other hand, DAP would end up having an effect, since in that case $\forall$ linearly precedes M. DAP would cause $\forall$ to be pruned from M's alternatives, yielding vacuous exhaustification. Consequently, the disjuncts of (13c) would remain in the same logical configuration as those in (12b), which has been argued to be infelicitous. The potential effect of DAP in (13a) might thus explain why this structure appears slightly more degraded then the other ones in (13).

[7] We also tried to eliminate a triviality issue by using *most* instead of e.g. *some*, because $\exists \vee \forall \vee \neg\exists = \top$, but on the other hand, $M \vee \forall \vee \neg\exists = M \vee \neg\exists \neq \top$.

[8] Although this parse can be discouraged by the use of a specific intonation, and the *else* particle signaling a higher-level disjunction, we assume that it remains somewhat "active" in the mind of the listener.

Let us now turn to F&S's account. F&S predict that $\textsc{Exh}$ should apply to M in (13a) and (13b), but not in (13c) or (13d), since $(\neg\exists \vee \forall) \vee \textsc{Exh}(M, \mathcal{A}_M) = (\neg\exists \vee \forall) \vee (M \wedge \neg\forall) = \neg\exists \vee \forall \vee M$, i.e., $\textsc{Exh}$ is Incrementally Weakening in that configuration. F&S then predict (13a) and (13b) to be felicitous and (13c) and (13d) to be infelicitous - which we do not think is the right kind of contrast.

4 Conclusion

We developed an account of the asymmetric felicity pattern of scalar HDs by proposing a new way to compute formal alternatives, *Dynamic Alternative Pruning* (DAP). DAP relocates the source of HD-related asymmetries within the choice of the relevant alternatives passed to $\textsc{Exh}$, as opposed to whether or not $\textsc{Exh}$ should be inserted (Fox & Spector's view). DAP constitutes an incremental, local, and, unlike previous accounts, one-pass algorithm, which guarantees that the formal alternatives of a proposition R should exclude any locally-preceding contrast antecedent L. This assumption is motivated by the observation that, from the speaker's point of view, there one good reason, different from the alternative being false, for not using it twice in a row in a discourse; namely, non-redundancy. Therefore, drawing a scalar implicature about an alternative that has been overtly and recently entertained by the speaker does not seem to be a legitimate step to take. DAP, by pruning such alternatives, precisely ensures that this "deviant" kind of implicature is not derived.

We showed that our account does just as well as the previous ones for a variety of HDs, and that it may make interesting predictions in the case of long-distance scalar HDs, for which felicity judgment are hard to get, unfortunately. Further evidence, potentially experimental, would be welcome to assess the accuracy of DAP *vs* F&S's account in that particular respect.

One datapoint that DAP cannot straightforwardly capture is a case of HC-obviation that is supposedly triggered by embedding an entire scalar HD under $\textsc{Exh}$. This is exemplified in (14).

(14) a. John **must** do **some** or **all** of the readings. (HD↑)
$\textsc{Exh}(\Box(\textsc{Exh}(\exists) \vee \forall))$

b. John **must** do **all** or **some** of the readings. (HD↓)
$\textsc{Exh}(\Box(\forall \vee \textsc{Exh}(\exists)))$

The issue is the following. If DAP predicts Φ to be HC-violating, then, due to its locality, for all context C, $C[\Phi]$ is also predicted to be HC-violating. Since DAP predicts *all or some* to be HC-violating, (14b) should be so too. It appears difficult to modify DAP to account for cases such as those, without having to posit some more global constraint akin to F&S's *Incremental Weakening*.

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