A dynamic alternative-pruning account of asymmetries in Hurford Disjunctions[a]

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Introduction

Hurford's Constraint

- Hurford Disjunctions (henceforth HD) are disjunctions of the form $p \vee q$ where p entails q ($p \Rightarrow q$).
- Those disjunctions are generally thought to be infelicitous (Hurford, 1974). **This is known as Hurford's constraint** (henceforth **HC**) exemplified in (1) below.

(1) # Michelle lives in **Paris** or **France**.
Michelle lives in Paris $\Rightarrow$ **Michelle lives in France**

- We (somewhat abusively) call **Paris** the **strong** disjunct, and **France** the **weak** disjunct.

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Accounts of basic Hurford disjunctions

- Various constraints have been devised to capture those basic HDs: Non-Triviality (Schlenker, 2009), Mismatching Implicatures (Meyer, 2013, 2015), Non-Redundancy (Katzir and Singh, 2014), Logical Integrity (Anvari, 2018).
- Those constraints impose logical restrictions on the two disjuncts w.r.t. each other and/or the context.
- Crucially, **those restrictions are symmetric, i.e. do not depend on the ordering of the two disjuncts.**

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The particular case of “scalar” Hurford Disjunctions (SHD)

- As first noticed by Gazdar, some HDs involving two related scalar items (let us call them SHDs) appear to be felicitous (Gazdar, 1979).
- This apparent **obviation** of Hurford's Constraint is exemplified in (2a), with scalemates **or** and **and**, and (2b), with scalemates **some** and **all**.

(2) a. Jude ate cookies **or** apples, or (else) cookies **and** apples.
Jude ate cookies and apples ⇒ **Jude ate cookies or apples**

b. Jude ate **some** of the cookies or **all** of the cookies.
Jude ate all of the cookies ⇒ **Jude ate some of the cookies**

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“Singh’s asymmetry” in SHDs

- (Singh, 2008) pointed out that SHDs are subject to an asymmetry:
  - a **weak**-to-**strong** SHD, such as (3a), is felicitous...
  - while a **strong**-to-**weak** SHD like (3b), is not.

(3) a. Eleanor ate **some** or **all** of the cereals. ($\exists \vee \forall$)

b. # Eleanor ate **all** or **some** of the cereals. ($\forall \vee \exists$)

- The contrast may subtle; but at least, it seems that (3a) is less in need an overt **only** fronting **some** than (3b) is, in order to be “rescued”.

(3′) a. Eleanor ate (**only**) **some** or **all** of the cereals. ($\exists \vee \forall$)

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The challenge

- The various principles modeling Hurford's Constraint in the basic case cannot account for Singh's asymmetry, because they are insensitive to the order of presentation of the disjuncts.
- Since the asymmetry seems to apply only to SHDs only (see (4) to be sure of that !), **it must result from an interplay between scalar implicatures and a specific implementation of Hurford's Constraint.**

(4) a. # Michelle lives in **Paris** or **France**.
$\rightsquigarrow$ **Paris** is not in **France** ?!?

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- The rest of this talk is structured follows:
  - We briefly review previous accounts of Singh's asymmetry, and point out some of their limits.
  - We propose a novel account of the asymmetry based on what we will call *Dynamic Alternative Pruning* (DAP).
  - We show that DAP straightforwardly accounts for (3) and correctly predicts *obviation* of Hurford's Constraint in certain specific environments.
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Background

How can scalar implicatures help ?

- In the particular case of SHDs, the grammatical approach to scalar implicatures (Chierchia, 2006; Chierchia et al., 2012; Fox, 2007; Spector et al., 2008, a.o.) seems more appropriate than the Neo-Gricean framework (Fauconnier, 1975a, 1975b; Horn, 1972, 1989; Levinson, 1983, 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.**

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- **More specifically, the grammatical view allows for implicatures targeting the weak Hurford disjunct.**

Exhaustification and the grammatical approach

- The grammatical 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 $\mathscr{A}_p$, and returns the conjunction of the prejacent and the grand negation of logically stronger alternatives.

Basic Exhaustification

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

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Exh to the rescue.. but we are not quite here yet !

(3) a. Eleanor ate **some** or **all** of the cereals. $(\exists \vee \forall)$

$\rightsquigarrow$ Eleanor ate **only** **some** or **all** of the cereals.

b. # Eleanor ate **all** or **some** of the cereals. $(\forall \vee \exists)$

$\not\rightsquigarrow$ Eleanor ate **all** or **only** **some** of the cereals.

- Under those assumptions, an occurrence of *some* ($\exists$) embedded within a disjunctive statement may be parsed as $\text{Exh}(\exists, \mathscr{A}_\exists)$.
- Assuming that the set of stronger alternatives to **some** only contains **all** ($\forall$), $\text{Exh}(\exists, \mathscr{A}_\exists) = \exists \wedge \neg\forall$, meaning, **some but not all**.
- Since $\exists \wedge \neg\forall$ no longer entails $\forall$, computing embedded scalar implicatures in (3) can indeed help rescuing SHDs from HC-violation...
- **...but this rescue mechanism, without further assumptions, applies to both weak-to-strong and strong-to-weak SHDs, so the contrast between (3a) and (3b) still remains to be accounted for !**

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Singh's solution (Singh, 2008)

- Singh proposed a specific implementation of the process checking the satisfaction of Hurford's Constraint (let us call it **HC-checking**).
- HC-checking applies incrementally, and in a somewhat greedy fashion, at each point of application of the $\vee$ (*or*) operator.

HC-checking

Check whether the *potentially* EXHaustified left-hand-side disjunct, along with *necessarily* non-EXHaustified right-hand-side disjunct, do not violate HC.

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Limits of Singh's account

- Singh's theory is appealing due to its relative simplicity: HC-checking is applied on-the-fly, with a precise timing w.r.t. EXH.
- **This account however, runs into problems when a SHD gets embedded under certain kinds of operators...**
- In particular, when a SHD gets embedded under a necessity modal, such as *must*, like in (5) below, both orders seem felicitous.

(5) a. Robert must examine **some** or **all** of the patients. $\Box(\exists \vee \forall)$
$\rightsquigarrow$ Robert must examine **only some**, or **all** of the patients.

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- **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 ΔA where A is a formula and Δ a left-hand-side context for this formula, $^*\Delta\text{Exh}(A)$ whenever, for any logical continuation Γ of $\Delta\text{Exh}(A)$, $\Delta A\Gamma \Rightarrow \Delta\text{Exh}(A)\Gamma$ or $\Delta A\Gamma \Leftrightarrow \Delta\text{Exh}(A)\Gamma$.

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- ...but at the cost of positing a new, quite complex ECONOMY principle governing EXH-insertion, which 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.
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- Tomioka argues that a specific implementation of Hurford's Constraint is active in contrastive environments in general, including disjunctions and *but*-statements, as exemplified in (6).

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b. # Adam did **all** of the homework, but Bill did **some** of it.

(Tomioka, 2021)

- It is worth noting that the conjuncts in (6) are logically independent 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.
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- The CAC appeals to the notion of *focus semantic value*, as well as that of *ordinary value*, as defined in (Rooth, 1992):
  - the **ordinary semantic value** of an element refers to its "regular" semantics;
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The Contrast Antecedent Condition (CAC)

When an element R is contrastively focused, there must be an antecedent L preceding R and generating a set of alternatives $\mathscr{A}_L$, s.t.:

- $\mathscr{A}_L$ is a subset of the focus semantic value of L — Subset
- its members are mutually exclusive — Exclusivity
- it includes the ordinary value of both L and R — Inclusivity

- Appendix on p. 36 describes how Tomioka's account captures the basic contrast of (3).

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Limits of Tomioka's account

- Tomioka's approach is interesting because appears well-suited to more general "contrastive" environments, whereby the disjuncts are not in an entailment relation *per se*.
- Yet, it posits strong structural constraints on alternatives, in particular EXCLUSIVITY, which can be seen as an emulation of HC.
- Additionally, the account predicts that the disjunctive counterpart of (6), given in (7) should exhibit the same HD-like felicity pattern, which is not true.

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

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The proposal

Capturing Singh's asymmetry via Alternative Pruning

- We propose an alternative way of deriving HD-related asymmetries, using a lightweight mechanism we call *Dynamic Alternative Pruning* (DAP).
- Instead of formulating the asymmetry as a problem of EXH-insertion as F&S do, we assume EXH is always inserted, but does not always operate on the exact same set of alternatives.
- The fact that our account relocates the asymmetry in the set of alternatives makes it closer to Tomioka's.
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Dynamic Alternative Pruning: key ingredients and definition

- The key difference between our account and the previous accounts is that we assume $\mathscr{A}_p$ 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 (Rooth, 1992) and (Tomioka, 2021), that R has an ordinary semantic value $[\![R]\!]_o$, and a focus semantic value $[\![R]\!]_f$.
- We then define the alternatives to R as follows:

Dynamic Alternative Pruning (DAP)

$$\mathscr{A}_R = \begin{cases} [\![R]\!]_f \setminus [\![L]\!]_o \text{ if } \exists L \prec_{\ell.\ell} R.\ [\![R]\!]_f = [\![L]\!]_f \\ [\![R]\!]_f \text{ otherwise} \end{cases}$$

- Where $\prec_{\ell.\ell}$ represents **local linear precedence**, restricted to the left-hand side of the $\vee$ operator.
- Whenever it's defined, we call the locally-linearly preceding element L the **contrast antecedent** of R, following Tomioka.

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Accounting for the basic case

(3) a. Eleanor ate **some** or **all** of the cereals. ($\exists \vee \forall$)
$\rightsquigarrow$ Eleanor ate **only** **some** or **all** of the cereals.

b. # Eleanor ate **all** or **some** of the cereals. ($\forall \vee \exists$)
$\not\rightsquigarrow$ Eleanor ate **all** or **only** **some** of the cereals.

- In (3a) EXH is applied to the 1st disjunct ($L = \exists$). L has no contrast antecedent and thus, the $\forall$-alternative is still present in $\mathscr{A}_L$. $\text{EXH}(L, \mathscr{A}_L)$ standardly yields $\exists \wedge \neg\forall$. This makes the two disjuncts of (3a) mutually exclusive and the structure is successfully rescued from HC-violation.
- In (3b), EXH is applied to the 2nd disjunct ($R = \exists$), which has a contrast antecedent $L = \forall$, so the $\forall$-alternative is no longer taken into account (pruned) in $\mathscr{A}_R$, and EXHaustification becomes idle ($\text{EXH}(R, \mathscr{A}_R) = \exists$). The structure therefore remains HC-violating.
- This result can be easily generalized to other simple SHDs, such as $(p \vee q) \vee (p \wedge q)$.

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More complex SHDs

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 (8) for instance, is s.t. $\exists$ and $\forall$ are separated by *most* (**M**), supposedly leading to HC-obviation.

(8) *Context: did Prudence do* **most** *of the homework ?*

a. Prudence did **some** or **all** of the homework. ($\exists \vee \forall$)
$\rightsquigarrow$ Prudence did **some** but not **most** or **all** of the homework.

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DAP accounts for DED cases

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- In (8a) $\exists$ occurs in the 1st disjunct, L, which does not have any contrast antecedent. EXH thus operates on the standard alternative set: $\text{EXH}(L, \mathscr{A}_L) = \text{EXH}(\exists, \{\exists, \mathbf{M}, \forall\}) = \exists \wedge \neg \mathbf{M} \Rightarrow \exists \wedge \neg \forall$. This causes the two disjuncts to become mutually exclusive, and hence HC-compliant.
- In (8b) $\exists$ occurs within the 2nd disjunct, R. We have $[\![R]\!]_f = \{\exists, \mathbf{M}, \forall\}$. R however, has a clear contrast antecedent, $L = \forall$. As a result, we have $\mathscr{A}_R = \{\exists, \mathbf{M}\}$, and thus, $\text{EXH}(R, \mathscr{A}_R) = \exists \wedge \neg \mathbf{M}$. Same result as in (8a).

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HC-obviation by universal operators

- Another interesting case discussed by F&S is that of universally quantified disjuncts such as those in (9). Unlike its non-quantified counterpart (10b), (9b) seems to be subject to HC-obviation.

(9) a. George must play the guitar **or** the sitar, or he must play **both**. $\Box(g \vee s) \vee \Box(g \wedge s)$

b. George must play the guitar **and** the sitar, or he must play **either**. $\Box(g \wedge s) \vee \Box(g \vee s)$

(10) a. George plays the guitar **or** the sitar, or he plays **both** the guitar **and** the sitar. $(g \vee s) \vee (g \wedge s)$

b. # George plays the guitar **and** the sitar, or he plays **either** the guitar **or** the sitar. $(g \wedge s) \vee (g \vee s)$

DAP accounts for the universally quantified disjuncts case

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- In (9a), the 1st disjunct $L = \Box(g \vee s)$ is enriched by computing $\textsc{Exh}(\Box(g \vee s), \mathscr{A}_{\Box(g \vee s)})$. We have $\mathscr{A}_{\Box(g \vee s)} = \{\Box g, \Box s, \Box(g \wedge s)\}$. Since $\Box g$ and $\Box s$ are the only two alternatives that are stronger than L, L is enriched with $\neg\Box g \wedge \neg\Box s$. Since $R = \Box(g \wedge s) = \Box g \wedge \Box s$ and $\neg\Box g \wedge \neg\Box s$ are contradictory, the disjuncts are no longer entailing, and the structure becomes HC-compliant.
- In (9b), $L = \Box(g \wedge s)$ constitutes a contrast antecedent to $R = \Box(g \vee s)$, so $\mathscr{A}_R = \{\Box g, \Box s, \Box(g \wedge s)\} \setminus \{\Box(g \wedge s)\} = \{\Box g, \Box s\}$. Yet, alternative pruning does not affect $\textsc{Exh}$austification in that case, since the alternative to R that has been pruned, $\Box(g \wedge s)$, is not stronger than R. As a result, $\textsc{Exh}$austification proceeds just like in (9a), and leads to the same result.

DAP accounts for the universally quantified disjuncts case

(9) a. George must play the guitar **or** the sitar, or he must play **both**. $\Box(g \lor s) \lor \Box(g \land s)$

b. George must play the guitar **and** the sitar, or he must play **either**. $\Box(g \land s) \lor \Box(g \lor s)$

- In (9a), the 1[st] disjunct $L = \Box(g \lor s)$ is enriched by computing $\textsc{Exh}(\Box(g \lor s), \mathscr{A}_{\Box(g \lor s)})$. We have $\mathscr{A}_{\Box(g \lor s)} = \{\Box g, \Box s, \Box(g \land s)\}$. Since $\Box g$ and $\Box s$ are the only two alternatives that are stronger than L, L is enriched with $\neg\Box g \land \neg\Box s$. Since $R = \Box(g \land s) = \Box g \land \Box s$ and $\neg\Box g \land \neg\Box s$ are contradictory, the disjuncts are no longer entailing, and the structure becomes HC-compliant.
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The challenge of long-distance Hurford disjunctions

- Long-distance Hurford Disjunctions (LDHDs, see (11)) have been pointed out as a challenge for implementations of HC (Marty and Romoli, 2022, now M&R).

(11) # Yoko lives in **France**, or she lives in **London** or in **Paris**.

- LDHDs differ from HDs in that the **strong** disjunct is embedded in a lower-level disjunction with a term contradicting the **weak** disjunct.
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- Here, we take for granted the mysterious infelicity of LDHDs; note however, that "quasi"-LDHDs (using M&R's terminology) seem to be rescued from HC-violation, as shown by (12).

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HC-obviation in scalar LDHDs

- To the best of our knowledge, scalar LDHDs (SLDHDs) such as those in (13) have not been discussed in the literature so far.
- Felicity judgments are hard to get, because of the two levels of disjunction, which may introduce additional parsing difficulties.
- We feel however that the sentences in (13) sound consistently less redundant than (11), which points to HC-obviation...

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

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Scalar LDHDs as a testing ground for DAP

- If scalar LDHDs are indeed subject to HC-obviation, DAP, and not F&S's ECONOMY principle, happens to make the right prediction.
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- F&S predict that $\textsc{Exh}$ should apply to $\mathbf{M}$ in (13a), but not in (13b), because $\textsc{Exh}$ is Incrementally Weakening in that configuration: $(\forall \vee \neg\exists) \vee \textsc{Exh}(\mathbf{M}, \mathscr{A}_{\mathbf{M}}) = (\forall \vee \neg\exists) \vee (\mathbf{M} \wedge \neg\forall) = \forall \vee \neg\exists \vee \mathbf{M}$.
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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).
- It constitutes an incremental, local, and one-pass algorithm, which guarantees that the formal alternatives of a proposition R should exclude any locally-preceding contrast antecedent L.
- Our account does just as well as the previous ones for a variety of SHDs, and may make interesting predictions in the case of SLDHDs, 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.

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Future work

- One datapoint that DAP cannot straightforwardly capture is a case of HC-obviation triggered by embedding an entire scalar HD under $(\textsc{Exh} \circ \Box)$ (5). Note that this was already an issue for Singh.

(5) a. Robert must examine **some** or **all** of the patients.
$\textsc{Exh}(\Box(\textsc{Exh}(\exists) \vee \forall))$

b. Robert must examine **all** or **some** of the patients.
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- It appears difficult to modify DAP to account for cases such as those, without subscribing to a more global constraint akin to F&S's ECONOMY principle.

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Thank you !

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Appendices

How (Singh, 2008) predicts the basic asymmetry

(3) a. Eleanor ate **some** or **all** of the cereals. ($\exists \vee \forall$)
$\rightsquigarrow$ Eleanor ate **only** **some** or **all** of the cereals.

b. # Eleanor ate **all** or **some** of the cereals. ($\forall \vee \exists$)
$\not\rightsquigarrow$ Eleanor ate **all** or **only** **some** of the cereals.

- In (3a), the two arguments passed to HC-checking are $\textsc{Exh}(\exists, \mathscr{A}_{\exists}) = \exists \wedge \neg\forall$ ($\textsc{Exh}$austified left-hand side) and $\forall$ (necessarily non-$\textsc{Exh}$austified right-hand side). Since those two arguments 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 non-$\textsc{Exh}$austified right-hand side). Since $\forall \Rightarrow \exists$, HC is violated.

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- In (3a), EXHaustifying the 1st disjunct would yield $\text{EXH}(\exists, \mathscr{A}_{\exists}) = \exists \wedge \neg\forall \not\Leftarrow \exists$. This result trivially extends to any logical continuation Γ of the 1st disjunct. Therefore, EXH is not IW and can be inserted, making the resulting two disjuncts HC-compliant.
- In (3b), EXHaustifying the 2nd disjunct would yield $\forall \vee \text{EXH}(\exists, \mathscr{A}_{\exists}) = \forall \vee (\exists \wedge \neg\forall) = \forall \vee \exists$. This last equivalence trivially extends to any continuation Γ, so EXH is IW, and thus *cannot* be inserted, so the structure remains HC-violating, as desired.

How (Tomioka, 2021) predicts the basic asymmetry

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- In (3a), EXHaustifying the 1st disjunct allows to verify the CAC, since $\mathscr{A}_{\text{EXH}(\exists,\mathscr{A}_\exists)}$ can be defined as the set $\{\exists \wedge \neg\forall, \forall, \neg\exists\}$, which includes the ordinary value of the 1st disjunct $\text{EXH}(\exists, \mathscr{A}_\exists) = \exists \wedge \neg\forall$ and the ordinary value of the 2nd disjunct $\forall$, and whose members are mutually exclusive.
- In (3a), finding a CAC-compliant set of alternatives for $\forall$ is impossible, since it should contain $\forall$ (ordinary value of the 1st disjunct), but also either:
  - $\exists$ (ordinary value of the non-EXHaustified 2nd disjunct) – this would violate EXCLUSIVITY, as $\forall \Rightarrow \exists$.
  - or $\exists \wedge \neg\forall$ (ordinary value of the EXHaustified 2nd disjunct) – but this would violate SUBSET, since $\exists \wedge \neg\forall$ is more complex than $\forall$, and thus cannot be a focus alternative to $\forall$.

How (Tomioka, 2021) deals with the SLDHD challenge I

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

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- Let us first focus on (13a).
  - In non-EXHaustified (13a), INCLUSIVITY imposes that $\mathscr{A}_{\mathbf{M}}$ include $\{\mathbf{M}, (\neg\exists \vee \forall)\}$, but SUBSET also imposes that $(\neg\exists \vee \forall)$ be a focus alternative to $\mathbf{M}$, which is impossible because it is too complex. The CAC cannot be satisfied.
  - In EXHaustified (13a), INCLUSIVITY imposes that $\mathscr{A}_{\mathbf{M}\wedge\neg\forall}$ include $\{(\mathbf{M}\wedge\neg\forall), (\neg\exists \vee \forall)\}$, a set that satisfies SUBSET and EXCLUSIVITY. The CAC is overall satisfied.
- Conclusion: (13a) is felicitous iff EXHaustified.

How (Tomioka, 2021) deals with the SLDHD challenge II

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

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

- Let us now focus on (13b)...
  - In non-EXHaustified (13b), INCLUSIVITY imposes that $\mathscr{A}_{\neg\exists\vee\forall}$ include $\{\mathbf{M}, (\neg\exists \vee \forall)\}$, a set that violates EXCLUSIVITY. The CAC cannot be satisfied.
  - In EXHaustified (13b), INCLUSIVITY imposes that $\mathscr{A}_{\neg\exists\vee\forall}$ include $\{(\mathbf{M} \wedge \neg\forall), (\neg\exists \vee \forall)\}$ a set that satisfies SUBSET and EXCLUSIVITY. The CAC is overall satisfied.
- Conclusion: (13b) is felicitous iff EXHaustified.