Anaphora and simplification

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https://patrickdelliott.com/pdf/mil-slides.pdf

This talk is based on joint work with **Yasu Sudo** (UCL).

This work is part of an over-arching project to develop an account of anaphoric accessibility based on an independently-motivated, explanatory theory of presupposition projection.

- My 2020 manuscript *Towards a principled logic of anaphora*. `https://ling.auf.net/lingbuzz/005562`
- My 2022 TLLM proceedings paper *Disjunction in a predictive theory of anaphora*. `https://ling.auf.net/lingbuzz/006657`
- My 2022 manuscript *Partee conjunctions: projection and possibility*. `https://ling.auf.net/lingbuzz/006857`
- A (soon to be finished) paper with Yasu Sudo: *Free choice with anaphora*; also a 2022 Sinn und Bedeutung talk.

Introduction

- Background: anaphora in disjunctive sentences.
- The problem: simplification with anaphora — *free choice* as the main case study.
- Setting up the analysis: Bilateral Update Semantics (BUS) and Partee disjunctions.
- Integrating BUS with a presuppositional account of free choice.

Anaphora in disjunctive sentences

Discourse anaphora is possible across disjuncts $\phi \vee \psi$ if ϕ contains an existential statement, and $\neg\phi$ contextually entails a witness to the existential (Barbara Partee).

(1) Either there isn't a^x bathroom in this house,
or it$_x$'s in a funny place. $\neg\exists_x B(x) \vee F(x)$

You might be skeptical that (1) is a *bona fide* case of discourse anaphora. Two relevant observations:

- Formal Link Condition.
- Uniqueness inference (or lack thereof).

Formal link condition

This is *bona fide* discourse anaphora — Partee disjunctions are subject to the *formal link condition*.

(2) a. ? Rob is married, and he'll bring them$_x$.

b. Rob has a^x spouse, and he'll bring them$_x$.

(3) a. ? Either Rob isn't married or he'll bring them$_x$.

b. Either Rob *doesn't* have a^x spouse or he'll bring them$_x$.

Contrast between (2a) and (2b) parallels contrast between (3a) and (3b).

Like *bona fide* discourse anaphora, anaphora in Partee disjunctions doesn't give rise to an (obligatory) uniqueness inference — we can see this by adapting Heim's famous Sage plant sentence (Mandelkern & Rothschild 2020).

(4) a. Sue bought a^x Sage plant, and she bought 8 others along with it$_x$.

b. Either Sue didn't buy a^x Sage plant, or she bought 8 others along with it$_x$.

As Mandelkern & Rothschild emphasize, this is incompatible with E-type accounts of anaphora Partee disjunctions (i.e., **it**=[**the Sage plant**]; Heim 1990, Elbourne 2005). This will be important!

Theoretical status of Partee disjunctions

Classical dynamic theories of discourse anaphora (e.g., Heim 1982, Groenendijk & Stokhof 1991) are unable to account for Partee disjunctions due to their treatment of negation.

Without going into detail, the crux of the problem: *Rob isn't married* and *Rob doesn't have a spouse* end up being semantically equivalent.

Several alternative frameworks have subsequently emerged which resolve this issue, although the details vary; see especially Krahmer & Muskens 1995, Gotham 2019, Elliott 2020, 2022, Hofmann 2019, 2022, Mandelkern 2022.

Simplification with anaphora

Simplification inferences

Disjunction interacts with other logical operators in surprising ways — concretely, it gives rise to *simplification inferences* which prove problematic for classical semantics.

Three relevant cases:

- **Free choice** (Kamp 1973; our main case study).
- Distributive inferences (Crnič, Chemla & Fox 2015).
- Simplification of Disjunctive Antecedents (SDA) (Fine 1975, Nute 1975).

The problem of Free Choice (FC) — how to validate (5) (Kamp 1973).

(5) **FC:** $\Diamond(\phi \vee \psi) \Rightarrow \Diamond\phi \wedge \Diamond\psi$

(6) You may have coffee or tea.

a. $\Rightarrow$ *You may have coffee and you may have tea*

It's easy to see that a classical semantics for existential models and disjunction doesn't validate FC; the existence of an accessible world at which $\phi \vee \psi$ is true doesn't guarantee the existence of an accessible world at which ϕ is true, and one at which ψ is true.

Accounts of free choice

Accounts of FC can be split into two main camps:

- Exhaustification accounts — FC is an implicature (Kratzer & Shimoyama 2002, Alonso-Ovalle 2005, Fox 2007, Bar-Lev & Fox 2017, Bar-Lev 2018, del Pinal, Bassi & Sauerland 2022).
- Semantic accounts — FC is a semantic entailment (Zimmermann 2000, Aloni 2022, Simons 2005, Willer 2018, 2019b, Goldstein 2019, 2020).

Currently an open question which is the right approach to this phenomenon. Our talk will bear on this question, in favour of semantic accounts.

Simplification in exhaustification accounts

What is relevant for our purposes is that all exhaustification accounts we're aware of involve computations relative to *simpler* 'domain' alternatives (Fox & Katzir 2011, Katzir 2008).

$$\phi, \psi \in \mathbf{ALT}(\phi \vee \psi)$$

Domain alternatives also play an important role in the literature on ignorance inferences (Sauerland 2004), and of course in exhaustification accounts of other simplification inferences.

The precise mechanics of the exhaustification account won't be crucial for our argument, but we'll briefly sketch Bar-Lev & Fox's (2020) *innocent inclusion* account.

Bar-Lev & Fox's $\mathcal{E}xh$ operates in two steps:

1. Exclusion step: negate as many alternatives as possible, in a way which doesn't lead to contradictions.
2. inclusion step: assert as many alternatives as possible, in a way which doesn't lead to contradictions.

$$\mathbf{Alt}(\phi \vee \psi) = \{ \underbrace{\phi \vee \psi}_{\text{prejacent}}, \underbrace{\phi \wedge \psi}_{\text{conj. alt}}, \underbrace{\phi, \psi}_{\text{domain alts}} \}$$

The *exclusion step* negates the conjunctive alternative; the domain alternatives can't be consistently negated:

$$\underbrace{\phi \vee \psi}_{\text{assertion}} \wedge \underbrace{\neg(\phi \vee \psi)}_{\text{implicature}}$$

The *inclusion step* can't consistently include the domain alternatives, since doing so would contradict the implicature.

Modalized disjunctions and inclusion

$$\mathbf{Alt}(\Diamond(\phi \vee \psi)) = \{\, \underbrace{\Diamond(\phi \vee \psi)}_{\text{prejacent}}, \underbrace{\Diamond(\phi \wedge \psi)}_{\text{conj. alt}}, \underbrace{\Diamond\phi, \Diamond\psi}_{\text{domain alts}} \,\}$$

The *exclusion step* again negates the conjunctive alternative; the domain alternatives can't be consistently negated.

$$\underbrace{\Diamond(\phi \vee \psi)}_{\text{assertion}} \wedge \underbrace{\neg\Diamond(\phi \wedge \psi)}_{\text{implicature}}$$

Crucially, including the domain alternatives *is* consistent with the implicature, giving rise to FC.

$$\underbrace{\Diamond(\phi \vee \psi)}_{\text{assertion}} \wedge \underbrace{\neg\Diamond(\phi \wedge \psi)}_{\text{implicature}} \wedge \underbrace{\Diamond\phi \wedge \Diamond\psi}_{\text{FC}}$$

Simplification in semantic accounts

Semantic accounts are clearly not wedded to simplification, unlike exhaustification accounts, although many nevertheless place conditions on individual disjuncts.

Later on, we'll show how a concrete semantic account of FC can be tweaked in order to avoid the problems that arise due to simplification.

The problem, abstractly

The problem of anaphora with free choice involves a Partee disjunction embedded under an existential modal.

(7) $\Diamond(\neg\exists_x P(x) \vee Q(x))$

As expected, sentences like (7) give rise to the FC inference (8a), corresponding to the first disjunct. Surprisingly however, they also give rise to the inference in (8b), whereas a simplification account is tailored to derive the classical FC inference (8c).

(8) a. $\Rightarrow \Diamond\neg\exists_x P(x)$

b. $\Rightarrow \Diamond\exists_x (P(x) \wedge Q(x))$

c. $\not\Rightarrow \Diamond Q(x)$

The problem, concretely i

First, an example with a possibility modal:

(9) It's possible that Tony doesn't have a^x stash,
or that he hid it$_x$.

a. $\Rightarrow$ *It's possible that Tony doesn't have a stash.*

b. $\Rightarrow$ *It's possible that Tony has a stash and hid it.*

The problem extends to more classical cases involving deontic modals:

(10) You're allowed to (either) write no^x squib, or submit it$_x$ before the final class.

a. ⇒ *You're allowed to write no squib.*

b. ⇒ *You're allowed to write a squib and submit it before the final class.*

Anaphora and simplification inferences more generally

Like FC, disjunction gives rise to other *simplification inferences* which prove to be problematic for classical semantics.

- Distributive inferences.
- Simplification of Disjunctive Antecedents (SDA).

These phenomena receive a completely parallel account to FC inferences, in terms of exhaustification (Bar-Lev & Fox 2020).

The presence of an anaphoric dependency in the disjunction gives rise to a problem completely parallel to the one we observe with FC.

Distributive inferences are intuitively valid, when a disjunction is in the scope of a universal quantifier:

(11) **Distributive inference**:
$\forall_x(\phi \vee \psi) \vDash \exists_x \phi \wedge \exists_x \psi$

(12) Every student either didn't submit a squib, or submitted it before the last day of class.

a. $\Rightarrow$ *Some student didn't submit a squib*

b. $\Rightarrow$ *Some student submitted a squib before the last day of class*

SDA is intuitively valid in natural language, and is not predicted by classical semantics for disjunction and conditionals (Fine 1975).

(13) **Simplification of Disjunctive Antecedents (SDA):**
$(\phi \vee \psi) > \rho \vDash (\phi > \rho) \wedge (\psi > \rho)$

(14) If either there's no bathroom or it's upstairs, this house needs to be renovated.

a. $\Rightarrow$ *if there's no bathroom, this house needs to be renovated.*

b. $\Rightarrow$ *If there's a bathroom upstairs, this house needs to be renovated*

Sharpening the problem for simplification

One way of understanding what goes wrong — once we have a discourse-anaphoric dependency between the two disjuncts, the latter disjunct is no longer a **truthmaker** of the disjunctive sentence.

Accounts based on simplification implicitly rely on the domain alternatives of disjunction each being truthmakers of the disjunctive sentence.

An E-type approach to anaphora would potentially help get the right descriptive content in the latter disjunct (with local accommodation), i.e.:

(15) You're allowed to write no squib,
or submit it[**=the squib**] before the final class.

As we already showed in our discussion of donkey anaphora, an E-type approach isn't tenable for Partee disjunctions in the first place.

Local accommodation?

Another way out would be to say that the *anaphoric* presupposition of the free pronoun is somehow locally accommodated.

but: anaphoric presuppositions *can't* easily be locally accommodated, cf. Barbara Partee's famous marble example.

(16) a. 1^x out of these 10 marbles is still missing.
It$_x$'s under the couch.

b. I've found 9 out these 10 marbles.
It$_x$'s under the couch.

Partee disjunctions — a crucial aspect of the puzzle — are already problematic for many existing theories of discourse anaphora (with some notable exceptions, such as Hofmann 2019, 2022, Mandelkern 2022).

We adopt Elliott's (2020, 2022) *Strong Kleene* account of Partee disjunctions, which has the virtue of drawing a tight connection between presupposition projection and anaphora in disjunctive sentences.

As a proof of concept, we integrate Goldstein's (2019) presuppositional account of FC with Elliott's account of Partee disjunctions. Since both exploit *update semantics*, this turns out to be relatively straightforward.

Bilateral Update Semantics

Our initial goal will be to set up a simple account of Partee disjunctions by setting up an update semantics which validates *Double Negation Elimination*.

(17) $\neg\neg\phi \iff \phi$

This will be necessary in order to account for how the *negation* of a negative statement can introduce a discourse referent. There is independent evidence that this is necessary (see especially Gotham 2019 for discussion).

(18) There's no way that Matt doesn't own a^x smart shirt. It$_x$'s in his closet!

We'll accomplish this by setting up a Bilateral Update Semantics (BUS), in which an expression ϕ is associated with both a *positive update* on an information states s, $s[\phi]^+$ and a *negative update* $s[\phi]^-$ — see Elliott 2022 for details of the full system, and Willer 2019a, 20180, 2019b for a similar set-up.

Updates are functions from Heimian information states (sets of world-assignment pairs) to information states.

The positive update $s[\phi]^+$ often (but not always) corresponds to the effect of asserting ϕ against a Heimian file context set s.

(19) $s[\text{it}_x \text{ is upstairs}]^+ := \{ (w, g) \in s \mid g_x \text{ is upstairs}_w \}$

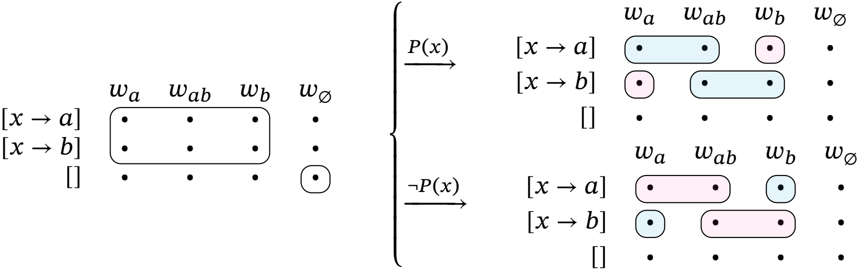
(20) $s[\text{it}_x \text{ is upstairs}]^- := \{ (w, g) \in s \mid g_x \text{ isn't upstairs}_w \}$

Atomic sentences are associated with a positive/negative update which picks out the possibilities in s at which the sentence is true/false respectively.

We assume that assignments are partial, which means that $s[\phi]^{+,-}$ doesn't always partition s.

In order to capture Heimian familiarity, we assume (tentatively) that $c[\phi]^{+,-}$ must partition c in order for ϕ to be assertable at c (i.e., *Stalnaker's bridge*; von Fintel 2008).

Figure 1: Dynamics of simple sentences.
Subscripts on worlds exhaustively indicate which individuals are P



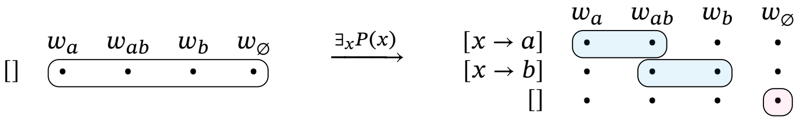
The positive update of an existential statement introduces a discourse referent, just like in ordinary update semantics.

(21) s[there is a^x bathroom]$^+$ $:=$
$\{\,(w, h) \mid (w, g) \in s, g[x]h \wedge h_x \text{ bathroom}_w\,\}$

Crucially, the negative update of an existential statement simply picks out possibilities in s at which there is no bathroom, without introducing any anaphoric information.

(22) s[there is a^x bathroom]$^-$ $:=$
$\{\,(w, g) \in s \mid \text{there is no bathroom in } w\,\}$

Figure 2: Dynamics of existential statements. Subscripts on worlds exhaustively indicate the individuals that are P.



Note that since existential statements can introduce anaphoric information, updates no longer necessarily partition the input state, even if the sentence is bivalent.

We can tweak the bridge principle using Groenendijk, Stokhof & Veltman's (1996) notion of *subsistence* ($\prec$) to fix this (ask me about this if you're interested).

$$s[\phi] := s[\phi]^{+} \text{ if } s \prec s[\phi]^{+} \cup s[\phi]^{-} \text{ else } \varnothing$$

In order to validate DNE, we can simply adopt the following "flip-flop" entry for negation (common in a bilateral setting).

(23) $s[\text{not } \phi]^{+} := s[\phi]^{-}$

(24) $s[\text{not } \phi]^{-} := s[\phi]^{+}$

It's obvious that this entry validates DNE, since $s[\neg\neg\phi]^{+} = s[\neg\phi]^{-} = s[\phi]^{+}$, and $s[\neg\neg\phi]^{-} = s[\neg\phi]^{+} = s[\phi]^{-}$.

This means that, e.g., $s[\text{there's no}^{x} \text{ bathroom}]^{-}$ will introduce a bathroom discourse referent. This will be crucial for our account of Partee disjunctions.

In BUS, we cash out the Strong Kleene truth table as a recipe for constructing positive/negative updates of complex expressions (this technique was innovated by Elliott 2020).

$\phi \vee \psi$	ψ_+	ψ_-	$\psi_?$
ϕ_+	$+$	$+$	$+$
ϕ_-	$+$	$-$	$?$
$\phi_?$	$+$	$?$	$?$

Figure 3: Strong Kleene disjunction

Each $+, -$ cell is interpreted as an instruction to perform a successive update. In order to get the result of the positive update of $s[\phi \vee \psi]^+$, we take the union of all of the successive updates represented by the $+$ cells.

In order to make sense of the ? cells — which correspond to the ‘unknown’ truth-value in Strong Kleene trivalent logic — we must define a derivative notion — the ‘unknown’ update.

(25) $s[\phi]^{?} = \{\, i \in s \mid i \not< s[\phi]^{+,-} \,\}$

In the simplest case, the unknown update picks out the parts of s which are neither in the positive, nor the negative update. To illustrate its utility, consider the unknown update of an open sentence:

(26) $s[\text{it}_x\text{'s upstairs}]^{?} := \{\, (w, g) \in s \mid g_x \text{ is undefined} \,\}$

(N.b. we can think of our bridge principle as a requirement that $c[\phi]^{?}$ is empty.)

An aside on explanatoriness

The Strong-Kleene truth-tables can be derived from basic principles of reasoning in the presence of uncertainty (they "come for free").

Connectives (and logical constants more generally) in BUS can be systematically derived from their Strong Kleene counterparts by a fixed recipe — no stipulations need to be made about how particular connectives manipulate anaphoric information.

BUS therefore meets Schlenker's (2008, 2009) "explanatory challenge" for dynamic semantics — widely appreciated for presupposition projection, but less so for anaphora.

Let's take a simple Partee disjunction, and start with computing the negative update.

(27) Either there's no^x bathroom, or it$_x$'s upstairs.

(28) $$s[\neg\exists_x B(x) \vee U(x)]^- = s[\neg\exists_x B(x)]^-[U(x)]^- = s[\exists_x B(x)]^+[U(x)]^-$$

(29) $$= \left\{ (w,h) \;\middle|\; \begin{array}{l} (w,g) \in s, g[x]h \\ \wedge\, h_x \text{ is a non-upstairs bathroom in } w \end{array} \right\}$$

N.b. that in BUS, de Morgan's equivalences go through — $\neg(\phi \vee \psi) \iff \neg\phi \wedge \neg\psi$, so "it's not the case that there is no bathroom or it's upstairs" is equivalent to "There's a bathroom and it's not upstairs" (by DNE).

The positive update is somewhat more involved. By the Strong Kleene truth-table, we must compute the following:

(30) $$s[\phi \vee \psi]^+ := s[\phi]^+[\psi]^+ \cup s[\phi]^+[\psi]^- \cup s[\phi]^+[\psi]^? \\ \cup\, s[\phi]^-[\psi]^+ \cup s[\phi]^?[\psi]^+$$

Roughly, the first line corresponds to dynamically verifying the disjunction by the truth of the first disjunct, and the second line corresponds to dynamically verifying the disjunction by the truth of the second disjunct.

We'll go through these cases one by one for our bathroom sentence.

Let's assume that the first disjunct is true — since the second disjunct introduces no anaphoric information, its contribution is trivial:

(31) s[there is no bathroom]$^{+}$[it's upstairs]$^{+,-,?}$ =
s[there is no bathroom]$^{+}$

(if ϕ is atomic, then $s[\phi]^{+,-,?} = s$)

What if the first disjunct is *false* — by DNE, that means it will introduce a DR, and the truth of the disjunction is dependent on the second disjunct being *true*.

(32) s[there is no bathroom]$^-$[it's upstairs]$^+$ =
s[there's a bathroom]$^+$[it's upstairs]$^+$

The $s[\phi]^?[\psi]^+$ case is irrelevant, since the first disjunct (an existential statement) is bivalent.

We've computed the positive update of a Partee disjunction:

(33) s[there's no^x bathroom or it$_x$'s upstairs]$^+$

$$= s[\text{there's a}^x \text{ bathroom}]^- \cup s[\text{there's a}^x \text{ bathroom}]^+[\text{it}_x\text{'s upstairs}]^+$$

$$= \{ (w,g) \in s \mid \text{there's no bathroom in } w \} \cup \{ (w,h) \mid (w,g) \in s, g[x]h, h_x \text{ an upstairs bathroom} \}$$

Possibilities where no bathrooms exist are retained, and bathroom-upstairs possibilities are associated with a bathroom discourse referent.

Remember that the negative update associates bathroom-not-upstairs possibilities with a bathroom discourse referent. This covers all scenarios — $s[.]^?$ is empty!

We've already mentioned that de Morgan's equivalences hold in BUS. By virtue of this and DNE, the following all end up being equivalent:

(34) Either there's no^x bathroom, or it$_x$'s upstairs.

(35) It's not the case that there's (both) a^x bathroom and it$_x$'s not upstairs.

(36) If there's a^x bathroom, then it$_x$'s upstairs.

Partee disjunctions have *existential* truth-conditions — our bathroom sentence is true if there is an upstairs bathroom, even if another bathroom is not upstairs (here we depart from, e.g., Krahmer & Muskens 1995, Gotham 2019).

The evidence that donkey sentences have existential readings is already well known (Chierchia 1995, Kanazawa 1994). It's relatively straightforward to make the same point for Partee disjunctions.

(37) Neither is there no bathroom in this house, nor is it in a surprising place.

(38) Either Gennaro doesn't have a credit card, or he paid with it.

I won't have anything to say (in this talk) about how to derive *universal* readings of donkey sentences, but a theory that generates a weaker reading by default seems like a promising starting point (see Champollion, Bumford & Henderson 2019).

Accounting for FR with anaphora

Now that we have a concrete account of discourse-anaphoric dependencies in disjunctive sentences, we're one step closer to accounting for FR with anaphora.

Since we've already developed an update semantics in order to account for Partee disjunctions, an account of FR which exploits update semantics is a natural fit — enter Goldstein's (2019) account.

The key idea behind Goldstein's semantic account of FR is that a disjunctive sentence semantically entails that each disjunct is possible.

(39) **Modal disjunction:** $\phi \vee \psi \Rightarrow \Diamond\phi \wedge \Diamond\psi$

Goldstein sketches an implementation of this idea in a simple update-semantic setting, following e.g., Veltman 1996. Here we simply adapt Goldstein's account to BUS, with an important adjustment.

Epistemic modals in update semantics

In update semantics, it is standard to treat epistemic modals as *consistency tests* on information states.

This idea can be translated straightforwardly into BUS as follows:

(40) $s[\Diamond\phi]^+ = s$ if $s[\phi]^+ \neq \emptyset$ else $\emptyset$

(41) $s[\Diamond\phi]^- = s$ if $s \prec s[\phi]^-$ else $\emptyset$

(N.b. in order to state the negative update of “might ϕ” we make use of the notion of *subsistence* from Groenendijk, Stokhof & Veltman 1996)

The final step will be to modify our semantics for disjunction — we'll simply state a new entry $\overline{\vee}$ in terms of our existing semantics for $\vee$.

(42) $s[\phi\overline{\vee}\psi]^+ := s[\phi \vee \psi]^+$
if $s[\phi]^+[\psi]^{+,-,?} \neq \varnothing$ and $s[\phi]^{-,?}[\psi]^+ \neq \varnothing$
else $\varnothing$

(43) $s[\phi\overline{\vee}\psi]^- := s[\phi \vee \psi]^-$

The intuition here is that $\phi \vee \psi$ can only be true if *both ways of dynamically verifying the disjunction* are contextually consistent; the negative update remains the same as before.

Let's see how this derives FR with anaphora in a concrete case.

The inferences we want to derive:

(44) $\Diamond(\neg\exists_x B(x) \vee U(x))$
$\Rightarrow \Diamond\neg\exists_x B(x)$
$\Rightarrow \Diamond(\exists_x B(x) \wedge U(x))$

Let's consider what constraints the disjunctive sentence places on the input state s (in order to be true):

(45) $\{(w, g) \in s \mid \text{no bathroom in } w\} \neq \varnothing$

(46) $\left\{ (w, h) \,\middle|\, \begin{array}{l} (w, g) \in s, g[x]h, \\ h_x \text{an upstairs bathroom in } w \end{array} \right\} \neq \varnothing$

So for the bathroom disjunction to be true, there should be at least one *no bathroom* possibility, and at least one *bathroom upstairs* possibility.

Illustration iii

Now, the epistemic modal $\Diamond$ demands that there are some possibilities in s at which the bathroom disjunction is true.

Since the bathroom disjunction itself places a contingency requirement on the input state, this will only hold if:

- The *no bathroom* possibilities in s are non-empty.
- The *bathroom upstairs* possibilities in s are non-empty

This guarantees that, whenever s is consistent with $\neg\exists_x B(x) \vee U(x)$, s is consistent with both $\neg\exists_x B(x)$ and $\exists_x B(x) \wedge U(x)$. FR with anaphora is thereby derived as a semantic entailment.

The approach to FC with anaphora developed here can be easily extended to negative FC with anaphora by adopting a *negative modal conjunction*.

Extensions to SDA and distributive inferences are a WiP!

Conclusion

Summing up

Crucial ingredients:

- A dynamic account of Partee disjunctions which can deliver existential truth conditions — we went with BUS, since it easily integrates with a presuppositional account of FC, but other potentially good candidates: Mandelkern 2022, Hofmann 2019, 2022.
- An account of FR which treats it as a semantic entailment — we went with Goldstein's (2019) implementation of modal disjunction as a proof of concept. Another good candidate is a dynamicization of Aloni's (2022) account.

Open issues

- Generalization to non-epistemic modals — see Goldstein 2019 for details on how to generalize the account of FR we assume to non-epistemics.
- Is there a way to reconcile the exhaustification account and FR with anaphora? The only possibility we can think of is to assume a syntactic representation of the local context into the latter disjunct (Meyer 2016), but this has independent problems. We leave this as an open challenge.

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