Symmetry, Pruning & Brevity

Marie-Christine Meyer

ZAS Berlin

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Relevance-Based Pruning

Narrowing down $\mathcal{A}LT$ to A is allowed only if no relevant alternative is left out

Brevity-Based Pruning

Narrowing down $\mathcal{A}LT$ to A is allowed only if the enriched meaning that this derives could not have been expressed simpler

Pruning

: The act of deleting elements from the set $\mathcal{A}LT$ of formal, potential alternatives

usually done in order to get the set of alternatives A that are actually used to compute the scalar implicatures of σ in C

Alternatives $\mathcal{A}LT(\sigma)$ used in implicature computation come from:

- the lexicon
- sub-constituents of σ
- the context

(1) John drank some$_{\text{ALL}}$ of the beers

(2) Everybody knows a song or a poem

(3) Mary must reject some but not all papers.
Bill only has to reject some

Structural Alternatives $\mathcal{A}LT$

$\alpha \in \mathcal{A}LT(\sigma)$ iff α can be derived from σ by replacing sub-constituents in σ with

- elements from the lexicon
- sub-constituents of σ
- constituents uttered in C

(Katzir 2007)

Innocently Excludable Alternatives $\mathcal{IE}$

The set $\mathcal{IE} \subseteq \mathcal{A}LT(\sigma)$ is the intersection of all sets $Max \subseteq \mathcal{A}LT$ s.t.

1. all elements in Max can be negated together without contradicting σ
2. there is no element in $\mathcal{A}LT(\sigma)$ which could be added to Max and 1. still be met

(Fox 2007)

An Example for $\mathcal{IE}$

(4) A or B

- $\mathcal{A}LT$ = {A, B, A and B, C}
- Max_1 = {A, A and B, C}, Max_2 = {B, A and B, C}
- $\mathcal{IE}$ = $Max_1 \cap Max_2$ = {A and B, C}

Predicted Implicature:

$(A \vee B) \wedge \neg(A \wedge B)\ [\wedge \neg C]$

Notation

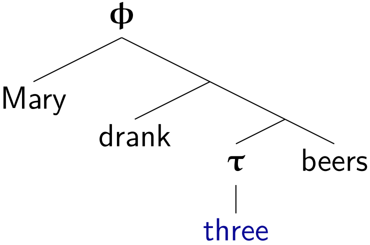
exh [$\mathcal{A}LT$] [A or B]

Assumption

exh and the set it quantifies over (here: $\mathcal{A}LT$) are represented syntactically

Practice $\mathcal{A}LT$

C: John drank $[_\epsilon$ **exactly three**$]$ beers



$\mathcal{A}LT(\phi)$:

- lexicon: substitute τ with item *four*
- context: substitute τ with *exactly three*

$$\mathcal{A}LT(\phi) = \{\text{THREE, EXACTLY THREE, FOUR}\}$$

Back to Pruning

Why narrow down the set of structural alternatives $\mathcal{A}LT$?

"Pruning : The act of deleting elements from the set $\mathcal{A}LT$ of formal, potential alternatives" [from earlier]

(5) Mary liked the costumes in Swan Lake

$\mathcal{ALT}$	{Mary loved the costumes in S.L.,
=	Mary invented Cheerios,
$\mathcal{IE}$	Mary ordered the invasion of Poland, …}

➜ **Pruning to $\mathcal{A} \subset \mathcal{ALT}$**

Example of a possible pruning

$\mathcal{A}LT =$ {Mary loved the costumes in S.L.
Mary invented Cheerios,
Mary ordered the invasion of Poland, ...}

$\cap$

$\mathcal{C} =$ {Mary loved the costumes in S.L.}

$= \mathcal{A}$: the pruned set of active alternatives

[from earlier:]
Why narrow down the set of structural alternatives $\mathcal{A}LT$ to $\mathcal{A} \subset \mathcal{A}LT$?

☞ To derive the implicatures actually observed in a given context C

The puzzle: Pruning is not always possible

Example of an impossible pruning

(6) (John drank **some but not all** of the beers. What about Mary?)
She drank **some** of the beers

$\mathcal{A}LT =$ $\{\text{SOME}, \text{SBNA}, \text{ALL}\}$

$\mathcal{A} =$ $\{\text{SOME}, \text{SBNA}\}$

$exh\ [\mathcal{A}]\ [\text{SOME}]$ $= \text{SOME} \wedge \neg\text{SBNA}$
$= \text{ALL}$

✘ **no pruning**

(Fox & Katzir 2011)

Example of an impossible pruning

(7) (John drank **some but not all** of the beers, Bill drank all.)
And Mary (also) drank **some** of the beers

$\mathcal{A}LT =$ $\{\text{SBNA}, \text{ALL}, \text{SOME}\}$

$\mathcal{A} =$ $\{\text{ALL}, \text{SOME}\}$

$exh\ [\mathcal{A}]\ [\text{SOME}]$ $= \text{SOME} \wedge \neg\text{ALL}$
$= \text{SBNA}$

✘ **no pruning**

(Fox & Katzir 2011)

Example of an impossible pruning

(8) (Mary likes **cats**. What about John?)
He likes **cats or dogs**

$\mathcal{A}LT =$ $\{\textsc{cats}, \textsc{dogs}, \textsc{cats and dogs}\}$

$\mathcal{A} =$ $\{\textsc{cats}\}$

$exh\ [\mathcal{A}]\ [\textsc{cats or dogs}]$ $= (\textsc{cats} \vee \textsc{dogs}) \wedge \neg\textsc{cats}$
$= \textsc{dogs} \wedge \neg\textsc{cats}$

✘ **no pruning**

Example of an impossible pruning

(9) (Mary owns **exactly three** cats. What about John?)
He owns **three** cats

$\mathcal{A}LT =$ $\{$EXACTLY THREE, FOUR$\}$

$\mathcal{A} =$ $\{$EXACTLY THREE$\}$

$exh\ [\mathcal{A}]\ [$THREE$]$ $=$ THREE $\wedge \neg$EXACTLY THREE
$=$ FOUR

✘ **no pruning**

What is the difference between the possible and the impossible prunings?

Fox & Katzir (2011): Exhaustively relevant alternatives cannot be deleted from $\mathcal{A}LT$

(10) A pruning $\mathcal{A} \subset \mathcal{A}LT(\sigma)$ is licensed iff there is no element $\phi \in \mathcal{A}LT - \mathcal{A}$ s.t. ϕ is relevant when exhaustified w.r.t. $\mathcal{A}$

(11) ϕ is relevant when exhaustified w.r.t. $\mathcal{A}$ iff $exh\ [\mathcal{A}]\ [\phi]$ is in the Boolean Closure of $\mathcal{A}$

Proposal

- ☞ What blocks the impossible prunings is a more general constraint against redundancy
- ☞ F&K's condition (10) doesn't need to be stipulated

Efficiency

An LF ϕ is ruled out if there is a competitor ψ such that

- $\psi < \phi$
- $[\![\psi]\!] \equiv [\![\phi]\!]$

$$\psi < \phi \quad \text{iff} \quad \psi \in \mathcal{ALT}(\phi) \wedge \phi \notin \mathcal{ALT}(\psi)$$

Notation $\mathcal{COMP}(\phi) = \{\psi \mid \psi < \phi\}$

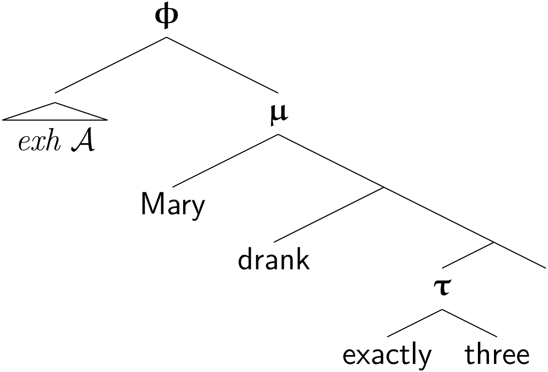
(Meyer 2013, 2014, 2015)

Efficiency – in simple words

ψ blocks ϕ if ψ is strictly simpler* than ϕ but the two are semantically equivalent

*in the sense of Katzir (2007)

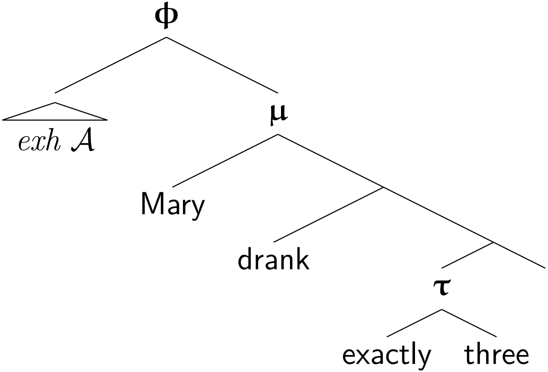
Practice $\mathcal{COMP}$:



$\mathcal{C}OMP(\phi)$:

- sub-constituents: substitute ϕ with μ
- sub-constituents: substitute τ with *three*
- lexicon & sub-constituents: substitute *three* with *four* and then ϕ w μ

Practice $\mathcal{COMP}$:



$COMP(\phi)$:

- sub-constituents: substitute ϕ with μ
- sub-constituents: substitute τ with *three*
- lexicon & sub-constituents: substitute *three* with *four* and then ϕ w μ

$$\mathcal{COMP}(\phi) = \{\mathit{exh}\,[A]\,[\text{THREE}],\ \text{EX. THREE},\ \mathit{exh}\,[A]\,[\text{FOUR}],\ \dots\}$$

Back to impossible pruning:

(12) (John drank **some but not all** of the beers...)
Mary drank **some** of the beers

$$exh\ [\mathcal{A}]\ [\textsc{some}] = \textsc{some}\ \&\ \neg\ \textsc{sbna} = \textbf{all}$$

$$\mathcal{A} = \{\textsc{some},\ \textsc{sbna}\}$$

$$\mathcal{COMP}(12) = \{\textsc{some},\ \textsc{sbna},\ \boxed{all}\}$$

✘ **blocked**

(13) $exh\ [\mathcal{A}]\ [\text{SOME}] = \text{SOME}\ \&\ \neg\ \text{ALL} =$ **sbna**

$\mathcal{A} = \{\text{SOME},\ \text{ALL}\}$

$\mathcal{COMP}(15) = \{\text{SOME},\ \boxed{sbna},\ \text{ALL}\}$

✘ **blocked**

(14) (Mary likes **cats**. What about John?)
He likes **cats or dogs**

$exh\ [\mathcal{A}]\ [\textsc{cats or dogs}]$
$= (\textsc{cats} \vee \textsc{dogs})\ \&\ \neg\textsc{cats}$ = **dogs & ¬cats**

$\mathcal{A} = \{\textsc{cats}\}$

$\mathcal{COMP}$(14) $= \{ exh[ALT][dogs]$, ...}
= dogs & ¬ cats

✘ **blocked**

(Mary owns **exactly three** cats. What about John?)
He owns **three** cats

(15) $\textit{exh}\ [\mathcal{A}]\ [\textsc{three}]$
$= \textsc{three}\ \&\ \neg\textsc{exactly three} = \textbf{four}$

$\mathcal{A} = \{\textsc{exactly three}\}$

$\mathcal{COMP}(15) = \{\boxed{\textit{four}}, ...\}$

✘ **blocked**

Intermediate Summary

- context can provide set $\mathcal{A}LT$ with particular properties:

  $\mathcal{A}LT_1 = \{\text{SOME, SBNA, ALL}\}$
  $\mathcal{A}LT_2 = \{\text{EXACTLY THREE, THREE, FOUR}\}$

- no SI possible, but pruning would re-introduce unattested SI's:
  - SOME $\Rightarrow$ ALL
  - THREE $\Rightarrow$ FOUR

  cf. Meyer (2015b)

- The relevant restriction was formalized as a Brevity-based constraint

Surprising Pruning Patterns

Symmetric Alternatives

Two alternatives α_1, α_2 of σ are *symmetric* if the following holds:

- $\sigma = \alpha_1 \vee \alpha_2$
- $\alpha_1 \wedge \alpha_2 = \bot$

Symmetric Alternatives

Two alternatives α_1, α_2 of σ are *symmetric* if the following holds:

- $\sigma = \alpha_1 \vee \alpha_2$
- $\alpha_1 \wedge \alpha_2 = \bot$

(16) $\mathcal{A}LT = \{\textsc{some}, \textsc{sbna}, \textsc{all}\}$

- $\textsc{some} = \textsc{sbna} \vee \textsc{all}$
- $\textsc{sbna} \wedge \textsc{all} = \bot$

Recall: no SI and no pruning predicted

(17) (John drank **some but not all** of the beers...)
exh Mary drank **some** of the beers

$\mathcal{A}$ = $\mathcal{A}LT$ (no pruning)
$\mathcal{A}LT = \{\textsc{sbna},\ \textsc{some},\ \textsc{all}\}$
$Max_1 = \{\textsc{sbna}\}$, $Max_2 = \{\textsc{all}\}$, $Max_1 \cap Max_2 = \{\}$

$$exh\ [\mathcal{A}LT]\ [\textsc{some}] = \textsc{some}$$

Fox & Katzir (2011)

Recall: no SI and no pruning predicted

(18) #John only/exh talked to some of the girls, and Mary talked to some but not all
$\neq$ John talked to some & $\neg$ sbna girls yesterday

(19) #John ate exactly three cookies, and Mary only/exh ate three cookies
$\neq$ Mary ate three & $\neg$ exactly three cookies

$\mathcal{IE} = \{\ \}$
exh and *only* predicted to be vacuous

Katzir (2007)

Unpredicted pruning possible with ✓ MaxPS

(20) (John drank **some but not all** of the beers.)
\# Mary only drank some of the beers

but:

(21) (John drank **some but not all** of the beers.)
✓ Mary <u>also</u> only drank some of the beers

Unpredicted pruning possible when ✓ MaxPS:

(22) John drank **some but not all** of the beers.
Mary also only drank some of the beers

$$\textit{only}\ [\mathcal{A}]\ [\text{SOME}] = \text{SOME}\ \&\ \neg\text{ALL} \\ = \text{SBNA}$$

$$\mathcal{A}LT = \{\text{SOME},\ \text{SBNA},\ \text{ALL}\}$$
$$\mathcal{A} = \{\text{SOME},\ \text{ALL}\}$$

➜ **Deleting SBNA possible?**

But only into one direction:

(23) Sue drank **all** of the beers, John drank **some but not all**.
Mary also only drank some of the beers

✘ *only* $[\mathcal{A}]$ $[\text{SOME}] = \text{SOME} \ \& \ \neg\text{SBNA}$
$= \text{ALL}$

$\mathcal{A}LT = \{\text{SOME},\ \text{SBNA},\ \text{ALL}\}$
$\mathcal{A} = \{\text{SOME},\ \text{SBNA}\}$

✘ **Deleting ALL not possible**

A related observation:

(24) John is brilliant, but he is not organized)
Mary is <u>also</u> only brilliant

$\Rightarrow \neg$ (Mary is organized)

$\mathcal{ALT} = \{$brilliant, organized, not organized$\}$
$\mathcal{A} = \{$brilliant, organized$\}$

➜ $\mathcal{A}$ is possible

Attempt at a generalization:
It is the alternative containing the negation that can be deleted

$\mathcal{A}LT =$ {A, not B, B}
$\checkmark$ $\mathcal{A} =$ {A, B}

It's not about negation:

(25) John went to Japan; he missed out on Korea
Mary also only went to Japan

$\Rightarrow \neg$ (Mary went to Korea)

$\mathcal{A}LT = \{$go Japan, miss Korea, go Korea, ...$\}$
$\mathcal{A} = \{$go Japan, go Korea$\}$

cf. Trinh & Haida (2011)

It's not about negation:

(26) Mary loves pandas, but she hates cats.
John also only loves pandas

$\Rightarrow \neg$ (John loves cats)

$\mathcal{A}LT = \{$love pandas, hate cats, love cats, ...$\}$

It's not about negation:

(27) John is brilliant, but he is not organized.
Mary is <u>also</u> only brilliant

$\Rightarrow \neg$ (Mary is organized)

$\mathcal{A}LT = \{$brilliant, not organized, organized$\}$

versus

(28) John is polite, and he doesn't swear.
Mary is (# also) only polite

$\Rightarrow \neg$ (Mary does not swear)

$\mathcal{A}LT = \{$polite, not swear, swear$\}$

Trinh & Haida (2015)

Contrast as predictive factor?

(29) John drank some **but** not all of the beers
$\#$John drank some and not all of the beers

$\mathcal{A}LT = \{$some, all, ~~sbna~~$\}$

(30) Mary went to Japan, **but** she missed out on Korea
$\#$ Mary went to Japan, and she missed out on Korea

$\mathcal{A}LT = \{$go Japan, go Korea, ~~miss Korea~~$\}$

Contrast as predictive factor?

(31) John is brilliant, **but** he is not organized
#John is brilliant, and he is not organized

$\mathcal{A}LT = \{$brilliant, organized, ~~not organized~~$\}$

(32) John is polite, **and** he doesn't swear
John is polite, but he doesn't swear

$\mathcal{A}LT = \{$polite, not swear, ~~swear~~$\}$

Contrast as predictive factor?

(33) John is brilliant, **but** he not organized.

(34) John went to Japan; BUT he missed Korea

(35) Mary loves pandas, **but** she hates cats

(36) John is polite, **and** he doesn't swear

e.g., Lakoff (1971), Toosarvandani (2014)

Contrast as predictive factor?

(37) Mary is **only** brilliant
= Mary is brilliant **but** not organized
$\mathcal{A}LT$ = {brilliant, organized}

"In excluding an alternative, *but* is closely related to the adverb *only*. (...) the alternatives presented in the *but*-conjuncts are excluded via negation.* [The two versions] (...) differ in two respects: First, in the case of *only* there may be more than one excluded alternative (...). Secondly, in the case of *only* the alternatives (...) need not be given explicitly, whereas in the case of *but* the alternative is presented in the second conjunct.

* if there is no explicit negation [*think negative antonyms*], the hearer has to reconstruct the appropriate alternative"

Umbach (2004), s. also Al Khatib (2013)

Contrast as predictive factor?

John is brilliant, **but** he not organized
not + *but*-$\mathcal{ALT}$: organized

(38) Mary is also only brilliant
$\Rightarrow \neg$ (Mary is organized)

$\mathcal{ALT} = \{$brilliant, organized$\}$

Contrast as predictive factor?

John went to Japan; BUT he missed Korea
not + reconstructed *but*-$\mathcal{A}LT$: went to Korea

(39) Mary also only went to Japan
$\Rightarrow \neg$ (Mary went to Korea)

$\mathcal{A}LT = \{$went to Japan, went to Korea$\}$

Contrast as predictive factor?

Mary loves pandas, **but** she hates cats
not + reconstructed *but*-$\mathcal{ALT}$: loves cats

(40) John also only loves pandas
$\Rightarrow \neg$ (John loves cats)

$\mathcal{ALT} = \{$loves pandas, loves cats$\}$

Contrast as predictive factor?

Descriptive Generalization (tentative)
Negation (explicit or implicit) that is used to create *but*-contrast is not included in the substitution source for $\mathcal{A}LT$

Intermediate Summary II

- *but* data are not necessarily evidence for problematic pruning
- Rather, the seemingly deleted alternative might have never be in $\mathcal{A}LT$ in the first place
- $\mathcal{A}LT$ is sensitive to independent constraints on contrastiveness e.g. in *but*-coordination
- Structural approach needs to be modified to allow for this sensitivity
- Not all negation is created equal when it comes to $\mathcal{A}LT$

Why does oddness only disappear with *only*, but not with *exh*?

A contrast in felicity:

(41) John drank **some but not all** of the beers.
✓ Mary also only drank some of the beers

$\Rightarrow \neg$ (Mary drank all of the beers)

(42) John drank **some but not all** of the beers.
Mary (also) drank some of the beers

$\not\Rightarrow \neg$ (Mary drank all of the beers) ✘

(43) John drank **some but not all** of the beers.

Possible structure:

exh Mary (also) drank some of the beers

Possible alternatives (cf. *only* data)

$\mathcal{A}LT = \{\text{SOME},\ \text{ALL}\}$

Prediction

$exh\ [\mathcal{A}LT]\ [\text{SOME}] = \text{SOME}\ \&\ \neg\text{ALL}$

1. We know that $\mathcal{A} = \{\textsc{some},\ \textsc{all}\}$ is possible in the presence of *but* (here: *some* **but** *not all*)

2. Therefore, the problem cannot be a a vacuous (obligatory) exh: The SI should be possible

3. The non-exh reading with uncertainty implicatures should be possible a fortiori

☞ The problem must be independent of $\mathcal{A}LT$

A parallel?

(44) #Mary has 43 CDs and John has 50

(under approximate reading of 50)

Strategic Encoding

Let $\mu_1 = \textsc{sbna}$, $\mu_2 = \textsc{some}$. If a sentence S is ambiguous between μ_1 and μ_2, then the speaker should use S only if one of μ_1, μ_2 is more likely than the other in the given context. Otherwise, she should use an alternative sentence S' which only maps to one of μ_1, μ_2.

Parikh (2001), Krifka (2009)

An a-symmetric context

(45) Mary drank some of the beers

$\mu_1 = exh\,[\{\textsc{some},\ \textsc{all}\}]\ [\![\textsc{some}]\!] = \textsc{sbna}$
$\mu_2 = \textsc{some} = \textsc{some} \vee \textsc{all}$

☞ Quantity, Opinionatedness, and $\mathcal{COMP}$ make μ_1 more likely in default context C

☞ Speaker uses (45) to encode μ_1

A symmetric context

(46) (John drank exactly three beers.)
$\#$ Mary drank three beers

$$\mathcal{COMP}(\text{THREE}) = \{\text{exactly three, three}\}$$

$\mu_1 = exh\ [\{\text{three, four}\}]\ [\text{three}] = \text{exactly three}$
$\mu_2 = \text{three}$

☞ Contextual $\mathcal{COMP}$ makes μ_1 no longer likely than μ_2

Intermediate Summary III

- *exh* differs from *only* in being covert
- structures are ambiguous wrt the presence of *exh*
- $\mu_1 = exh[\sigma]$ no longer more likely when unambiguous equivalent structure enters $\mathcal{COMP}$
- encoding choice sensitive to contextual standard of complexity $\mathcal{COMP}$