18

A Linearization-based approach to Gapping

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Abstract

Non-constituent Coordination phenomena have for a long time eluded a formally precise uniform account in Linguistic Theory, including Constraint-based grammar formalisms. This work provides a novel approach to Gapping phenomena (Ross, 1970) by extending recent Linearization-based accounts of NCC in Head-driven Phrase Structure Grammar (Pollard and Sag, 1994).

Keywords Non-constituent Coordination, Domains, HPSG

18.1 Introduction

Kathol (1995), Crysmann (2000, 2003), and Yatabe (2001) propose to use linearization domains to capture different kinds of Non-constituent Coordination (NCC) phenomena in HPSG. Recently, Beavers and Sag (2004) propose a uniform coordination construction to account for NCC phenomena in general. Gapping however, remains unaccounted for.

In this paper we show that a linearization approach to NCC can also accommodate Gapping, as well as Stripping phenomena. Section 2 overviews the proposal in Beavers and Sag (2004) and section 3 discusses the data as well as some linguistic claims found in the literature. Section 4 provides an integrated analysis and addresses some issues for long-distance NCC in general. Section 5 contains concluding remarks.

18.2 Non-Constituent Coordination and HPSG

Following insights in Crysmann (2000, 2003) and Yatabe (2001), Beavers and Sag (2004) recently propose a general constraint in HPSG that

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uses structure-sharing constraints operating over order domains (DOM) (Reape, 1994, Kathol, 1995) to capture Constituent Coordination (CC), Right-Node Raising (RNR), and Argument Cluster Coordination (ACC) patterns (henceforth commas mark pauses):

(14) a. Bill loves wine and Mary hates beer. (CC)
b. Bill cooked, and Mary ate, a pizza. (RNR)
c. He gave a rose to Ann, and an orchid to Tracy. (ACC)

The relevant coordination construction is given in (15),[1] where daughter domain lists are split, and partially concatenated in the mother:

(15) *cnj-cx* ⇒

$$\left[\begin{array}{l}\textsc{mtr}\left[\begin{array}{l}\textsc{dom}\ \boxed{A}\oplus\boxed{B_1}\oplus\boxed{C}\oplus\boxed{B_2}\oplus\boxed{D}\\ \textsc{syn}\ \boxed{0}\end{array}\right]\\ \textsc{dtrs}\left\langle\left[\begin{array}{l}\textsc{dom}\ \boxed{A}\left\langle\left[\begin{array}{ll}\textsc{frm}&\boxed{F_1}\\ \textsc{hd}&\boxed{H_1}\end{array}\right],\ldots,\left[\begin{array}{ll}\textsc{frm}&\boxed{F_n}\\ \textsc{hd}&\boxed{H_n}\end{array}\right]\right\rangle\oplus\\ \qquad\boxed{B_1}_{ne-list}\oplus\left\langle\left[\begin{array}{ll}\textsc{frm}&\boxed{G_1}\\ \textsc{hd}&\boxed{I_1}\end{array}\right],\ldots,\left[\begin{array}{ll}\textsc{frm}&\boxed{G_m}\\ \textsc{hd}&\boxed{I_m}\end{array}\right]\right\rangle,\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ -\end{array}\right.\right.\\ \qquad\left.\left.\left[\begin{array}{l}\textsc{dom}\ \boxed{C}\left\langle\left(\left[\textsc{syn}\ \ cnj\right]\right)\right\rangle\oplus\left\langle\left[\begin{array}{ll}\textsc{frm}&\boxed{F_1}\\ \textsc{hd}&\boxed{H_1}\end{array}\right],\ldots,\left[\begin{array}{ll}\textsc{frm}&\boxed{F_n}\\ \textsc{hd}&\boxed{H_n}\end{array}\right]\right\rangle\oplus\\ \qquad\boxed{B_2}_{ne-list}\oplus\boxed{D}\left\langle\left[\begin{array}{ll}\textsc{frm}&\boxed{G_1}\\ \textsc{hd}&\boxed{I_1}\end{array}\right],\ldots,\left[\begin{array}{ll}\textsc{frm}&\boxed{G_m}\\ \textsc{hd}&\boxed{I_m}\end{array}\right]\right\rangle\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ +\end{array}\right]\right\rangle\end{array}\right]$$

$n, m \geq 0$

This construction conjoins two constituents and splits the list of domain objects of each conjunct into three sublists. Crucially, the peripheral lists $\boxed{A}$ and $\boxed{D}$ may or not be empty. In the latter case, the members of these lists must share category and morphological form between conjuncts (via HEAD and FORM). The mother's domain corresponds to the concatenation of the shared peripheries $\boxed{A}$ and $\boxed{D}$, and the non-shared domain objects contributed by the daughters. But note that the shared material only occurs peripherally in the mother node. This concatenation pattern of DOM lists in the mother node allows (15) to yield CC if both peripheries are empty ($\boxed{A}$=⟨ ⟩,$\boxed{D}$=⟨ ⟩, in (16a)), RNR if the right periphery is non-empty ($\boxed{A}$=⟨ ⟩,$\boxed{D}$=⟨[*a*, *pizza*]⟩, in (16b)), and ACC if the left periphery is non-empty ($\boxed{A}$=⟨[*gave*]⟩,$\boxed{D}$=⟨ ⟩, in (16c)):

[1] A *hd-mk-cxt* construction ensures the base case (Beavers and Sag, 2004, 59-60).

(16) a. [DOM ⟨[*Bill*], [*loves*], [*wine*], [*and*], [*Mary*], [*hates*], [*beer*]⟩]
b. [DOM ⟨[*Bill*], [*cooked*], [*and*], [*Mary*], [*ate*], [*a*, *pizza*]⟩]
c. [DOM ⟨[*gave*], [*a*, *rose*], [*to*, *Ann*], [*and*], [*an*, *orchid*], [*to*, *Tracy*]⟩]

Because in Beavers and Sag (2004) morph forms are shared (rather than phonology or entire domain objects), one correctly rules out (17):[2]

(17) a. # I ran out of luck and ~~ran~~ down a stone pillar.
b. # Ned said Mia, and Tom said Bob, are a nice couple.
c. # John bought ~~some old books~~ and Mary sold some old book.

But (15) fails to capture Gapping since sharing would have to be non-peripheral and systematically located in the non-initial conjunct:

(18) a. John will bring dessert, and Mary, wine.
b. Ann reads stories to her kids, and Maria, to the students.
c. Tim wrote a book in London, and his brother, in Paris.

18.3 Gapping Data

Gapping operates independently from other NCC phenomena given that it may co-occur with RNR for instance, as seen in (19):

(19) a. I tried to argue with Mia, and Greg, with Kate, that by noon the show would probably be sold-out.
b. I told Maria, and David, Anna, that the lecture was canceled.

Also, Gapping is able to occur in comparatives (Hendriks, 1995):

(20) a. Paula kissed more boys than Sue girls.
b. ?*Paula kissed more than Sue kissed girls. (RNR)
c. ?*Paula kissed more boys than hugged girls. (ACC)

It is also well-known that Gapping does not preserve verbal inflection:

(21) a. John admires Neil Young, and his friends, Elvis Costello.
b. Sam was buying balloons, and the other kids, food and drinks.

Gapping cannot be arbitrarily embedded in NP islands for instance:

(22) *Alan went to London, and Bill met a girl who said Jim, to Paris.

18.3.1 Discourse Anaphora

We do not address VP or N Ellipsis presently, as it is known to differ significantly from NCC, e.g. allowing for non-linguistic antecedents:

(23) a. [Hankamer brandishes cleaver, advances on Sag]
Sag: Don't! My god, don't (Hankamer and Sag, 1976, 409)

[2]But note that an extra constraint like [SYN $\boxed{0}$]$\in\boxed{A}\oplus\boxed{B_1}$ may be required to prevent RNR the local head: '*John and Mary smiles' (cf. Crysmann (2002, 301)).

b. [John opens a book, and as Mia opens a newspaper, says:]
(And) Mia, a newspaper.

c. [mechanic approaches his boss after examining the race cars]
One with a broken gear, the other two are ok.

Cases of so-called N-Gapping (Jackendoff, 1971) are very different from Verbal Gapping. N-Gapping can also occur as discourse anaphora with different agreement (cf. (23c) and (24a)), and reside in non-conjuncts as in (24b):

(24) a. I have one car with flat tires and two with a broken gear.
b. After his car was stolen, Tim sought to buy one with an alarm.

This suggests that 'Nominal Gapping' should rather be analyzed as anaphoric Nominal Ellipsis (see also Neijt (1979, 29)). Further evidence comes from the fact that, unlike in Verbal Gapping, such cases can be arbitrarily embedded, and may even occur in the initial conjunct:

(25) a. Six candidates abandoned the interview and I met a colleague who mentioned that two even failed to show up.

b. John's photo of Anna is good, and I met someone who agreed that Fred's of Lynn was not bad either.

(26) Tim only gulped *one* early in the morning, but his sister managed to eat *three* chocolate bars before lunch.

For the present work, we thus assume that Gapping only applies to verbal constituents. Of course, many dependents can also be gapped along with the verb, as in (18) above and in (27) (Pesetsky, 1982, 645):

(27) a. This doctor said I should eat tuna fish, and that doctor, salmon.
b. Timmy thinks mom bought a new bike, and Annie, a puppy.

See Lappin (1999) for a HPSG account of antecedent-contained Ellipsis.

18.3.2 Locality Constraints

Neijt (1979, 138) argues that Wh-islands block Gapping with examples such as the one given in (28a). However, the oddness is probably pragmatic rather than syntactic, given the structurally identical sentence in (28b) (assume for instance that Bo and Mia are team leaders):

(28) a. *John wondered what to cook today and Peter, tomorrow.
b. Bo decided who is working tomorrow and Mia, the next day.

Lasnik and Saito (1992) and others argue that conjuncts containing gaps cannot be larger than IP, based on examples like (29) below:

(29) *I think that John saw Bill, and that Mary ~~saw~~ Susan.

In HPSG terms, this is equivalent to assuming that Gapping only applies to unmarked clauses, i.e. phrases with the feature MARKING *none*. On the other hand, unmarked subordinate clauses can easily gap:

(30) I hope Ann enjoys her coloring book, and John, his new bike.

This contrasts with RNR for instance, known to cross CP boundaries:

(31) a. Sandy doubted he could buy, and Carol knew he couldn't buy, the collected works of Rosa Luxemburg.
b. I've been wondering whether, but wouldn't positively want to state that, your theory is correct. (Bresnan, 1974)

The difficulty in gapping marked clauses is intriguing, and suggests that a generalization is perhaps being missed. An alternative approach to this issue might be to consider the interaction of prosodic or psycholinguistic processing factors. Consider for example Sohn (1999, 368), where it is claimed that it is not possible to gap embedded constituents:

(32) ?? Jo said the boy likes cheese, and Tom ~~said the boy likes~~ pickles.

Such claim is refuted by examples like the ones given in (27) and (33):

(33) One reviewer said that the paper had nine typos, and the other reviewer, only two.

Hankamer (1973) proposes principles like 'The No-Ambiguity Constraint' (and more generally, the 'The Structural Recoverability Hypothesis') that prevent a Gapping operation from yielding a syntactically ambiguous gapped structure. In this case embedded Gapping is possible, but dispreferred since there is a tendency to match the right remnant to the closest NP. This is the preferential reading of the example in (34), with wide scope of *think*:

(34) I think that Mia wrote me an essay, and Sue, an entire paper.

Similar processing biases and exceptions motivated Kuno (1976) to propose 'perceptual' constraints like the 'Minimal Distance Principle' or the 'Tendency for Subject-Predicate Interpretation'. In this view, processing is biased to preferential parsings which sometimes do not arrive to a valid analysis and, due to the complexity of the structures, fail to re-process them adequately.[3] It is unclear if there is such an explanation for (29), and for now we opt for a syntactic account.

Gapping does require that the head of the conjunct is not a remnant (e.g. Jackendoff (1971), Sag (1976, 139–147), and Chao (1988, 19-34)):

(35) a. John knows how to make spaghetti and Sue, macaroni.
b. John knows how to prepare sushi and Sue, how to cook it.

[3]See also Keller (2001) for an experimental study on Gapping gradience in OT.

c. *John knows how to eat spaghetti and Bill wonders, macaroni.
d. *Kim knows how to make sushi and Bill learned how to, pizza.

(36) John is fond of Mary, and Bill (*said he), of Sue.

The same applies to interrogative and passive sentential conjuncts:

(37) a. Which cat likes olives, and which cat, grapes?
b.*I asked which cat likes olives, and you asked which cat, grapes.

(38) a. Did Bill eat the peaches, and (*did) Harry, the grapes?
b. Tim was hassled by the Police, and Bob (*was), by the FBI.

This simple generalization is able to straightforwardly rule out well-known data where the deleted verb is not the head of the conjunct:

(39) a.*Tim ate the rice, and that Harry ~~ate~~ the beans is fantastic.
b.*The man who sells books and the woman who ~~sells~~ flowers met outside.

We conclude that Gapping is not as conditioned by locality constraints as previously claimed, and that the fundamental syntactic condition for Gapping is the deletion of the local verbal head. Several island effects are also known to condition Gapping, and these will be predicted by independently motivated linearization constraints.

In the next section we provide a syntactic account of Gapping, while following the standard assumption that pragmatics, processing and prosodic factors can interact to promote or penalize intelligibility (as discussed above in (28), as well as in (64) and (65) below).

18.4 Gapping in HPSG

The coordination construction proposed by Beavers and Sag (2004) uses constraints that quantify over tag indices (structure-sharing between n items inside potentially empty lists: $n \geq 0$). Strictly speaking, this raises non-trivial issues for feature-logic formalisms and their implementation. But usually such notation is taken to abbreviate standard relational constraints. One can thus obtain an equivalent version of (15) that captures the sharing of FORM and HEAD values across potentially empty lists in RNR and ACC via an ancillary `h_f_share`/2 relation:

(40) `h_f_share`(1, 2) ← (1=⟨⟩ ∧ 2=⟨⟩) ∨

$$\left(\boxed{1}=\left\langle\begin{bmatrix}\textsc{frm} & \boxed{3}\\ \textsc{syn}\,|\,\textsc{hd} & \boxed{4}\end{bmatrix}|\ \boxed{L_1}\right\rangle \wedge \boxed{2}=\left\langle\begin{bmatrix}\textsc{frm} & \boxed{3}\\ \textsc{syn}\,|\,\textsc{hd} & \boxed{4}\end{bmatrix}|\ \boxed{L_2}\right\rangle \wedge \texttt{h\_f\_share}(\boxed{L_1},\boxed{L_2})\right)$$

This relation takes two potentially empty lists of domain objects and ensures that all members have pair-wise shared FORM and HEAD values. We adopt this alternative for perspicuity, without loss of generality.

In the case of Gapping however, the identity requirements seem to be weaker. This is the case of verbal inflection identity, not required in Gapping as seen in (21), but necessary for RNR:

(41) *I said that the kids, and you claimed that the professor, was ill.

Identity in Gapping seems to be essentially categorial and semantic in nature, and thus we will define it as sharing of HEAD and RELN values between the gap and the antecedent, as illustrated below:

(42) Tracy arrives today, and her friends, tomorrow.

$$\left[\begin{array}{l}\textsc{phon}\ \langle \textit{arrives}\rangle \\ \textsc{syn}\,|\,\textsc{cat}\,|\,\textsc{head}\quad \boxed{1}\begin{bmatrix}\textit{verb}\\ \textsc{vform}\ \textit{finite}\\ \textsc{aux}\ -\\ \textsc{inv}\ -\end{bmatrix} \\ \textsc{sem}\,|\,\textsc{rels}\ \left\langle\left[\textsc{reln}\ \boxed{2}\textit{arrive}_1\_\textit{rel}\right]\right\rangle\end{array}\right]\quad\left[\begin{array}{l}\textsc{phon}\ \langle \textit{arrive}\rangle \\ \textsc{syn}\,|\,\textsc{cat}\,|\,\textsc{head}\quad \boxed{1}\begin{bmatrix}\textit{verb}\\ \textsc{vform}\ \textit{finite}\\ \textsc{aux}\ -\\ \textsc{inv}\ -\end{bmatrix} \\ \textsc{sem}\,|\,\textsc{rels}\ \left\langle\left[\textsc{reln}\ \boxed{2}\textit{arrive}_1\_\textit{rel}\right]\right\rangle\end{array}\right]$$

Note that only the name of the predicate relation is shared. Consequently, predicates with different semantic relations cannot be identified, including singular and plural nouns e.g. 'ticket(x)' and 'ticket*(X)':

(43) #I bought the tickets today, and Bo ~~bought the ticket~~ yesterday.

Since agreement information is located in SEM|INDEX (see Pollard and Sag (1994, 76)), sharing HEAD of gapped items does not force identical agreement, but it does force identical verbal inflectional form (HEAD|VFORM). The data from Portuguese given below show that the verb tense form (besides semantics) is the relevant identity requirement:

(44) Eu chego hoje e eles ~~chegam~~ amanhã.
I arrive$_{sg.1p.pre}$ today and they arrive$_{pl.ms.3p.pre}$ tomorrow

(45) *Eu cheguei ontem e eles ~~chegarão~~ amanhã.
I arrive$_{sg.1p.pst}$ yesterday and they arrive$_{pl.ms.3p.fut}$ tomorrow

We thus formalize the identity conditions for Gapping via a `h_s_share`/2 relation over two lists of domain objects:

(46) $$\texttt{h\_s\_share}(\boxed{1},\boxed{2}) \leftarrow (\boxed{1}{=}\langle\rangle \wedge \boxed{2}{=}\langle\rangle) \vee$$
$$(\boxed{1}{=}\left\langle\begin{bmatrix}\textsc{syn}\,|\,\textsc{cat}\,|\,\textsc{head}\ \boxed{h}\\ \textsc{sem}|\textsc{rels}\langle\left[\textsc{reln}\ \boxed{r_1}\right],\ldots,\left[\textsc{reln}\ \boxed{r_n}\right]\rangle\end{bmatrix}|\boxed{L_1}\right\rangle\wedge$$
$$\boxed{2}{=}\left\langle\begin{bmatrix}\textsc{syn}\,|\,\textsc{cat}\,|\,\textsc{head}\ \boxed{h}\\ \textsc{sem}|\textsc{rels}\langle\left[\textsc{reln}\ \boxed{r_1}\right],\ldots,\left[\textsc{reln}\ \boxed{r_n}\right]\rangle\end{bmatrix}|\boxed{L_2}\right\rangle\wedge\ \texttt{h\_s\_share}(\boxed{L_1},\boxed{L_2}))$$

Finally, we can rewrite the coordination construction (15) using standard constraints, while extending it to Gapping phenomena:

(47) *cnj-cx* ⇒

$$\left[\begin{array}{l}\textsc{mtr}\ \left[\begin{array}{l}\textsc{dom}\ \boxed{A_1}\oplus\boxed{L_1}\oplus\boxed{I_1}\oplus\boxed{R_1}\oplus\boxed{C}\oplus\left[\boxed{L_2}\oplus\boxed{R_2}\right]_{ne-list}\oplus\boxed{D_2}\\ \textsc{syn}\ \boxed{0}\end{array}\right]\\ \textsc{dtrs}\left\langle\left[\begin{array}{l}\textsc{dom}\ \boxed{A_1}\oplus\left[\boxed{L_1}\oplus\boxed{I_1}\oplus\boxed{R_1}\right]_{ne-list}\oplus\boxed{D_1}\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ -\end{array}\right],\right.\\ \qquad\left.\left[\begin{array}{l}\textsc{dom}\ \boxed{C}\left\langle\left([\textsc{syn}\ cnj]\right)\right\rangle\oplus\boxed{A_2}\oplus\left[\boxed{L_2}\oplus\boxed{I_2}\oplus\boxed{R_2}\right]_{ne-list}\oplus\boxed{D_2}\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ +\end{array}\right]\right\rangle\end{array}\right]$$

$\wedge$ `h_f_share`$(\boxed{A_1},\boxed{A_2})$ $\wedge$ `h_f_share`$(\boxed{D_1},\boxed{D_2})$ $\wedge$ `h_s_share`$(\boxed{I_1},\boxed{I_2})$
$\wedge$ $\boxed{I_2}$=*ne-list* ⇒ $\left[\textsc{syn}\ \boxed{0}\left[\textsc{hd}\ verb, \textsc{mrk}\ none\right]\right]\in\boxed{I_2}$

The sharing relations are integrated in the implicational constraint in the usual way, as conjoined constraints. Gapping arises if the shared non-peripheral lists $\boxed{I_1}$ and $\boxed{I_2}$ are resolved as non-empty, because the latter is not appended to the mother domain. There is also an extra constraint requiring that, if Gapping occurs, the conjuncts $\boxed{0}$ must be verbal and unmarked, and that the corresponding head domain object must reside in the gap (as discussed in the previous section). E.g.:

(48) John likes caviar, and Mary, beans.

$$\left[\begin{array}{l}\textsc{mtr}\mid\textsc{dom}\ \boxed{A1}\langle\rangle\oplus\boxed{L1}\langle John\rangle\oplus\boxed{I1}\langle likes\rangle\oplus\boxed{R1}\langle caviar\rangle\oplus\\ \qquad\boxed{C}\langle[and]\rangle\oplus\boxed{L2}\langle Mary\rangle\oplus\boxed{R2}\langle beans\rangle\oplus\boxed{D2}\langle\rangle\\ \textsc{dtrs}\left\langle\left[\textsc{dom}\ \boxed{A1}\langle\rangle\oplus\boxed{L1}\langle[John]\rangle\oplus\boxed{I1}\langle[likes]\rangle\oplus\boxed{R1}\langle[caviar]\rangle\oplus\boxed{D1}\langle\rangle\right],\right.\\ \qquad\left.\left[\textsc{dom}\ \boxed{C}\langle[and]\rangle\oplus\boxed{A2}\langle\rangle\oplus\boxed{L2}\langle[Mary]\rangle\oplus\boxed{I2}\langle[likes]\rangle\oplus\boxed{R2}\langle[beans]\rangle\oplus\boxed{D2}\langle\rangle\right]\right\rangle\end{array}\right]$$

FIGURE 1: Gapping of a shared internal sub-list (schematic)

The peripheral lists $\boxed{A_2}$ and $\boxed{D_2}$ are resolved as empty, but the internal lists are not. In particular, $\boxed{I_2}$ = $\langle[likes]\rangle$). Consider a larger gap:

(49) Mia can help me today, and Jess, tomorrow.
$\boxed{L_2}$=$\langle[Jess]\rangle$, $\boxed{I_2}$=$\langle[can],[help],[me]\rangle$, $\boxed{R_2}$=$\langle[tomorrow]\rangle$

Consider also Gapping in null-subject languages like Portuguese:

(50) Comprei um livro e a Ana ~~comprou~~ uma revista.
(I) bought$_{1st}$ a book and the Ana bought$_{3rd}$ a magazine
$\boxed{L_1}$ = $\langle\rangle$, $\boxed{I_1}$ = $\langle[comprei]\rangle$, $\boxed{R_1}$ = $\langle[um,\ livro]\rangle$
$\boxed{L_2}$ = $\langle[a,Ana]\rangle$, $\boxed{I_2}$ = $\langle[comprou]\rangle$, $\boxed{R_2}$ = $\langle[uma,\ revista]\rangle$

Mixed RNR cases arise from non-empty resolutions of both $\boxed{I_2}$ and $\boxed{D_2}$:

(51) I told Maria, and David, Anna, that the lecture was canceled.
$\boxed{A_2}$=⟨⟩ $\boxed{D_2}$=⟨[*that*, *the*, *lecture*, *was*, *canceled*]⟩
$\boxed{L_2}$=⟨[*David*]⟩, $\boxed{I_2}$ =⟨[*told*]⟩, $\boxed{R_2}$=⟨[*Anna*]⟩

Hankamer and Sag (1976, 409) identify an ellipsis pattern known as Stripping, where all but a small number of items are peripherally elided. Typically, the remnant is intonationally marked:

(52) a. Flowers grow well here, and sometimes herbs.
b. *You* could sleep in the living room today, or *Susan*.
c. Either Mia can help me today, or Jess.

Hankamer and Sag (1976), Chao (1988), Hendriks (1995), and others have argued that Gapping and Stripping are very similar operations. Like Gapping, Stripping may not be recovered from unspoken context, the gap cannot occur backwards, it occurs in comparatives. Also, it does not impose inflection identity nor is it possible in subordinate clauses:

(53) a. Flowers grow well here, and sometimes herbs.
b. Trees grow well here, and sometimes wheat.
c.*We grow flowers in here, and over there is the place where we sometimes herbs.

In our account, such instances of Stripping arise as a special case of the constraints in (47), where the non-shared $\boxed{R_2}$ list is resolved as empty but $\boxed{L_2}$ and the shared $\boxed{I_2}$ are non-empty:[4]

(54) Flowers grow well here, and sometimes herbs.
$\boxed{A_2}$ = ⟨⟩
$\boxed{L_2}$ = ⟨[*sometimes*],[*herbs*]⟩, $\boxed{I_2}$ = ⟨[*grow*],[*well*],[*here*]⟩, $\boxed{R_2}$ = ⟨⟩
$\boxed{D_2}$ = ⟨⟩

18.4.1 Order Domains and Compaction

A Linearization approach to NCC can use independently motivated linear order restrictions to predict possible ellipsis patterns. For instance, NPs are usually assumed to be bounding categories (i.e. *compacted*) as they become arguments of a subcategorizing head. In our approach to NCC, this correctly rules out the examples in (55) because the append constraints can only split lists of domains, not domain objects:

(55) a. *I bought a gold fish, and Tim, ~~bought [a~~ parrot].
b. *Don is [a painter and a fan of jazz], and Bob ~~is a fan~~ of blues.
c. *[The best swimmer] lost and [~~the best~~ runner] won. (ACC)
d. *John loves [the ~~house~~], and Mary adores [the house]. (RNR)

[4]Cases like 'Mia helped me today and ~~helped~~ Jess (too)' are captured as ACC.

In the case of PPs and relative clauses, these are usually assumed to be compacted and liberated from the NP domain (see partial compaction in Kathol and Pollard (1995)), due to extraposition phenomena:

(56) a. [I] [bought] [a book] [yesterday] [about Asian philosophy].
b. [I] [met] [a man] [yesterday] [who reminded me of Nixon].

In our linearization approach to Gapping, the compaction of these phrases predicts several 'Complex NP Constraint' effects:

(57) a. *A man who loves cats and a man who ~~loves~~ dogs met outside.
b. *I met a man who owns a Rolls-Royce, and my friend, a Ferrari.

Moreover, the liberation of PPs predicts that these can be remnants:[5]

(58) a. Reeves gave a talk about Superstring theory, and Dawkins, about the evolution of extended phenotypes.
b. Yesterday we traveled sixty miles, and on the day before, fifty.

Relative clauses on the other hand, are very poor remnants. This might result from a very strong tendency for the relative to be parsed as attaching to the closest NP remnant:

(59) ?One broker may prefer stocks that go up, and another, that go down.

Beavers and Sag (2004) suggest that subordinate sentences should remain uncompacted in order to capture long-distance RNR in (31) above. This is also the case for long-distance Gapping in (27) and for Gapping in verb clusters as in (35b). However, the typical assumption is that subordinate sentences are compacted in order to prevent interleaving effects with several kinds of items (e.g. Kathol (2000, 95–97,153)). In the case of verb clusters, interleaving effects motivate Kathol (2000, 209) to assume that these are uncompacted in German. This is also the case for English, due to floating quantification and 'either' interleaving:

(60) They will <u>either</u> have to [_ lower prices] [<u>or</u> fire some personel].

But even if some verb clusters required compaction, long-distance NCC already suggests that domains embedded in compacted verb-headed constituents should be accessible. We thus assume recursive domains (as is the case of Reape (1994) and Beavers and Sag (2004), where domain objects are of type *sign*) and distinguish between two kinds of compacted domains: some domain objects (e.g. a compacted S) are 'transparent' to NCC sharing constraints in the sense that the embedded subdomains can be shared, while others are 'opaque' to sharing

[5] In the case of (55b), the partial NP compaction would yield the compacted domain [*a,musician,and,a,fan*], which still disallows the gap in (55b).

(e.g. NPs, even if embedded in a compacted S).

We thus extend the append relation '$\oplus$' used in (47) to allow sharing peripherally embedded DOM objects given a parametrical constraint τ:

(61) $\oplus_{d(\tau)}(\textit{e-list}, \boxed{1}, \boxed{1}) \leftarrow \textit{true}$
$\oplus_{d(\tau)}(\langle \boxed{1} | \boxed{2} \rangle, \boxed{3}, \langle \boxed{1} | \boxed{4} \rangle) \leftarrow \oplus_{d(\tau)}(\boxed{2}, \boxed{3}, \boxed{4})$
$\oplus_{d(\tau)}(\langle [^{\tau}\textsc{dom}\ \boxed{1}] \rangle, \langle [^{\tau}\textsc{dom}\ \boxed{2}] | \boxed{4} \rangle, \langle [^{\tau}\textsc{dom}\ \boxed{3}] | \boxed{4} \rangle) \leftarrow \oplus_{d(\tau)}(\boxed{1}, \boxed{2}, \boxed{3})$

The first two clauses correspond to the standard append relation, but the third clause allows access to a peripheral domain object, provided that the constraint τ is satisfied. This argument thus specifies which kind of compacted domain object can be split by the constraint (it may correspond to the HEAD *pos* value, a *sign* description, or even a topological type). This enables the compaction of nominals to be distinguished from the compaction of subordinate clauses, as in (27a):

(62) $\boxed{B} = \langle [\textsc{frm}\langle \textit{that} \rangle], [\textsc{frm}\langle \textit{doc} \rangle], [\textsc{frm}\langle \textit{said} \rangle], [^{\tau}\textsc{dom}\ \langle [\textit{I}], [\textit{should}], [\textit{eat}], [\textit{salmon}] \rangle] \rangle$

with recursive domains, $\boxed{B} = \boxed{L} \oplus_{d(\tau)} \boxed{I} \oplus_{d(\tau)} \boxed{D}$ *may resolve as:*
$\boxed{L} = \langle [\textsc{frm}\ \langle \textit{that} \rangle], [\textsc{frm}\ \langle \textit{doc} \rangle] \rangle$
$\boxed{I} = \langle [\textsc{frm}\ \langle \textit{said} \rangle], [^{\tau}\textsc{dom}\ \langle [\textit{I}], [\textit{should}], [\textit{eat}] \rangle] \rangle$
$\boxed{R} = \langle [^{\tau}\textsc{frm}\ \langle \textit{salmon} \rangle] \rangle$

The τ argument in the append constraints in Gapping should thus allow splitting compacted S and VP domain objects, i.e. $\tau = \textit{phrase}[\textsc{hd}\ \textit{verb}, \textsc{mod}\ \textit{none}]$. Other NCC phenomena can be less restricted in this regard, for instance RNR does not show complex NP island effects:

(63) a. The man who sells, and the woman who buys, antiques in the market met outside.
b. I know a man who loves, and Sue met a woman who hates, hiking at night.

Accordingly, the append constraint that yields the $\boxed{D_1}$ and $\boxed{D_2}$ sublists in (47) should be $\tau = \textit{phrase}[\textsc{hd}\ \textit{verb}]$. This allows the parametric append to split any verb-headed phrasal domain (S, VP or RelC).

In what concerns deletion of prepositions, there is a gradience effect which may depend on the nature of the remnants:

(64) a. *Jim reads a book to Fred, and Mary, Peter.
b. ?John is going to Japan, and his sister, Australia.
c. Jim reads to his brother, and Mary, our kids.

We note that (64b) improves with a longer pause in the gap, presumably because it promotes contrast and helps to legitimize the remnant. The unacceptability of (64a) might be intensified by the oddness sometimes caused by adjacent remnants headed by identical items. Consider the

following well-known contrast, triggered by the post-gap remnants:[6]

(65) a. John gave a bike to the boy, and Tim, a doll to the girl.
b. ?*John gave the boy a bike, and Tim, the girl a doll.

Thus it may be that the ellipsis of argument marking prepositions is tolerated in certain conditions, or that ellipsis is possible in principle but that interacting factors cause gradient results. In that case, we would have to allow the parametric append to also access PPs.

18.4.2 Discontinuous Gapping

Jackendoff (1971, 24–25), Sag (1976, 148–166) and others consider discontinuous Gapping deletions:

(66) a. John kissed Susan at the party, and Peter, Mary.
b. Dexter wants Watford to win, and Warren, Ipswich.
c. Peter took Susan home, and John, Wendy.

Our sharing constraints need to be reformulated to also account for this pattern. This can be done by allowing the right periphery of the internal sub-lists to share a discontinuous list via the shuffle '◯' operator:

(67) *cnj-cx* ⇒

$$\left[\begin{array}{l}\textsc{mtr}\left[\begin{array}{l}\textsc{dom}\ \boxed{A_1}\oplus\boxed{L_1}\oplus\boxed{I_1}\oplus\left[\boxed{P_1}\bigcirc\boxed{R_1}\right]\oplus\boxed{C}\oplus\left[\boxed{L_2}\oplus\boxed{R_2}\right]_{ne-list}\oplus\boxed{D_2}\\ \textsc{syn}\ \boxed{0}\end{array}\right]\\ \textsc{dtrs}\left\langle\left[\begin{array}{l}\textsc{dom}\ \boxed{A_1}\oplus\left[\boxed{L_1}\oplus\boxed{I_1}\oplus\left[\boxed{P_1}\bigcirc\boxed{R_1}\right]\right]_{ne-list}\oplus\boxed{D_1}\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ -\end{array}\right],\right.\\ \qquad\left.\left[\begin{array}{l}\textsc{dom}\ \boxed{C}\left\langle\left([\textsc{syn}\ \mathit{cnj}]\right)\right\rangle\oplus\boxed{A_2}\oplus\left[\boxed{L_2}\oplus\boxed{I_2}\oplus\left[\boxed{P_2}\bigcirc\boxed{R_2}\right]\right]_{ne-list}\oplus\boxed{D_2}\\ \textsc{syn}\ \boxed{0}\\ \textsc{crd}\ +\end{array}\right]\right\rangle\end{array}\right]$$

$\wedge$ `h_f_share`$(\boxed{A_1},\boxed{A_2})$ $\wedge$ `h_f_share`$(\boxed{D_1},\boxed{D_2})$
$\wedge$ `h_s_share`$(\boxed{I_1},\boxed{I_2})$ $\wedge$ `h_s_share`$(\boxed{P_1},\boxed{P_2})$
$\wedge$ $\boxed{I_2}$ = *ne-list* ⇒ $[\textsc{syn}\,\boxed{0}[\textsc{hd}\ \mathit{verb}, \textsc{mrk}\ \mathit{none}]] \in \boxed{I_2}$

The internal right periphery list is now a shuffle of two sub-lists $[\boxed{P_2}\bigcirc\boxed{R_2}]$. This extra constraint allows sharing of non-adjacent items:

(68) ⟨[*John*],[*took*],[*Wendy*],[*home*]⟩ *yields* ⟨[*John*],[*Wendy*]⟩
given the following resolution:
$\boxed{L_2}$ = ⟨[*John*]⟩, $\boxed{I_2}$ = ⟨[*took*]⟩, $\boxed{R_2}$ = ⟨[*Wendy*]⟩, *and* $\boxed{P_2}$ = ⟨[*home*]⟩

The non-discontinuous Gapping data discussed in the previous sections is obtained from resolving the shared $\boxed{P_1}$ and $\boxed{P_2}$ lists as empty.

[6] This may reduce to a generalization similar to the Obligatory Contour Principle.

18.5 Conclusion

We propose an account of Gapping in HPSG, integrated in a more general constraint for Non-Constituent Coordination, following Beavers and Sag (2004). Here, a unique coordination construction captures several patterns by allowing shared items to be absent in the mother, using structure-sharing constraints over the domain objects contributed by the local daughters. Further research is required to capture gradience effects (as experimentally observed in Keller (2001)), which may result from perceptual, contextual, and prosodic factors.

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