Harmonic Syntax, proposal

Furkan Atmaca

IGRA

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Outline

Introduction

Motivations

- Handle movement with markedness.
- Build structure ground up.

Assumptions

- Derivations proceed in serial harmonic grammar (McCarthy, 2000, 2010, 2016).
- The input is non-structured (Heck et al., 2002, pp.354-359)
- Inclusiveness and extension conditions (Chomsky, 2000, p.113; Chomsky, 2014, p.175) are followed by GEN.
- Constraints can be tied to the operations by GEN (McCarthy, Kimper, & Mullin, 2012, p.174).
- Operations by GEN and evaluations for CON follow A-over-A (Chomsky, 1964, pp.930-931; Ross, 1967, pp.12-36).

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Build structure

(1) Features are not operators. What happens to merge features?
-CON checks them.

GEN: Merge

Put two syntactic items together.

CON: MC, merge constraint

Check merge features against the label. Incur a violation if there is a mismatch.

Items: DP_f, $V_{[\bullet DP \bullet]}$, $v_{[\bullet V \bullet]}$, $T_{[\bullet v \bullet]}$ . . .

Derivation: Merge feature [•V•] on v does not have a match.

Opr.	Input: DP_f	MC
Merge	$[V_{[\bullet DP \bullet]}\ DP_f]$	-
Merge	$[v_{[\bullet V \bullet]}\ DP_f]$	*
Merge	$[T_{[\bullet v \bullet]}\ DP_f]$	*
. . .	. . .	. . .

Name the structure

(2) If Merge is not driven by features, how is the label decided?
-GEN assigns the label

GEN: Label
Label a structure with one of its daughters if it is lacking a label.

CON: LB_X, generalized label constraint
Incur a violation for Label of GEN using X as a label.

Derivation: LB_X are only violated for the outputs of Label operation.

Opr.	Input: $[V_{[\bullet DP \bullet]}\ DP_f]$	LB_{DP}	LB_V
Label	$V[V_{[\bullet DP \bullet]}\ DP_f]$	-	*
Label	$DP[V_{[\bullet DP \bullet]}\ DP_f]$	*	-
...	...	...	...

Fundamental mechanics of markedness

(3) Features are subject to markedness constraints.

CON: X^*

Incur a violation for X times the distinct dominators of it.

Derivation 1: DP_f is only dominated by V

Opr.	Input: $\mathrm{V}[\mathrm{V}_{[\bullet\mathrm{DP}\bullet]}\ \mathrm{DP}_f]$	F^*
...	$\mathrm{V}[\mathrm{V}_{[\bullet\mathrm{DP}\bullet]}\ \mathrm{DP}_f]$	*
...	...	...

Derivation 2: DP_f is dominated by V and v

Opr.	Input: $\mathrm{v}[\mathrm{v}_{[\bullet\mathrm{V}\bullet]}\ \mathrm{V}[\mathrm{V}_{[\bullet\mathrm{DP}\bullet]}\ \mathrm{DP}_f]]$	F^*
...	$\mathrm{v}[\mathrm{v}_{[\bullet\mathrm{V}\bullet]}\ \mathrm{V}[\mathrm{V}_{[\bullet\mathrm{DP}\bullet]}\ \mathrm{DP}_f]]$	**
...	...	...

Moving is getting rid of markedness

(4) Merging an item anew alleviates markedness constraint violations.

Step 1: DP_f is dominated by V and v.

Opr.	Input: $[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]$	F^*
Label	$v[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]$	**
...	...	...

Step 2: DP_f is not dominated. Embedded DP_f is no longer subject to CON, A-over-A (Chomsky, 1964, pp.930-931; Ross, 1967, pp.12-36).

Opr.	Input: $[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]$	F^*
Merge	$[DP_f\ v[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]]$	-
...	...	...

When to get rid of markedness?

(5) If merging an item anew, moving, gets rid of markedness, it might indefinitely be merged again, which leads to a loop.
- Motivate merge over move.

CON: ExNum, ExWs, Exhaust numeration, Exhaust workspace
Incur a violation if no new item is used in merge.

Derivation: Merging $T_{[\bullet v \bullet]}$ does not violate ExWs, since it is not in the input, so it is new.

Opr.	Input: $v[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]$	ExWs	F*
Merge	$[DP_f\ v[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]]$	*	-
Merge	$[T_{[\bullet v \bullet]}\ v[v_{[\bullet V \bullet]}\ V[V_{[\bullet DP \bullet]}\ DP_f]]]]$	-	**
...	...	...	...

Discouraging Merge

(6) When all the new items to merge are exhausted, the derivation can still end up in a loop since all Merge outputs will violate ExWs.

CON: LAB, labelless structure

Incur a violation when the output does not have a label.

Derivation: LAB discourages merging items, new or old. Merge becomes costly when all the new items are used up.

Opr.	Input: $v[v_{[\bullet V\bullet]}\ V[V_{[\bullet DP\bullet]}\ DP_f]]$	ExWs	LAB	F*
Merge	$[DP_f\ v[v_{[\bullet V\bullet]}\ V[V_{[\bullet DP\bullet]}\ DP_f]]]$	*	*	-
Merge	$[T_{[\bullet v\bullet]}\ v[v_{[\bullet V\bullet]}\ V[V_{[\bullet DP\bullet]}\ DP_f]]]]$	-	*	**
...	...	...	...	...

Interim Conclusion

- Features do not drive the derivation.
- Merging an item anew, moving, gets rid of markedness violations for it, only the highest syntactic element of the same kind is relevant for GEN or CON.
- Moving an item is only optimal when the problem of staying outweighs the problem of merging an existing item.

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How items stop being a problem, permanently

(7) Is it possible for an item to stop being a problem?
-Yes, agreement features and Agree by GEN

GEN: Agree

Match the agreement features to the neutral features, remove the agreement feature when there is a match.
-Strict cycle interpretation of GEN requires the matches to be made between sisters.

Derivation: The agreement feature f:□ on DP is removed by Agree of GEN.

Opr.	Input: $[DP_{f:\square}\ v_f[v_{[\bullet V\bullet],f}\ V[V_{[\bullet DP\bullet]}\ DP_{f:\square}]]]$	F:□*
Agree	$[DP\ v_f[v_{[\bullet V\bullet],f}\ V[V_{[\bullet DP\bullet]}\ DP_{f:\square}]]]$	-
Label	$v_f[DP_{f:\square}\ v_f[v_{[\bullet V\bullet],f}\ V[V_{[\bullet DP\bullet]}\ DP_{f:\square}]]]$	*
...	...	...

How does the derivation converge?

(8) If the fully faithful candidate is a result of mapping the input to the output directly, the derivation immediately converges, since anything besides markedness constraints are tied to the operations by GEN.

Derivation: No constraint is violated if no operation is carried out at the first step.

Opr.	Input: DP_f	ExWs	LAB	F*
Merge	$[V_{[\bullet DP \bullet]}\ DP_f]$	-	*	-
none	DP_f	-	-	-

Solution: GEN should carry out one of the following operations: Merge, Label, Agree. If there is a label, Label is out. If there are no agreement features Agree is out.
-Fully faithful candidate can only be achieved via Merge!

How does the derivation converge?

(9) How can the result of an operation be fully faithful, identical, to the input?
-Merging an item with itself.
-In set theory, union of A with itself equals to A. Merging an item with itself does not change any domination relation.
-Since A-over-A is employed, every item is at an identical level. So, [A A] and A or [[. . .] [. . .]] and [. . .] are identical both in terms of hierarchy and elements.

Derivation: ExWs and LAB are tied to Merge of GEN. So, the fully faithful candidate can violate those. If the input has a label, LAB is not violated. However, no new item is used for Merge so ExWs is violated.

Opr.	Input: DP_f	ExWs	LAB	F*
Merge	$[V_{[\bullet DP \bullet]}\ DP_f]$	-	*	-
Merge	$([DP_f\ DP_f] \rightarrow DP_f)\ DP_f$	*	-	-

Example derivation

Abbreviations

- The abbreviations are: 'f:' for regular features and 'a:' for agreement features. 'xws' is ExWs.
- To make understanding outputs easier the keys are: iMrg: internal merge/move, xMrg: external merge, rMrg: reflexive merge/ merge with self, Lbl: label, and Agr: agree.
- 'W' indicates the winning probability.
- Constraint weights are given as a superscript.
- Constraint weights are calculated by feeding the derivations to an optimizing function trying to minimize the Kullback-Leibler divergence between the winner probabilities and the probabilities resulting from the harmonic values, MaxEnt (Hayes & Wilson, 2008, p.384), with limits between 0 and 100 for constraint weights.

Derivation

item	merge	agree	feature
DP	-	case:□	-
V	[•DP•]	-	-
v	[•V•]	-	-
T	[•v•]	-	case
C	[•T•]	-	-

Step 1: Input $DP_{a:case}$
Internal argument is merged with V.

W	opr.	output	xws^{58}	lab^{43}	mc^{61}	H
1	xMrg	[V $DP_{a:case}$]	0	1	0	43
0	xMrg	[v $DP_{a:case}$]	0	1	1	104
0	xMrg	[$T_{f:case}$ $DP_{a:case}$]	0	1	1	104
0	xMrg	[C $DP_{a:case}$]	0	1	1	104
0	rMrg	$DP_{a:case}$	1	0	0	58

Derivation

Step 2: Input [V $DP_{a:case}$]
The resulting merge is labelled with V.

W	opr.	output	xws^{58}	lab^{43}	lb_D^{100}	lb_V^{50}	mc^{61}	$case_{agr}^{36}$	H
1	Lbl	V[V $DP_{a:case}$]	0	0	0	1	0	1	86
0	Lbl	$DP_{a:case}$[V $DP_{a:case}$]	0	0	1	0	0	0	100
0	xMrg	[v [V $DP_{a:case}$]]	0	1	0	0	1	0	104
0	xMrg	[$T_{f:case}$ [V $DP_{a:case}$]]	0	1	0	0	1	0	104
0	xMrg	[C [V $DP_{a:case}$]]	0	1	0	0	1	0	104
0	iMrg	[V [V $DP_{a:case}$]]	1	1	0	0	1	0	162
0	iMrg	[$DP_{a:case}$ [V $DP_{a:case}$]]	1	1	0	0	0	0	101
0	rMrg	[V $DP_{a:case}$]	1	1	0	0	0	0	101

Step 3: Input V[V $DP_{a:case}$]
VP is merged with v.

W	opr.	output	xws^{58}	lab^{43}	mc^{61}	$case_{agr}^{36}$	H
1	xMrg	[v V[V $DP_{a:case}$]]	0	1	0	1	79
0	xMrg	[$T_{f:case}$ V[V $DP_{a:case}$]]	0	1	1	1	140
0	xMrg	[C V[V $DP_{a:case}$]]	0	1	1	1	140
0	iMrg	[$DP_{a:case}$ V[V $DP_{a:case}$]]	1	1	0	0	101
0	rMrg	V[V $DP_{a:case}$]	1	0	0	1	94

Derivation

Step 4: Input [v V[V $DP_{a:case}$]]
The resulting phrase is labelled with v.

W	opr.	output	xws^{58}	lab^{43}	lb_V^{50}	lb_v^0	mc^{61}	$case_{agr}^{36}$	H
1	Lbl	v[v V[V $DP_{a:case}$]]	0	0	0	1	0	2	72
0	Lbl	V[v V[V $DP_{a:case}$]]	0	0	1	0	0	1	86
0	xMrg	[$T_{f:case}$ [v V[V $DP_{a:case}$]]]	0	1	0	0	1	1	140
0	xMrg	[C [v V[V $DP_{a:case}$]]]	0	1	0	0	1	1	140
0	iMrg	[v [v V[V $DP_{a:case}$]]]	1	1	0	0	1	1	198
0	iMrg	[V[V $DP_{a:case}$] [v V[V $DP_{a:case}$]]]	1	1	0	0	0	1	137
0	iMrg	[$DP_{a:case}$ [v V[V $DP_{a:case}$]]]	1	1	0	0	0	0	101
0	rMrg	[v V[V $DP_{a:case}$]]	1	1	0	0	0	1	137

Step 5: Input v[v V[V $DP_{a:case}$]]
The internal argument moves, $case_{agr}$ violation is unbearable.

W	opr.	output	xws^{58}	lab^{43}	mc^{61}	$case_{agr}^{36}$	H
0	xMrg	[$T_{f:case}$ v[v V[V $DP_{a:case}$]]]	0	1	0	2	115
0	xMrg	[C v[v V[V $DP_{a:case}$]]]	0	1	1	2	176
0	iMrg	[V[V $DP_{a:case}$] v[v V[V $DP_{a:case}$]]]	1	1	0	1	137
1	iMrg	[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	1	1	0	0	101
0	rMrg	v[v V[V $DP_{a:case}$]]	1	0	0	2	130

Derivation

Step 6: Input [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]
The resulting phrase is labelled with v.

W	opr.	output	xws^{58}	lab^{43}	lb$^{100}_{D}$	lb$^{0}_{v}$	mc^{61}	case$^{36}_{agr}$	H
0	Lbl	$DP_{a:case}$[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	0	0	1	0	0	0	100
1	Lbl	v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	0	0	0	1	0	1	36
0	xMrg	[$T_{f:case}$ [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	1	0	0	1	0	104
0	xMrg	[C [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	1	0	0	1	0	104
0	iMrg	[$DP_{a:case}$ [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	0	0	0	101
0	iMrg	[v[v V[V $DP_{a:case}$]] [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	0	0	2	173
0	iMrg	[V[V $DP_{a:case}$] [$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	0	0	1	137
0	rMrg	[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	1	1	0	0	0	0	101

Derivation

Step 7: Input v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]
T is merged with vP.

W	opr.	output	xws^{58}	lab^{43}	mc^{61}	$case^{36}_{agr}$	H
1	xMrg	[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	1	0	1	79
0	xMrg	[C v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	1	1	1	140
0	iMrg	[$DP_{a:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	0	101
0	iMrg	[V[V $DP_{a:case}$] v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	1	137
0	rMrg	v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	1	0	0	1	94

Derivation

Step 8: Input [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]
The resulting merge is labelled with T.

W	opr.	output	xws^{58}	lab^{43}	lb$^{0}_{v}$	lb$^{14}_{T}$	mc^{61}	case$^{36}_{agr}$	case^{74}	H
1	Lbl	$T_{f:case}$[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	0	0	1	0	2	0	86
0	Lbl	v[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	0	0	1	0	0	1	1	110
0	xMrg	[C [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	0	1	0	0	1	1	0	140
0	iMrg	[$T_{f:case}$ [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	1	0	0	1	1	0	198
0	iMrg	[v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]] [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	1	0	0	0	1	0	137
0	iMrg	[$DP_{a:case}$ [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	1	0	0	0	0	0	101
0	iMrg	[V[V $DP_{a:case}$] [$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	1	0	0	0	1	0	137
0	rMrg	[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]	1	1	0	0	0	1	0	137

Derivation

Step 9: Input $T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$
The internal argument moves again. $case_{agr}$ violation is unbearable.

W	opr.	output	xws^{58}	lab^{43}	$case^{36}_{agr}$	H
0	xMrg	[C $T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$	0	1	2	115
0	iMrg	[v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]$ $T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$	1	1	1	137
1	iMrg	$[DP_{a:case}$ $T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$	1	1	0	101
0	iMrg	[V[V $DP_{a:case}]$ $T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$	1	1	1	137
0	rMrg	$T_{f:case}[T_{f:case}$ v$[DP_{a:case}$ v[v V[V $DP_{a:case}]]]]$	1	0	2	130

Derivation

Step 10: Input [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]
Agreement takes place between a : $case$ of DP and f : $case$ of T.

W	opr.	output	xws^{58}	lab^{43}	lb$_D^{100}$	lb$_T^{14}$	mc^{61}	case$_{agr}^{36}$	case^{74}	H
1	Agr	[DP T[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]	0	0	0	0	0	0	0	0
0	Lbl	DP$_{a:case}$[DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]	0	0	1	0	0	0	1	174
0	Lbl	T$_{f:case}$[DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]	0	0	0	1	0	1	0	50
0	xMrg	[C [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]]	0	1	0	0	1	0	0	104
0	iMrg	[DP$_{a:case}$ [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]]	1	1	0	0	0	0	0	101
0	iMrg	[T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]] [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]]	1	1	0	0	0	2	0	173
0	iMrg	[v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]] [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]]	1	1	0	0	0	1	0	137
0	iMrg	[V[V DP$_{a:case}$] [DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]]	1	1	0	0	0	1	0	137
0	rMrg	[DP$_{a:case}$ T$_{f:case}$[T$_{f:case}$ v[DP$_{a:case}$ v[v V[V DP$_{a:case}$]]]]]	1	1	0	0	0	0	0	101

Derivation

Step 11: Input [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]
The resulting phrase is labelled. The used feature does not travel up.

W	opr.	output	xws^{58}	lab^{43}	lb_D^{100}	lb_T^{14}	mc^{61}	$case_{agr}^{36}$	H
0	Lbl	DP[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	0	0	1	0	0	0	100
1	Lbl	T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	0	0	0	1	0	0	14
0	xMrg	[C [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	0	1	0	0	1	0	104
0	iMrg	[DP [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	0	0	0	101
0	iMrg	[T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]] [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	0	0	2	173
0	iMrg	[v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]] [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	0	0	1	137
0	iMrg	[V[V $DP_{a:case}$] [DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	0	0	1	137
0	rMrg	[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	1	0	0	0	0	101

Derivation

Step 12: Input T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]
TP is merged with C.

W	opr.	output	xws^{58}	lab^{43}	$case^{36}_{agr}$	H
1	xMrg	[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	0	1	0	43
0	iMrg	[DP T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	101
0	iMrg	[v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]] T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	1	137
0	iMrg	[V[V $DP_{a:case}$] T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	1	137
0	rMrg	T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]	1	0	0	58

Derivation

Step 13: Input [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]
The resulting merge is labelled with C.

W	opr.	output	xws^{58}	lab^{43}	lb$^{14}_{T}$	lb$^{0}_{C}$	mc^{61}	case$^{36}_{agr}$	H
1	Lbl	C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	0	0	0	1	0	0	0
0	Lbl	T[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	0	0	1	0	0	0	14
0	iMrg	[C [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	0	1	0	162
0	iMrg	[T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]] [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	0	0	0	101
0	iMrg	[DP [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	0	0	0	101
0	iMrg	[v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]] [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	0	0	1	137
0	iMrg	[V[V $DP_{a:case}$] [C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	0	0	1	137
0	rMrg	[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	1	0	0	0	0	101

Derivation

Step 14: Input C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]
Reflexive merge output is the most optimal, derivation culminates.

W	opr.	output	xws^{58}	lab^{43}	case$^{36}_{agr}$	H
0	iMrg	[T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]] C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	101
0	iMrg	[DP C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	0	101
0	iMrg	[v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]] C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	1	137
0	iMrg	[V[V $DP_{a:case}$] C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]]	1	1	1	137
1	rMrg	C[C T[DP T[$T_{f:case}$ v[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]]]]	1	0	0	58

Outcomes for movement

Locality

Locality is achieved when the problem of staying outweighs the problem of merging a new item or reflexive merge. So, movement is carried out as soon as it is required.

(10) Input v[v V[V $DP_{a:case}$]]

The internal argument moves, $case_{agr}$ violation is unbearable.

W	opr.	output	xws^{58}	lab^{43}	mc^{61}	$case^{36}_{agr}$	H
0	xMrg	[$T_{f:case}$ v[v V[V $DP_{a:case}$]]]	0	1	0	2	115
0	xMrg	[C v[v V[V $DP_{a:case}$]]]	0	1	1	2	176
0	iMrg	[V[V $DP_{a:case}$] v[v V[V $DP_{a:case}$]]]	1	1	0	1	137
1	iMrg	[$DP_{a:case}$ v[v V[V $DP_{a:case}$]]]	1	1	0	0	101
0	rMrg	v[v V[V $DP_{a:case}$]]	1	0	0	2	130

Anti Locality

Same domain movement settings never arise. Movement is harmony improvement.

Step i: Input V[V $DP_{f:X}$]

For iMrg of $DP_{f:X}$ to be optimal, $w(x*)$ should be at least 49.

W	opr	output	xws^{58}	lab^{43}	mc^{61}	x^*	H
0	xMrg	[v V[V $DP_{f:X}$]]	0	1	0	1	92
0	xMrg	[T V[V $DP_{f:X}$]]	0	1	1	1	153
0	xMrg	[C V[V $DP_{f:X}$]]	0	1	1	1	153
☞	iMrg	[$DP_{f:X}$ V[V $DP_{f:X}$]]	1	1	0	0	91
0	rMrg	V[V $DP_{f:X}$]	1	0	0	1	107

Step i-1: Input [V $DP_{f:X}$]

If $w(x*)$ is 49, then V[V $DP_{f:X}$] was never the optimal output to begin with.

W	opr	output	xws^{58}	lab^{43}	mc^{61}	x^{*49}	lb_D^{100}	lb_V^{50}	H
☞	Lbl	V[V $DP_{f:X}$]	0	0	0	1	0	1	99
0	Lbl	$DP_{f:X}$[V $DP_{f:X}$]	0	0	0	0	1	0	100
0	xMrg	[v [V $DP_{f:X}$]]	0	1	1	0	0	0	104
0	xMrg	[T [V $DP_{f:X}$]]	0	1	1	0	0	0	104
0	xMrg	[C [V $DP_{f:X}$]]	0	1	1	0	0	0	104
☛	rMrg	[V $DP_{f:X}$]	1	1	0	0	0	0	91

Phrasal movement

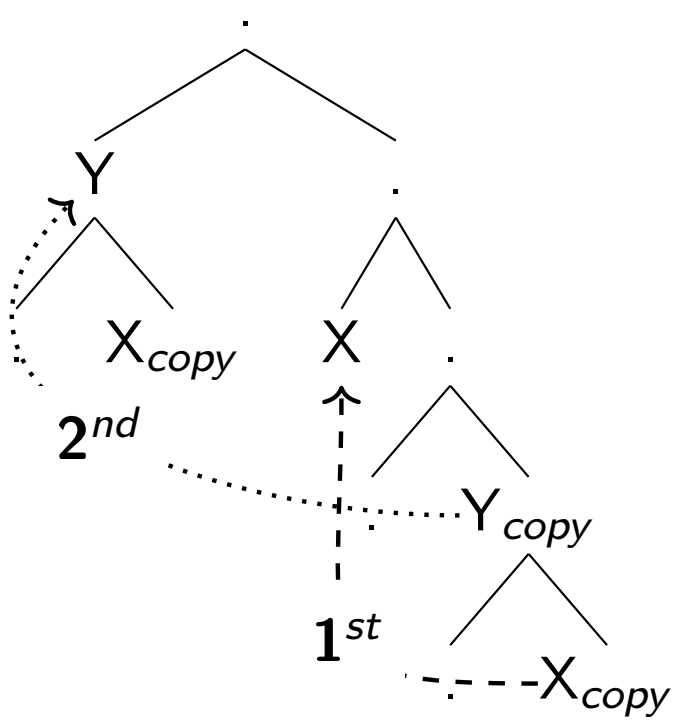
Phrasal movement is motivated the same way as normal movement, projecting item's feature leads to movement.

(11) Input T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]

W	opr	output	xws^{55}	lab^{50}	foc^{29}	H
0	xMerge	[C T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]]	0	1	2	108
0	iMerge	[v[v $V_{f:foc}$[$V_{f:foc}$ DP]] T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]]	1	1	1	134
☞	iMerge	[$V_{f:foc}$[$V_{f:foc}$ DP] T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]]	1	1	0	105
0	iMerge	[DP T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]]	1	1	2	163
0	rMerge	T[T v[v $V_{f:foc}$[$V_{f:foc}$ DP]]]	1	0	2	113

Remnant movement

(12) Remnant movement

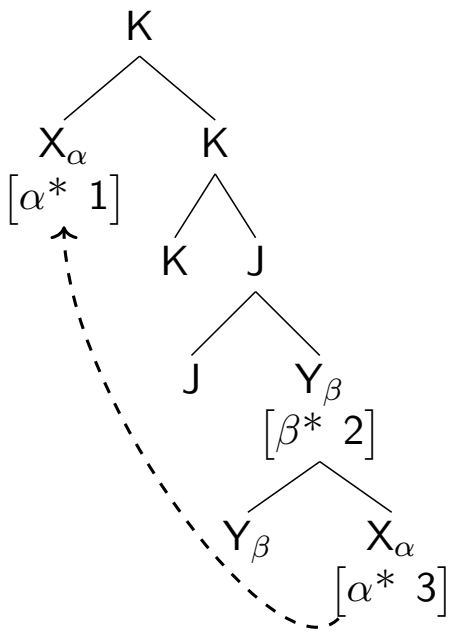


The item X moves first, followed by the movement of the phrase Y.

Remnant Movement, harmonic syntax I

α* and β* are markedness constraints.

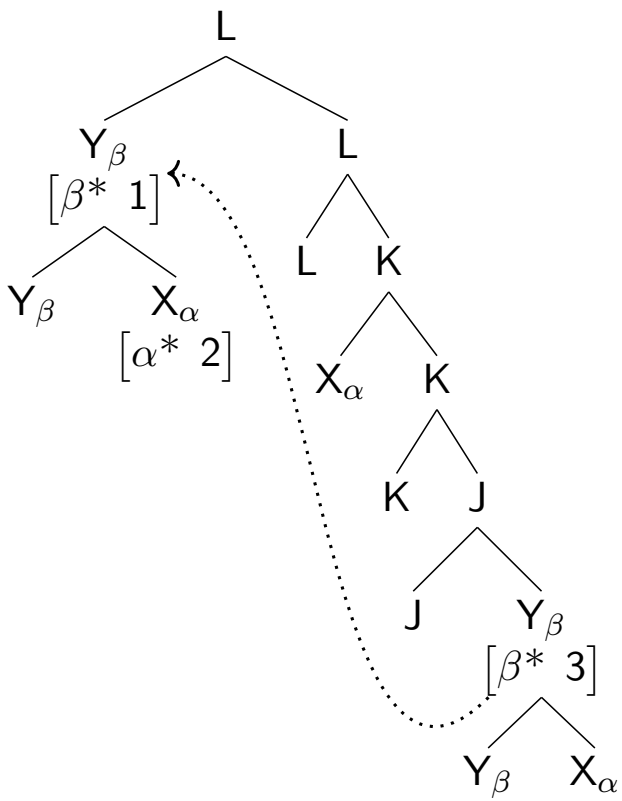
(13) First movement



3 violations of α* was enough to Merge X_α again to get rid of markedness violations. Later merge of K and labelling increases the violation of α* to 1, β* violation is still 2.

Remnant movement, harmonic syntax II

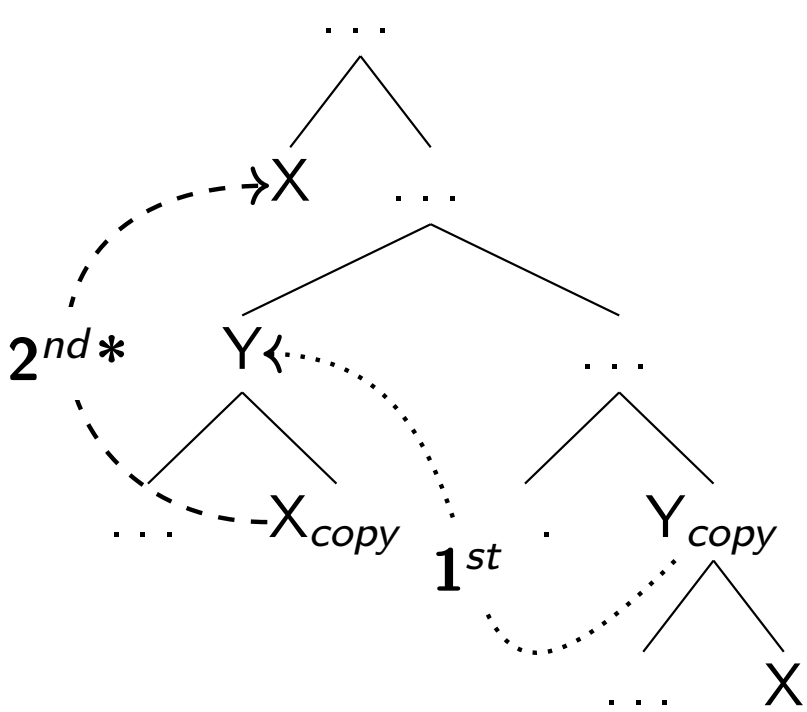
(14) Remnant movement



After the Merge of L and labelling, α* violation increases to 2. However, 3 violations β* forces remnant movement. This resets β* violation and decreases α* violation to 1. Later labelling increases both violations by 1.

Movement Freeze

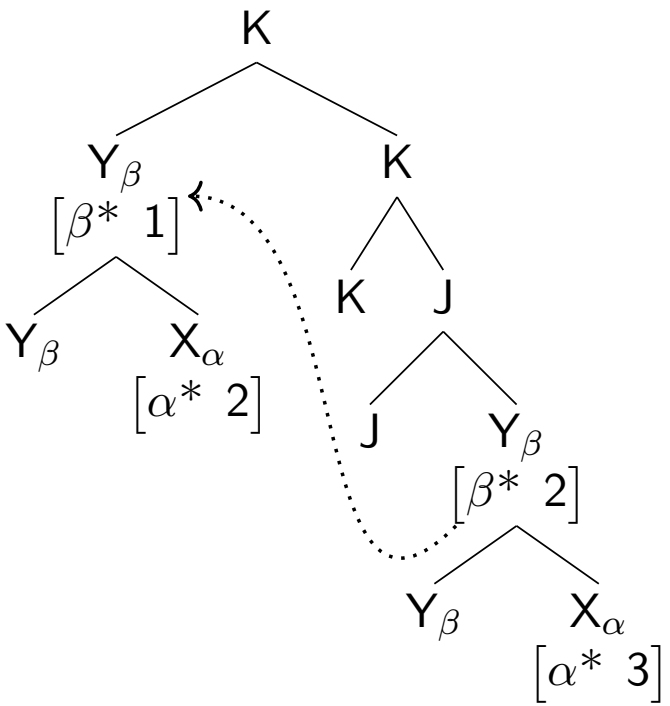
(15) Movement freeze



If the phrase Y moves first, the item X cannot move out of it.

Movement Freeze, harmonic syntax I

(16) Movement freeze

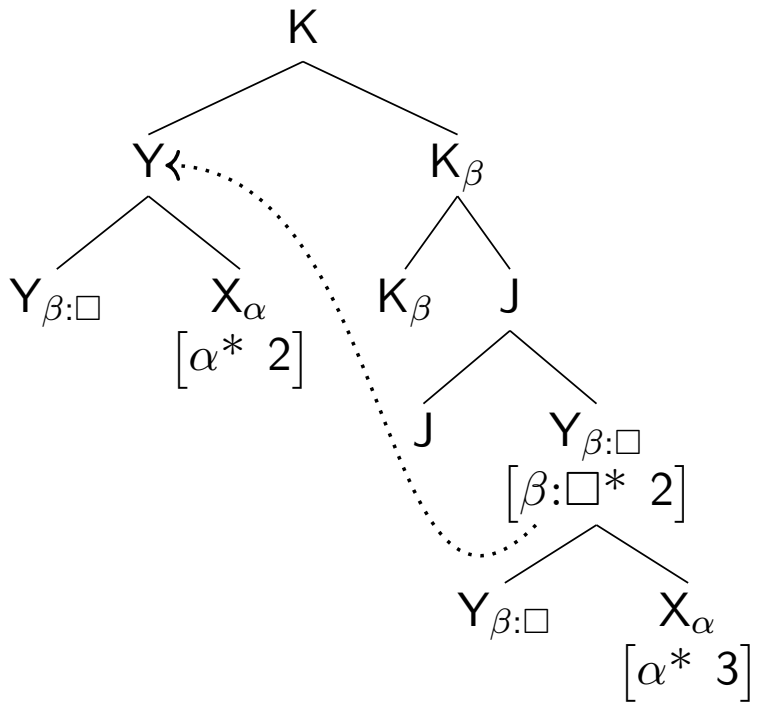


If the phrase Y moves first, it resets the markedness violations for α* of X_α from 3 to 1 first, then later labelling increases it to 2. Any further Merge and Label ends up with the phrase moving first.

Movement DeFreeze, harmonic syntax II

There is one configuration where movement freeze can be broken.

(17) Movement unfrozen



If phrasal movement is motivated by an agreement feature, that agreement feature can be satisfied after the movement. As a result, further Merge and Label can motivate moving out of a moved phrase.

Conclusion

Result

- Syntax is no longer feature driven.
- Operations are carried out very locally.
- Phrasal movement, remnant movement, movement freeze are free.
- Technically, movement defreeze is possible.

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