Deriving the LCA

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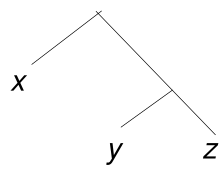
1. Main idea

linear order reflects the order in which elements are merged

(1) equivalence



≡ ⟨ *x*, ⟨ *y*, *z* ⟩ ⟩ ≡ / *x y z* /

replaces
(2) *Linear Correspondence Axiom (LCA)*
Linear order is a function of asymmetric c-command relations (Kayne 1994)

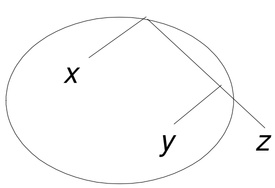
2. The LCA

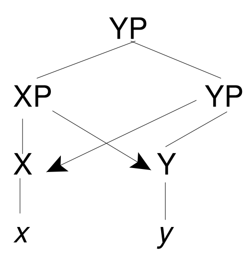
(3) *More exactly:*
Given a set *T* of terminals of a phrase marker *P* and an asymmetric c-command relation among the non-terminals of *P*, the dominance relation from non-terminals to terminals *d*(*A*) yields a linear ordering of *T*

(4) *General correctness of the structure-order correspondence*
a. subject-predicate order
b. extracted element precedes its remnant/trace
c. universal *A [& B]* coordination structure/order (Zwart 2005)

(5) *Problems of the LCA (as stated)*
a. global (representational) rather than local (derivational)
b. violates bare phrase structure requirement (Chomsky 1995, section 4.8)

Ad (5a)
(6) specifiers: no linear order of *x* and *y*



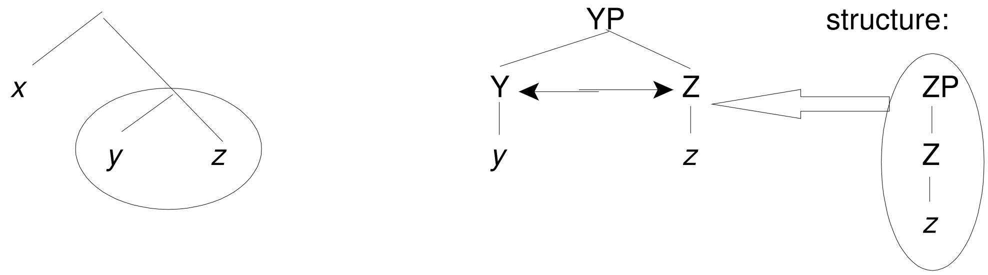


solution
YP and YP are 'segments', lower segment does not c-command

Ad (5b)

(7) bare complements: no linear order of *y* and *z*

solution
nonbranching structure:



(8) Bare Phrase Structure (Chomsky 1995): structure is a function of merge alone
- no segments
- no nonbranching structures
- no restrictions on number of adjunctions

Both problems are solved if linear order can be made ***a function of merge***

3. Merge

(9) *Merge*
1. select 2 elements *x*, *y* from a numeration (N)
2. combine *x* and *y* yielding P

(10) *Problems*

a. why 2?
b. no designated output (multiple tree creation, interarboreal operations)
c. recursion: select targets P in all instances of merge except the first step
d. move: select may target a term of P, but only for one of the two elements to be merged (= extension condition)

(11) *Simplification*
Merge assigns an element from the Numeration to the Derivation

(12) *Addressing the problems*

a. only 1
b. Derivation = designated output (no multiple tree creation, no interarboreal operations)
c. Merge = iterative (recursion = output of a derivation may appear in the next numeration)
d. No move (bottom up derivation: remerge from Numeration + ‘copy’ deletion; top down derivation: merge only once, leaving a gap)

(13) *Asymmetry*
Temporal asymmetry between a newly merged element and already existing structure (Jaspers 1998)

4. Top-down derivation (split-merge)

$\{ \{ a, b, c, d, e \}, \{ b, c, d, e \} \} \equiv \langle a, \{ b, c, d, e \} \rangle$

(14) *Derivation (D)*

1. $N = \{ a, b, c, d, e \}$ and $D = \varnothing$
2. Select *a*, yielding $N = \{ b, c, d, e \}$ and $D = \langle a, N \rangle$
3. Select *b*, yielding $N = \{ c, d, e \}$ and $D = \langle a, \langle b, N \rangle \rangle$
4. Select *c*, yielding $N = \{ d, e \}$ and $D = \langle a, \langle b, \langle c, N \rangle \rangle \rangle$
5. Select *d*, yielding $N = \{ e \}$ and $D = \langle a, \langle b, \langle c, \langle d, N \rangle \rangle \rangle \rangle$
6. Select *e*, yielding $N = \varnothing$ and $D = \langle a, \langle b, \langle c, \langle d, \langle e, N \rangle \rangle \rangle \rangle \rangle$

(15) *Merge*
Select $x \in N$, yielding $N = N - x$ and $D = \langle x, N \rangle$

(16) *Constituent*
P is a constituent if it is the output of Merge (i.e. N or D)

(17) *Syntactic position*
The pair $\langle x, N \rangle$ defines the syntactic position of *x*

(18) *Grammatical relation*
A grammatical relation between *x* and *y* exists iff $D = \langle x, y \rangle$

(19) *Linear order*
$\langle a, \langle b, c \rangle \rangle = \langle a, b, c \rangle = / a\ b\ c /$

(20) *Linear Correspondence Axiom*
$\langle x, y \rangle = / x\ y /$

5. Back to the LCA problems

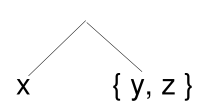
(21) *Problems of the (old) LCA*
a. global (representational) rather than local (derivational)
b. violates bare phrase structure requirement

Ad (21a)
(22) Order is a function of merge, i.e. established at each step of the derivation

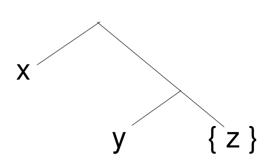
(23) specifier-head ordering:

$N = \{ x, y, z \}$ $D = \varnothing$

Merge *x* yielding $N = \{ y, z \}$ and $D = \langle x, N \rangle$



Merge *y* yielding $N = \{ z \}$ and $D = \langle x, \langle y, N \rangle \rangle$



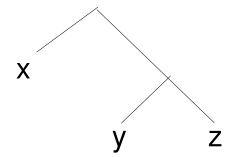
Ad (21b)

(23) bare phrase structure requirements are met (no vacuous structure)

(24) head-complement ordering:

(continuing from (22))

Merge *z* yielding N = ∅ and D = ⟨ x, ⟨ y, ⟨ z, N ⟩ ⟩ ⟩



6. Proof

(25) Split-merge yields a *derivational record K*, which may be expressed as a set of sets of elements in syntactic positions (cf. (17)) at each step of the derivation

(26)

	NUMERATION
initial situation	{ a, b, c, d, e }
first merge	{ b, c, d, e }
next merge	{ c, d, e }
next merge	{ d, e }
next merge	{ e }

(27) K = { { a, b, c, d, e }, { b, c, d ,e }, { c, d, e }, { d, e }, { e } }

(28) Kuratowski's Definition (Kuratowski 1921): { { a }, { a, b } } = ⟨ a, b ⟩

(29) K = ⟨ e, d, c, b, a ⟩ (succession relation, interpretable at Spell-Out)

(30) Linear order is a function of the order in which elements are merged (split off from N)

7. Outlook

(31) What determines the order in which elements are merged?
Ideally: order is free, but interpretation is not.

(32) Dependency: since each step yields ⟨ x, N ⟩, where N is an unordered set, only *x* is syntactically active, and nothing in N can turn *x* in a syntactic dependent.
Predicts: a general order-dependency correlation (Zwart 2004, 2006).

References

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