Structure and rules

Jean Mark Gawron

Linguistics 503 San Diego State University

2013 Jan

Relation of rules to structures

1. A PS-rule does more than list the order of words in a phrase. It is part of a grammar of PS rules, which together define possible tree structures in the hierarchical analysis of the language:

Relation of trees & rules

$$\boxed{\text{No tree}} \Leftrightarrow \boxed{\text{No rule}}$$

2. Consequences
   1. A PS-rule expanding phrase A does no work if phrase A does not occur on the **right hand side** of a rule (unless A is S, the "root node")
   2. The hierarchical structure of the grammar defines a complex set of conditions for word occurrences: The occurrence of a word is conditional on the occurrence of the structure introducing it.

PS-Grammars and trees

c d f g

$A \rightarrow B\ E$

$B \rightarrow C\ D$

$E \rightarrow F\ G$

$C \rightarrow c$

$D \rightarrow d$

$E \rightarrow e$

$F \rightarrow f$

$A \rightarrow C\ D\ F\ G$

$B \rightarrow C\ D$

$E \rightarrow F\ G$

$C \rightarrow c$

$D \rightarrow d$

$E \rightarrow e$

$F \rightarrow f$

PS-Grammars and trees

A
B   E
C D F G
| | | |
c d f g

A → B E
B → C D
E → F G
C → c
D → d
E → e
F → f
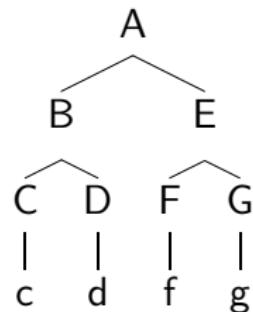
A → C D F G
B → C D
E → F G
C → c
D → d
E → e
F → f

PS-Grammars and trees

A → B E
B → C D
E → F G
C → c
D → d
E → e
F → f
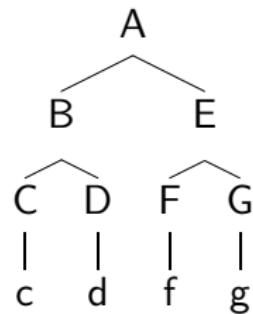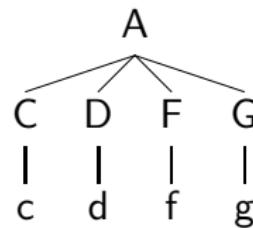
A → C D F G
B → C D
E → F G
C → c
D → d
E → e
F → f

Missing structure


```
                    lopa   beli   lale   kuntu
              S     walk   man    old    slowly


      V       N      Adj    Adv

     lopa    beli   lale   kuntu


                    S


      V       NP            Adv

     lopa    N    Adj      kuntu


            beli  lale
```
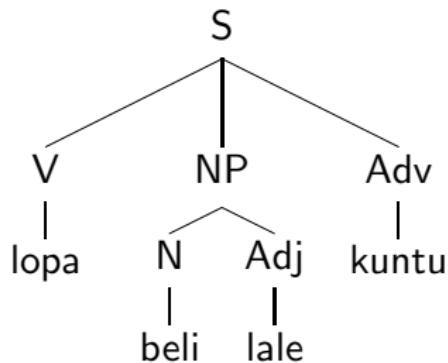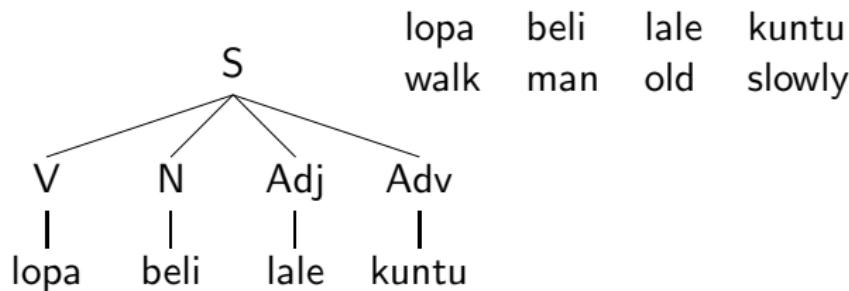
Missing structure

Missing structure
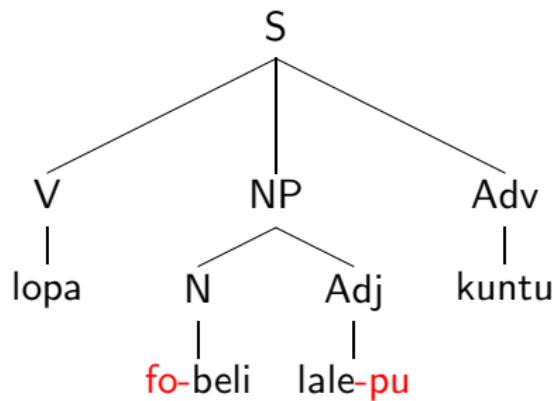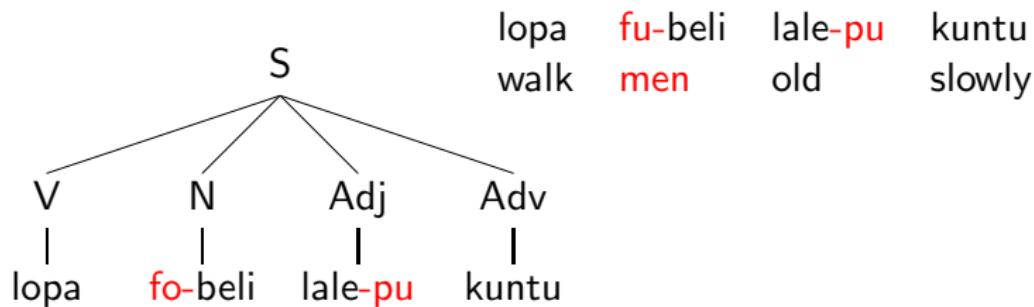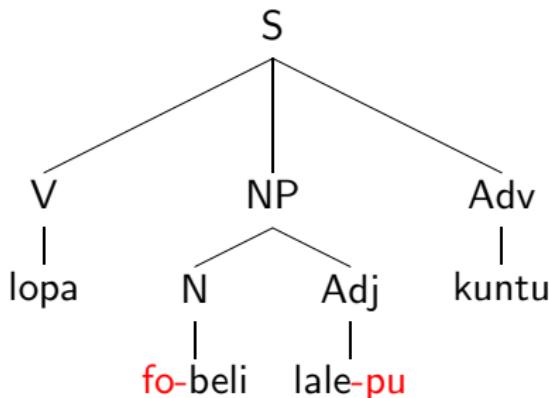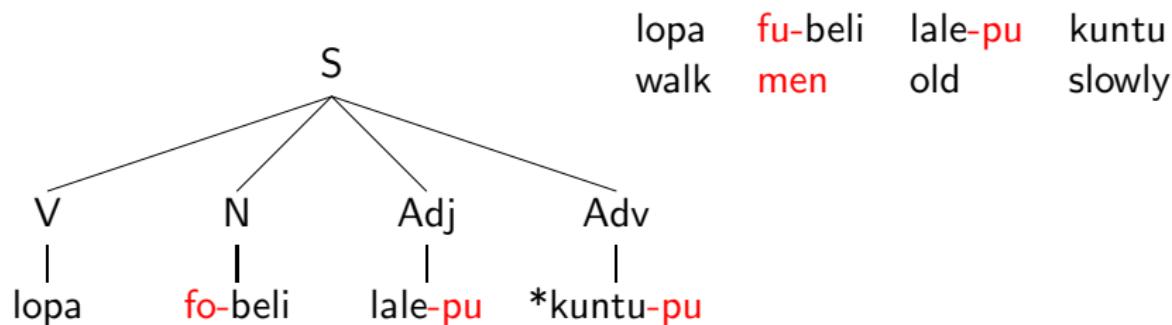
lopa	fu-beli	lale-pu	kuntu
walk	men	old	slowly

The two grammars

Grammar for bad tree
S → V N (Adj) Adv
NP → N (Adj)

Grammar for good tree
S → V NP Adv
NP → N (Adj)

The two grammars

Grammar for bad tree
S → V N (Adj) Adv

NP Rule useless!

Grammar for good tree
S → V NP Adv
NP → N (Adj)

## Co-occurrence: Modifiers depend on heads

Mersthami

7. lopa   [$_{NP}$ fotaha   lalepu]   kuntu   lale
    walked   women   old   slowly   very
   The old women walked very slowly.

Possible Grammar 1
S → V (NP) (Adv) (Adj)
NP → N (Adj)
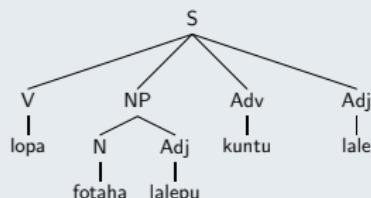
Possible Grammar 2
S → V (NP) (AdvP)
NP → N (Adj)
Advp→ Adv (Adj)
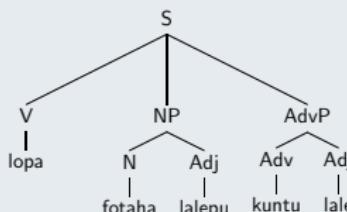
Grammar 2	Both grammars
* lopa fotaha lalepu lale	* lopa lalepu

Jean Mark Gawron

Bad structure

```
              S
          ┌───┴───┐
          V       NP
          │    ┌───┼───┐
        lopa   N   Adj  Adv
               │   │    │
             beli lale kuntu


              S
        ┌─────┼─────┐
        V     NP    Adv
        │    ┌─┴─┐   │
      lopa   N  Adj kuntu
             │   │
           beli lale
```
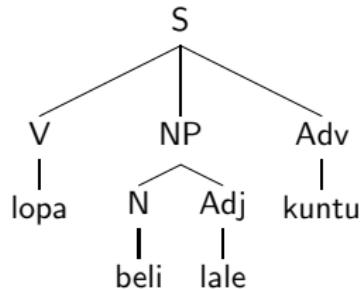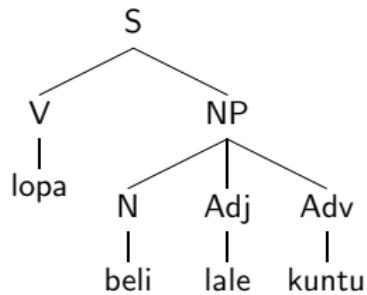
Bad structure
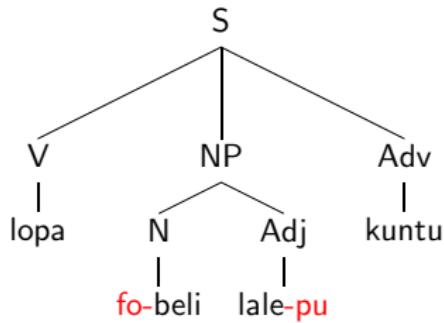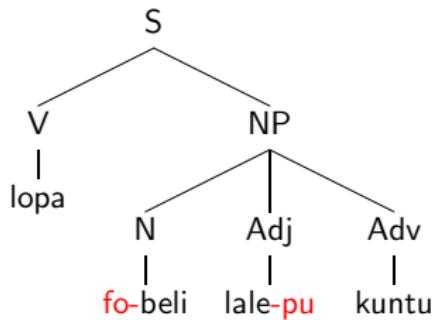
Bad structure
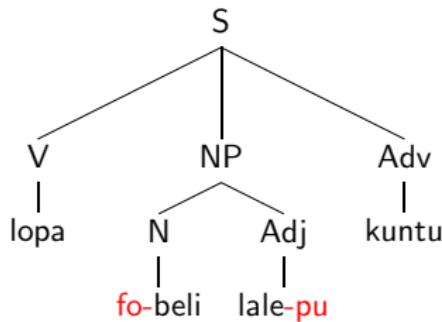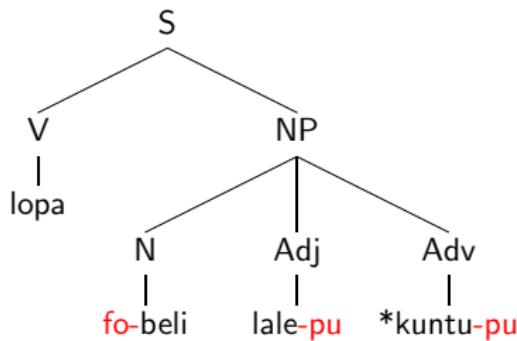
PS-rule heuristics

1. Part of what your PS rules are capturing is head-modifier relations
2. Intensifiers (*very*, *such a*, *extremely*, *too*, ...) modify what they intensify: *very* modifies *unhappy* in *an extremely unhappy man*.
3. Head-modifier relations are semantically-based. Use your knowledge of English head-modifier relations to *guide* you (not decide all issues!).

Adverbs/intensifiers never modify nouns

a.   The old man
b.   The slowly man
c.   *The very man

Even if the parts of speech change, the semantic relationships may not.