

The Lewis & Vasishth (2005) Sentence Parser

Felix Engelmann
2015

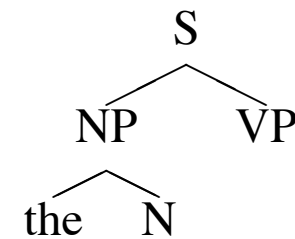
Left-Corner Parsing

$S \rightarrow NP VP$ $Det \rightarrow a, the$ $NP \rightarrow Det N$
 $N \rightarrow man, dog$ $V \rightarrow ran, saw$ $VP \rightarrow V$
 $VP \rightarrow V NP$

INPUT: *the*

GOAL CATEGORY STACK: [S]

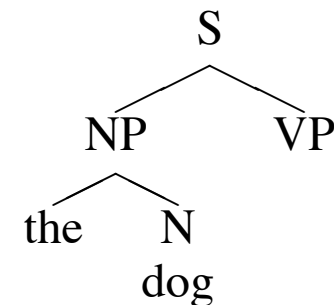
ACTIONS: If *the* is the left corner of any phrase structure rule then replace the stack content with the LHS of that rule. Repeat this left-corner rule until no further steps are possible. Wait for next input word. These actions yield the structure to the right:



INPUT: *dog*

GOAL CATEGORY STACK: [N NP VP S]

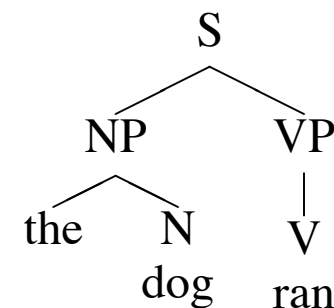
ACTIONS: Use the left-corner rule to expand *dog* to N. Since N is predicted in the incremental structure built so far (Step 1), integrate the N built up bottom-up into the tree. Since no further applications of the left-corner rule are possible, wait for the next input.



INPUT: *ran*

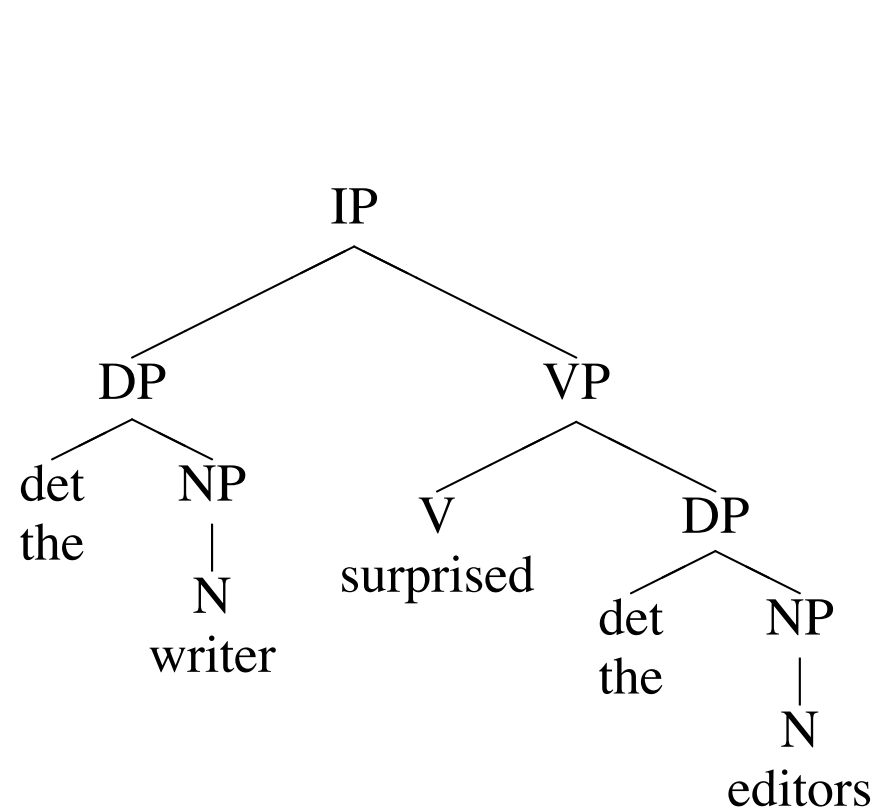
GOAL CATEGORY STACK: [VP S]

ACTIONS: Use the left-corner rule to expand *ran* to V, and apply this rule once again to expand to VP. Since a VP is predicted in the structure, integrate this with the tree.



Lewis & Vasishth (2005) Parser

The writer surprised the editors.



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp : DP9

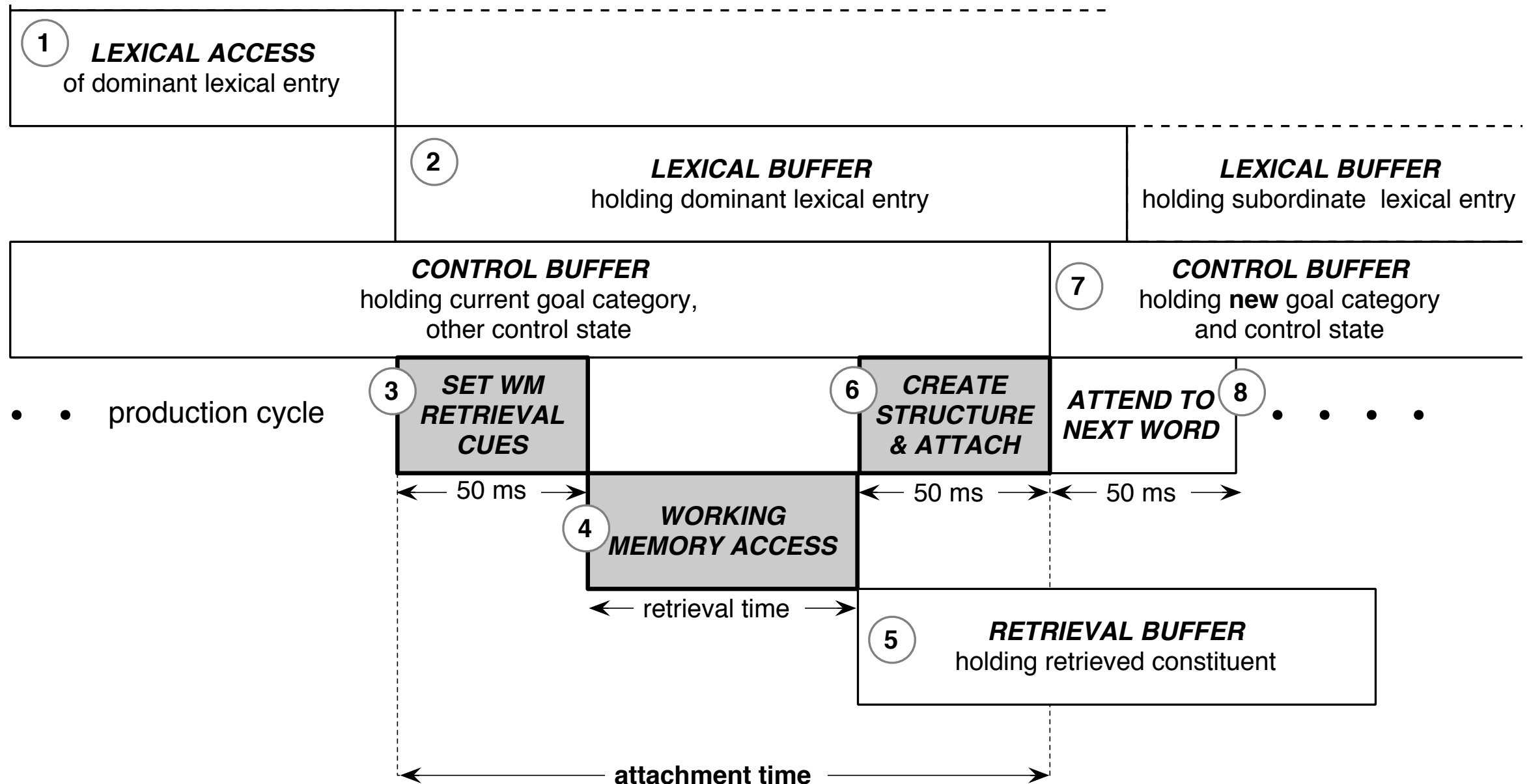
DP9

cat : DP
num : plural
head : *the*
comp : NP14

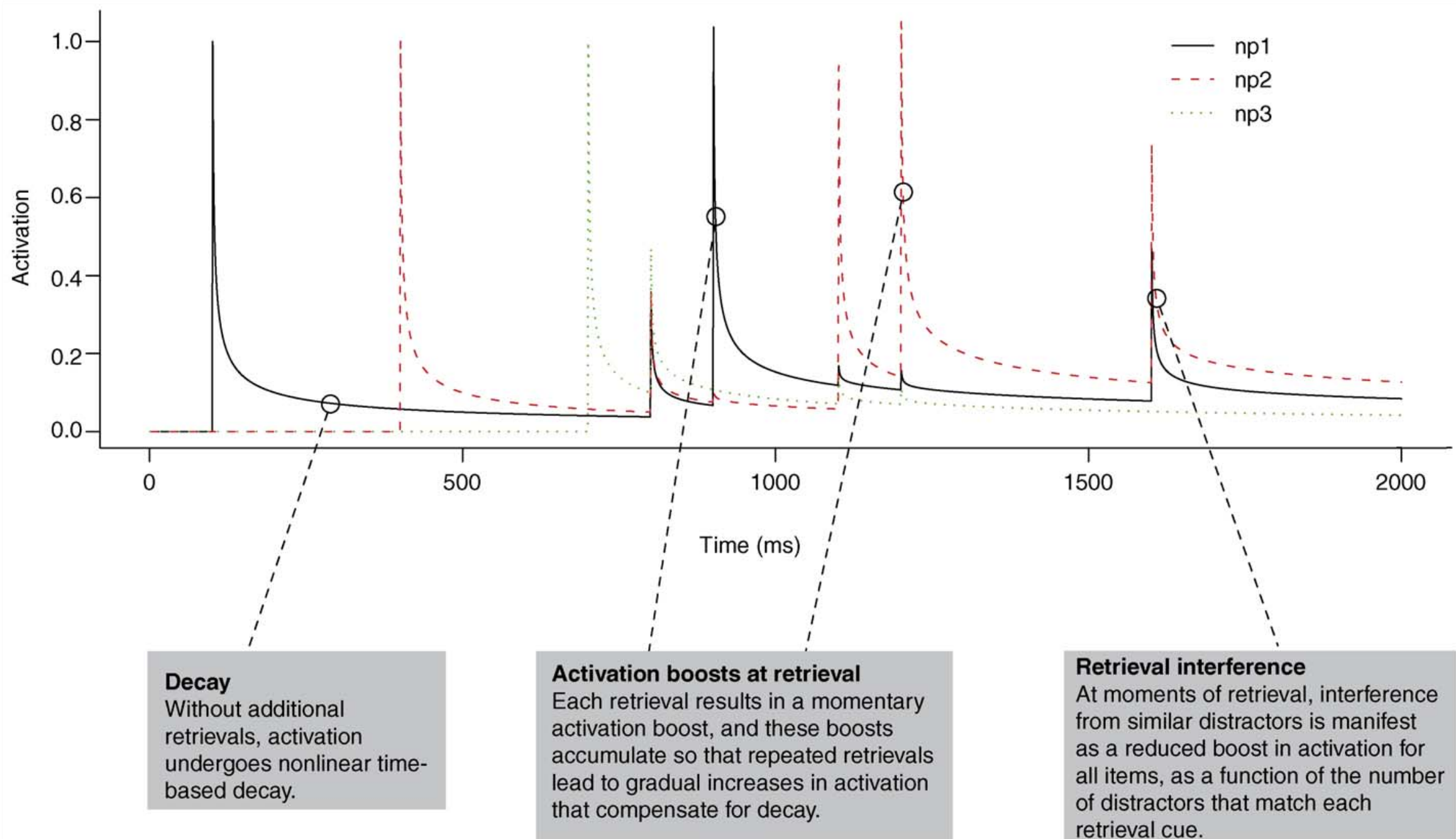
NP14

cat : NP
case : acc
num : plural
head : *editors*

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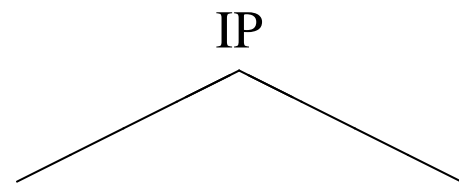


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Goal stack

The writer surprised the editors.

IP
DONE



IP3
cat : IP
num :
spec :
comp :
tense :
finite :

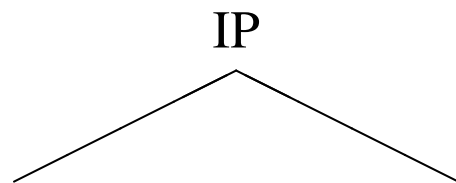
Lewis & Vasishth (2005) Parser

The writer surprised the editors.

Goal stack

IP
DONE

(P set-retrieval-cues-IP-goal-input-DET ...)



IP3
cat : IP
num :
spec :
comp :
tense :
finite :

Lewis & Vasishth (2005) Parser

The writer surprised the editors.

Goal stack

IP
DONE

(P set-retrieval-cues-IP-goal-input-DET ...)

Retrieval

IP3

cat : IP
num :
spec :
comp :
tense :
finite :

IP

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Goal stack

IP
DONE

The writer surprised the editors.

(P set-retrieval-cues-IP-goal-input-DET ...)

(P attach-DP-as-subject-of-predicted-IP ...)

Retrieval

IP3

cat : IP
num :
spec :
comp :
tense :
finite :

IP

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Goal stack

IP
DONE

The writer surprised the editors.

(P set-retrieval-cues-IP-goal-input-DET ...)

(P attach-DP-as-subject-of-predicted-IP ...)

Retrieval

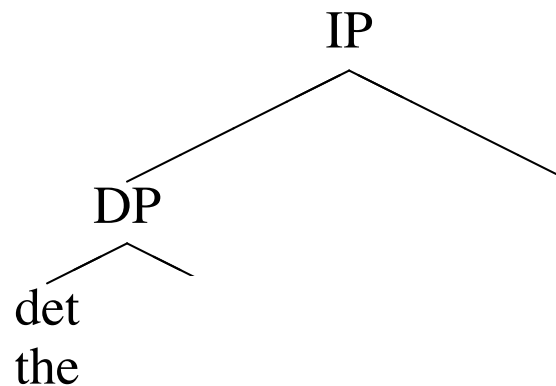
Creation

IP3

cat : IP
num :
spec : DP3
comp :
tense :
finite :

DP3

cat : DP
num :
head : *the*
comp :



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The writer surprised the editors.

Goal stack

NP
VP
DONE

(P set-retrieval-cues-IP-goal-input-DET ...)

(P attach-DP-as-subject-of-predicted-IP ...)

Retrieval

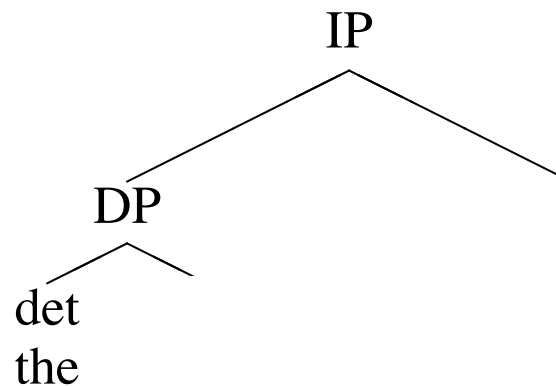
Creation

IP3

cat : IP
num :
spec : DP3
comp :
tense :
finite :

DP3

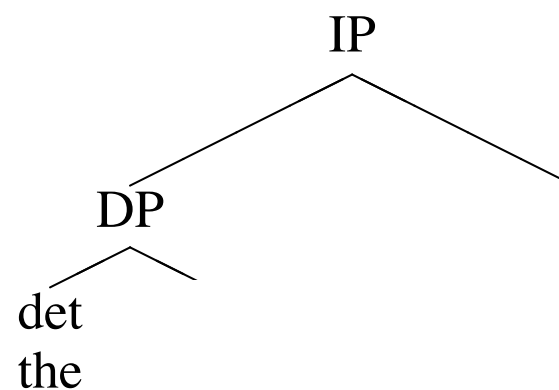
cat : DP
num :
head : *the*
comp :



```

(P set-retrieval-cues-IP-goal-input-DET
=goal>
  ISA      comprehend-sentence
  state    "read"
  goal-cat IP-goal
=retrieval>
  isa      lexical-entry
  word     =word
  cat      DET
==>
=lex> =retrieval
=goal>
  state    "wm-retrieval"
  cue1     wait-for-IP
+retrieval>
  ISA      syn-obj
  waiting-for-cat wait-for-IP
)

```



```

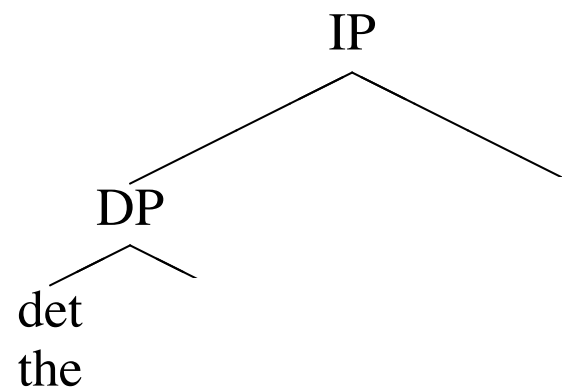
(P attach-DP-as-subject-of-predicted-IP
=goal>
  ISA      comprehend-sentence
  state    "wm-retrieval"
=retrieval>
  isa      syn-obj
  cat      IP
  ID       =ID-RETR
  head     nil
  waiting-for-cat wait-for-IP
=lex>
  isa      lexical-entry
  cat      DET
  word     =word
  number   sing-plural-lex
==>
=goal>
  state    "read"
  goal-cat NP-goal
+DPb>
  isa      syn-obj
  cat      DP
  ID       =ID-DP
  head     =word
  spec-of  =ID-RETR
  number   sing-plural
  waiting-for-cat wait-for-NP
  next-goal next-VP-goal
=retrieval>
  spec     =ID-DP
  waiting-for-cat wait-for-VP
)

```

```

(P set-retrieval-cues-IP-goal-input-DET
  =goal>
    ISA      comprehend-sentence
    state    "read"
    goal-cat IP-goal .....
  =retrieval>
    isa      lexical-entry
    word     =word
    cat      DET
  ==>
    =lex> =retrieval
    =goal>
      state    "wm-retrieval"
      cue1     wait-for-IP
    +retrieval>
      ISA      syn-obj
      waiting-for-cat wait-for-IP
)

```



Goal stack

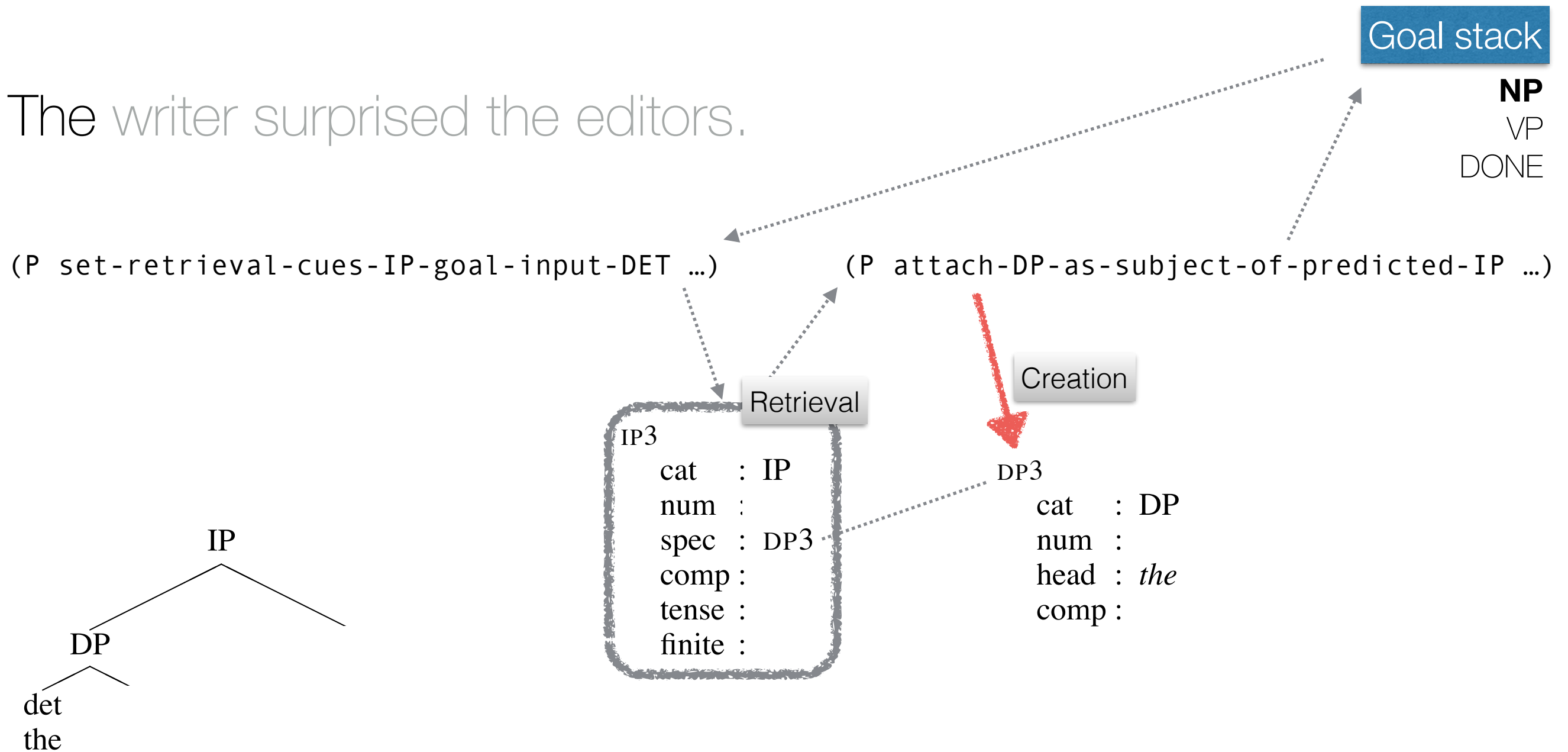
```

(P attach-DP-as-subject-of-predicted-IP
  =goal>
    ISA      comprehend-sentence
    state    "wm-retrieval"
    =retrieval>
      isa      syn-obj
      cat      IP
      ID       =ID-RETR
      head     nil
      waiting-for-cat wait-for-IP
    =lex>
      isa      lexical-entry
      cat      DET
      word     =word
      number   sing-plural-lex
    ==>
      =goal>
        state    "read"
        goal-cat NP-goal
      +DPb>
        isa      syn-obj
        cat      DP
        ID       =ID-DP
        head     =word
        spec-of  =ID-RETR
        number   sing-plural
        waiting-for-cat wait-for-NP
        next-goal next-VP-goal
      =retrieval>
        spec    =ID-DP
        waiting-for-cat wait-for-VP
)

```

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Goal stack

NP
VP
DONE

The writer surprised the editors.

(P set-retrieval-cues-...)

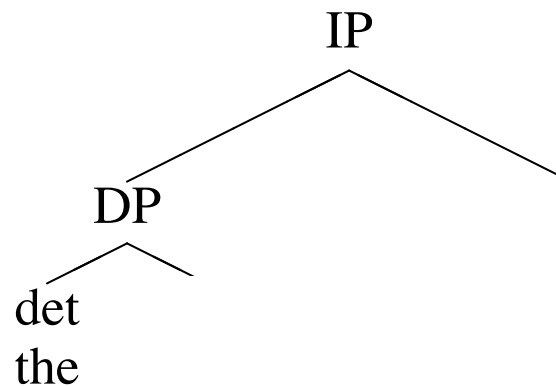
(P attach-...)

IP3

cat : IP
num :
spec : DP3
comp :
tense :
finite :

DP3

cat : DP
num :
head : *the*
comp :



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Goal stack

VP
DONE

(P set-retrieval-cues-...)

(P attach-...)

IP3

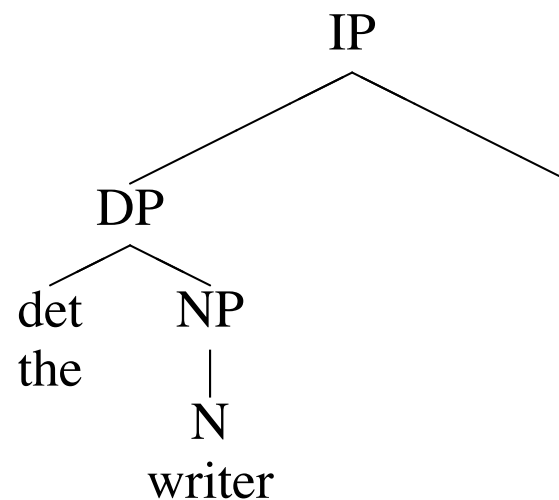
cat : IP
num : sing
spec : DP3
comp :
tense :
finite :

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*



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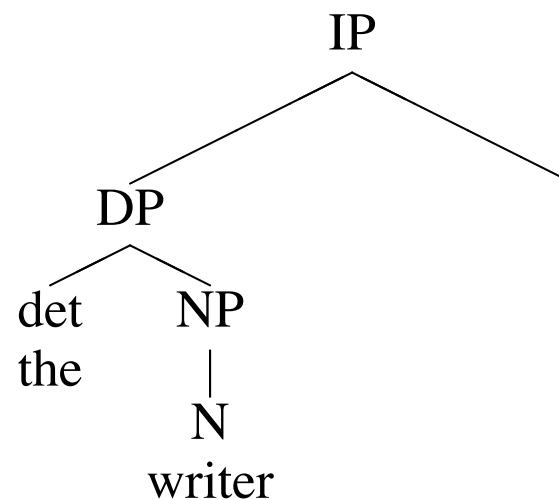
Goal stack

VP
DONE

The writer surprised the editors.

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp :
tense :
finite :

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

Lewis & Vasishth (2005) Parser

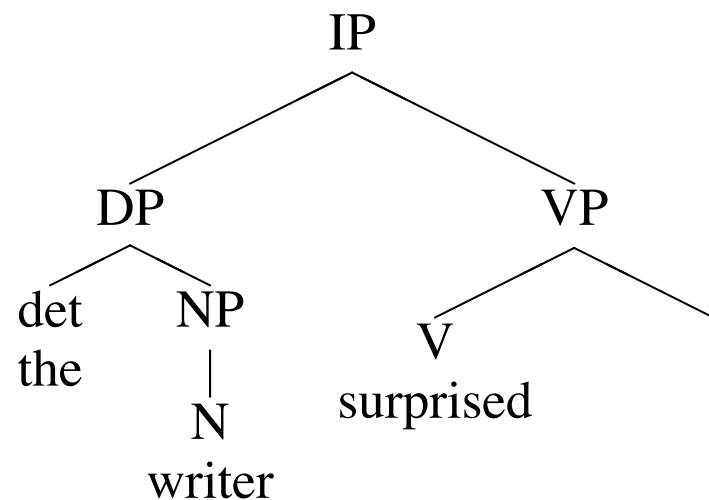
The writer surprised the editors.

Goal stack

DP
DONE

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp :

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

Lewis & Vasishth (2005) Parser

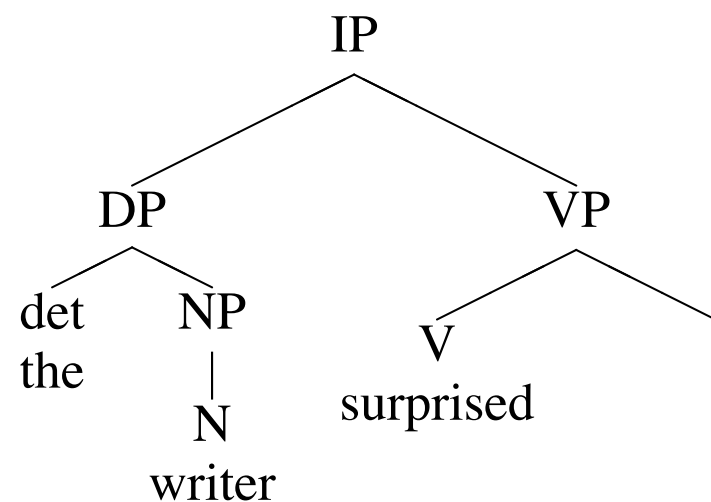
Goal stack

DP
DONE

The writer surprised the editors.

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp :

Lewis & Vasishth (2005) Parser

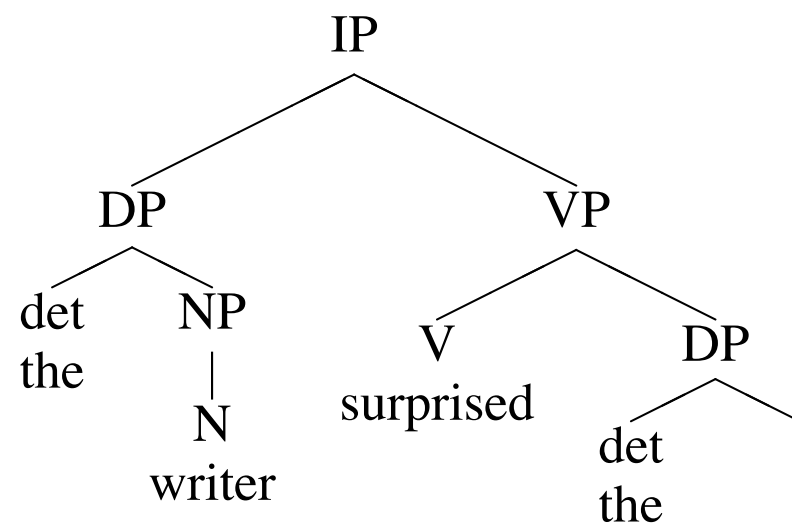
The writer surprised the editors.

Goal stack

NP
DONE

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp : DP9

DP9

cat : DP
num :
head :
comp :

Lewis & Vasishth (2005) Parser

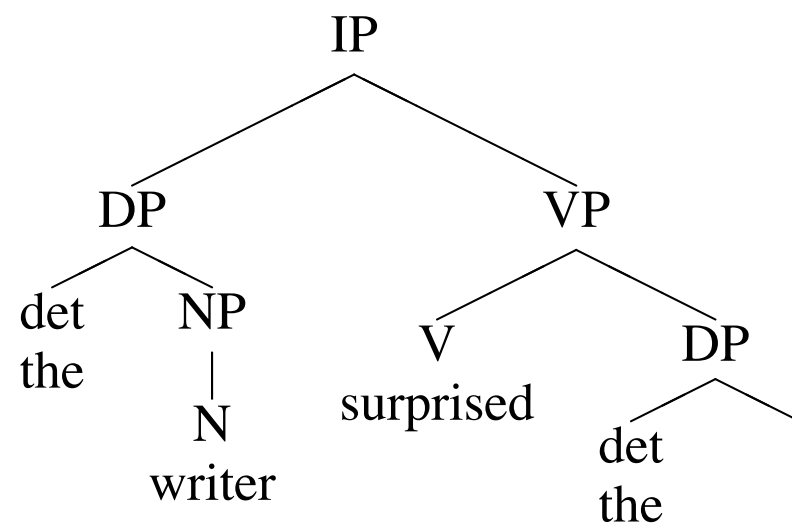
Goal stack

NP
DONE

The writer surprised the editors.

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp : DP9

DP9

cat : DP
num :
head :
comp :

Lewis & Vasishth (2005) Parser

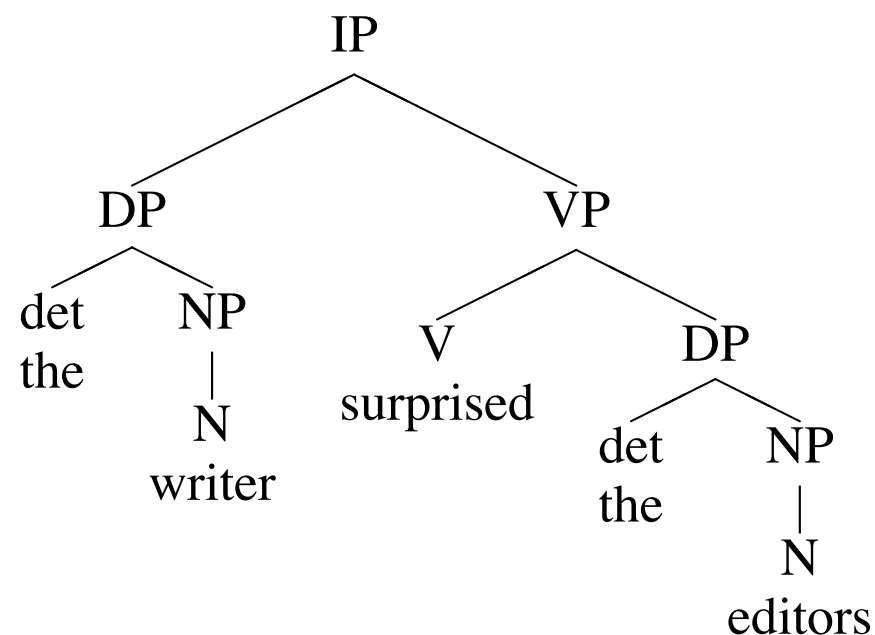
The writer surprised the editors.

Goal stack

DONE

(P set-retrieval-cues-...)

(P attach-...)



IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp : DP9

DP9

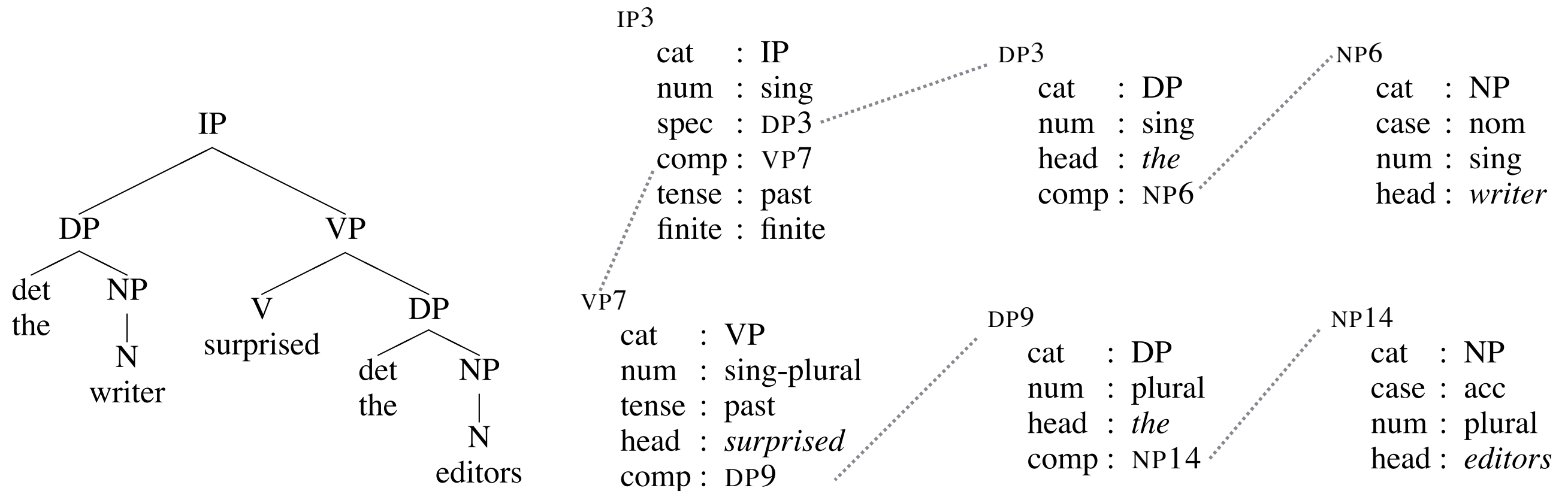
cat : DP
num : plural
head : *the*
comp : NP14

NP14

cat : NP
case : acc
num : plural
head : *editors*

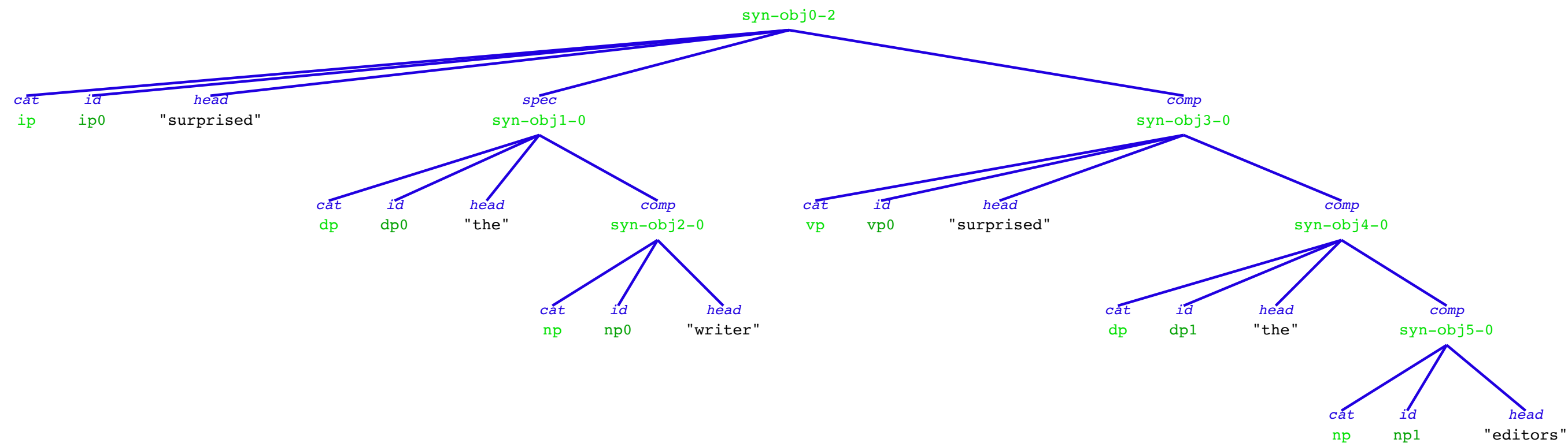
Lewis & Vasishth (2005) Parser

The writer surprised the editors.



Lewis & Vasishth (2005) Parser

The writer surprised the editors.



```
(ps "the writer surprised the
editors *")
(setf *real-time* T)
```



```
(load "../actr6/load-act-r-6.lisp")  
(run-environment) OR (start-environment)  
(load "sp-lv05.lisp")  
  
(ps "the writer surprised the editors *")  
  
(delete-output)  
(setf *real-time* T)  
(sgp :gram-lf 0.8)  
(ps *gg-or*)  
  
(re 'gg-exp1 60)
```

Example: Relative Clauses

Grodner & Gibson (2005)

SR: The reporter who sent the photographer to the editor hoped for a story.

OR: The reporter who the photographer sent to the editor hoped for a story.

