
TL—Notes 3b: Relative Clause in DCG

(GPSG, Gazdar 1981; Gazdar, Klein, Pullum, and Sag. 1985)

1

The Lexicon

det --> [Det], {det(Det)}.
det(a).
det(the).
det(some).
det(every).

n --> [N], {n(N)}.
n(author).
n(book).
n(program).
n(programmer).
n(professor).
n(student).

pn --> [PN], {pn(PN)}.
pn(begriffsschrift).

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The Homework 2 Bare-Bones DCG

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%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%  
%%  
%%   Pereira and Shieber, Program 3.12 pp.78-9  
%%   (corrected)  
%%  
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

s --> np, vp.

np --> det, n, optrel.
np --> pn.

vp --> tv, np.
vp --> iv.

optrel --> [].
optrel --> [that], vp.

2

pn(principia).
pn(lunar).
pn(shrdlu).
pn(bertrand).
pn(gottlob).
pn(terry).
pn(bill).

tv --> [TV], {tv(TV)}.
tv(pleased).
tv(met).
tv(ran).
tv(wrote).

iv --> [IV], {iv(IV)}.
iv(halted).

%| ?- s([bertrand, wrote, a, program, that, halted], []).
%

4

%yes
%! ?-

Object Relative Clauses

To generalize this grammar to capture relative clauses along the lines suggested by GPSG we would want to add rules like the following:

$s([s, [NP, VP]], \text{Gap}) \rightarrow np(NP, \text{nogap}), vp(VP, \text{Gap})$.

—where Gap is a prolog variable that takes as value either nogap or something like gap(np), the prolog equivalent of /NP. That is what the homework asks you to do.

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What you have to do

Do the following exercises, testing them on the sentences on the web page and below:

1. Make the program produce parse trees for the whole grammar, using list structures to represent trees as in the program for homework 1. (20%)
2. The program only captures (trivially) *subject* extraction. Extend the grammar to deal with object- and other complement- relatives, along the lines discussed in the lecture. *Hint: you can do this much as you did Number agreement, using a variable Gap to represent the GPSG slash, and the value nogap to represent an unslashed category, while the values gap(np), gap(pp) etc. represent /NP, /PP etc.* (50%)
3. Add rules and lexical entries for sentential complements **with and without complementiser that**, allowing verbphrases like *thought that Bertrand wrote Principia*, and relative clauses like *the book (that) Bertrand thought that Gottlob wrote*. (20%)

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4. Make sure that your program does *not* accept relative clauses like **the professor that Bertrand thought that wrote Begriffsschrift* (This is one of Ross's constraints, sometimes called the **Left Branch Condition** or **Fixed Subject Constraint**. Tell us why it holds in your DCG. Could it *not* hold?) (10%)

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The Test Sentences

Sentences to run your DCG on. In each case, check for multiple analyses and justify their presence or absence: Hand in a modified commented program and commented output. **30% of the above grades will be reserved for intelligible presentation of your program and its workings, and anything that goes beyond the extensions asked for.**

%Problem 1.

a program that pleased bertrand halted

%Problem 2.

a program that bertrand wrote halted

%Problem 3.

a program that bertrand thought that gottlob wrote pleased terry

%Problem 4.

gottlob met the professor that terry thought wrote principia

%Problem 5. Make sure your program still does not accept the following:

*a program that gottlob met terry halted

*gottlob met the professor that terry thought that wrote principia