

## LCTG—ASSIGNMENT 2

### DCGs and The Syntax of Relative Clauses due Oct 26th 2007, in class

The assignment asks you to extend a simple DCG-based Prolog program to accommodate a number of constructions, including relative clauses, drawing on notes 3 on GPSG.

Hand in a listing of all of the code, including comments, and the results, *in class*. Late homeworks must be arranged with us in advance for a definite date, and should be handed in *direct to the TA*.

The necessary programming techniques are covered in *Prolog for Natural Language Understanding* and/or *A Gentle Introductory Course on Prolog for Natural Language Processing*, both available on the class page, and were mostly used in the last homework.

## 1 Exercises

Here is a program to be found on the web page under Homework 2 as “program,” which is adapted from the program 3.12 in Ch. 3 of Pereira and Shieber:

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%
%%   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.

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).
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], []).
%
%yes
%! ?-

```

## 2 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%)
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%)

### 3 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