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## Exercise Sheet No 8

June 14, 2002

Deadline: June 26, 2002, before the lecture

**1 bonus point**

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### Exercise 8.1

Consider the following Prolog program:

```
p(a,b). p(a,a). p(a,c). p(d,b).  
q(b). q(c).  
s(X) :- p(X,Y),q(Y).
```

1. What answers to `:- s(X).` will Prolog give? Construct the SLD-tree. (2 points)
2. What answers would be produced if the clause for `s/1` was changed by inserting “cut” in the middle, as follows?

```
s(X) :- p(X,Y),!,q(Y).
```

Indicate the branches pruned in the SLD-tree. (2 points)

### Exercise 8.2

(6 points)

Consider directed graphs having a finite set of vertices. Define the predicate `path(A,B,G,P)` so that it is true if `P` is an *acyclic* path between `A` and `B` in the graph `G`.

### Exercise 8.3

(5 points)

Consider the following simple DCG.

```
s --> np, vp.  
np --> det, n.  
vp --> v, np.  
vp --> v.  
det --> [the].  
det --> [a].  
n --> [woman].  
n --> [man].  
v --> [shoots].
```

Suppose we add the noun `men` (which is plural) and the verb `shoot`. Then we would want a DCG which says that: “The men shoot” and “The man shoots” are accepted, but “The

men shoots” and “The man shoot” are *not* accepted. Change the DCG so that it works this way. Use an extra argument to cope with the singular plural distinction. Furthermore, change the DCG in such a way that it handles correctly the past tense of the verb.

#### Exercise 8.4

(5 points)

This exercise concerns a language<sup>1</sup> called *Buffalo*<sup>n</sup>, which is very much like English except that the only word in its lexicon is *buffalo*. Here are two sentences from the language:

- Buffalo buffalo buffalo Buffalo buffalo.
- Buffalo Buffalo buffalo buffalo buffalo Buffalo buffalo.

In case you do not believe these are sentences, here are two English sentences with corresponding syntactic structure:

- Dallas cattle bewilder Denver cattle.
- Chefs London critics admire cook Freen food.

Write a grammar for *Buffalo*<sup>n</sup>. The lexical categories are adjective, noun, and (transitive verb), and there should be one grammar rule for sentence, one for verb phrase, and three rules for noun phrase: raw noun, adjective modifier, and reduced relative clause (i.e. a relative clause without the word “that”). Tabulate the number of possible parses for *Buffalo*<sup>n</sup> for *n* up to 10.

#### Exercise 8.Fun

(:-) points)

Nowadays, there are some NLP systems which automatically translate between different languages. One such system is BabelFish (<http://babelfish.altavista.com/>). Check the system by translating “*Deutschland wird Weltmeister.*” from German into English into Italy back to English back to German. What is BabelFish’s “German-German” translation?

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<sup>1</sup>The language is due to Barton, Berwick, and Ristad.