SS 08 May 20th, 2008

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# Grammatikformalismen für die Computerlinguistik

## Homework Assignment 4 Due: May 26th

**Exercise 1. [3 points]** Write up the following simple abstract feature structures, where $\mathbb{A}_1$, $\mathbb{A}_2$ and $\mathbb{A}_3$ are the examples from pages 55–56 of *Grammar Formalisms and Parsing*, by stating their basis set, their re-entrancy relation and their label function:

1. $\mathbb{A}_1$/LIKES-BEST (the LIKES-BEST reduct of $\mathbb{A}_1$),
2. $\mathbb{A}_2$/OWNER (the OWNER reduct of $\mathbb{A}_2$),
3. $\mathbb{A}_3$/LIKES-BEST (the LIKES-BEST reduct of $\mathbb{A}_3$.)

It might be useful to start with drawing the corresponding concrete feature structures in MoMo and then to think about their abstract counterparts.

**Exercise 2. [4 points]**

(a) We presuppose our familiar signature for lists and animals first introduced in Section 2.1.2, p. 26 (a MoMo file with the signature for this exercise is provided in `Section231`, `non-green-pets231.mmp`).[1] How many simple abstract feature structures satisfy the following description?

`pet, color:`$\sim$`green`.

Create a MoMo file with an interpretation window that contains (MoMo counterparts of) all these feature structures.

(b) How many simple abstract feature structures satisfy the following description?

`pet *> color:`$\sim$`green`.

Add three examples to your mmp file (in a second interpretation window).

**Exercise 3. [3 points]** In Section 1.3 of the HPSG book Pollard and Sag introduce a number of notational abbreviations for AVM descriptions. These abbreviations allow us to write AVM descriptions such as (a) $\mathrm{NP}[nom]_{[2nd,plur]}$ and (b) $\mathrm{NP}[acc]_{[2nd,fem]}$.

1. Write down the MoMo descriptions which correspond to the AVM descriptions abbreviated by (a) and (b).
2. Is there an abstract feature structure (under Pollard and Sag's signature) which satisfies both (a) and (b) simultaneously? Give reasons for your answer.

[1] or: `milca.sfs.uni-tuebingen.de/A4/Course/Momo/mmps/Section231/non-green-pets231.mmp`

3. Draw a concrete feature structure which satisfies (a). Try to keep it as small as possible, i.e., use as few nodes as possible in a well-formed concrete feature structure satisfying (a).

**Exercise 4.** [**Extra Credit: 2 points**] Assume our familiar signature for birds and pets, also used in Exercise 2 above. Call that signature $\Sigma$.
When we want to write a grammar based on $\Sigma$ which licenses green parrots (and no other animals or lists), we discover that the smallest model of abstract feature structures containing a green parrot also contains two other feature structures.

1. Write an *initial grammar* in a MoMo file which licenses a green parrot and only two other feature structures, but nothing else. Draw (the MoMo counterparts) of the three feature structures admitted by your grammar.

2. Why is having the two additional abstract feature structures (besides the one representing the green parrot) in the model of our grammar unavoidable?