

Frank Richter:
Grammatikformalismen für die Computerlinguistik

Aufgabenblatt 5

Exercise 1. [3 points] Let Σ again be our familiar initial signature of lists, birds, and pets. Take a simple abstract feature structure under Σ representing a singleton list with a green parrot on it. The file `quant-exercise-233.mmp` at <http://milca.sfs.uni-tuebingen.de/A4/Course/Momo/mmps/Section233/quant-exercise-233.mmp> contains the signature and descriptions.

Consider the following Σ descriptions and decide for each one whether our simple abstract feature structure under Σ satisfies it or is admitted by it. In the descriptions, \forall stands for the universal quantifier, and \exists for the existential quantifier (MoMo notation for quantifiers).

1. (a) $\exists X(\text{color}:\text{green})$.
 (b) $\exists X(\text{color}:\text{green})$.
2. (a) $\forall X((X:\text{parrot}) * \> (X:\text{color}:\text{green}))$.
 (b) $\exists X((X:\text{parrot}) * \> (X:\text{color}:\text{green}))$.
3. (a) $\forall X((X:\text{parrot}) * \> (\text{color}:\text{green}))$
 (b) $\forall X((X:\text{parrot}) * \> (\exists Y(Y:\text{color}:\text{yellow})))$.

Exercise 2. [3 + 3 points] In this exercise we want to think again about the meaning of grammars, i.e., the meaning that we ascribe to tuples consisting of a signature and a set of descriptions.

We are working with the signature that we have favored so far, the signature of Section 2.1.2 with lists, birds and pets. A prepared file can be downloaded from <http://milca.sfs.uni-tuebingen.de/A4/Course/Momo/mmps/Section241/birdsandpets-ex-241.mmp>.

First we will formulate a set of descriptions over that signature. Together they form our grammar of lists of birds and pets. We have the following principles:

1. Woodpeckers are red.
2. Canaries are yellow.
3. Parrots are green.
4. Pets are brown.
5. Non-empty lists contain one or two elements.
6. The first element of each non-empty list is a canary.

- (a) Write this grammar down in MoMo notation. You may do this immediately in MoMo by either creating description cards separately for each principle of grammar, or one card that contains all of them. If you do this exercise directly in MoMo, please indicate separately what *precisely* your grammar is (another way of saying the same is: say what your grammar consists of).
- (b) State the (complete!) set of feature structures admitted by the grammar. (To keep this readable, use pictures of concrete feature structures that correspond to the abstract feature structures admitted by the grammar according to our definitions. The easiest way to create and submit your solution is to use MoMo. With MoMo you can of course also check whether each of your feature structures is really admitted by your grammar. To check whether your feature structures model your grammar, all the descriptions of the grammar have to be on one single description card of MoMo.)

Exercise 3. [2 points] Take our familiar signature of lists, birds, and pets as given in the file

<http://milca.sfs.uni-tuebingen.de/A4/Course/Momo/mmps/Section253/birds-and-pets-exs253.mmp>.

In the *Options* menu of MoMo you find a menu item *Top sort for lists*. Enter the top sort of lists in our signature. For your work with that signature, MoMo now gives you the option of using interchangeably either the usual syntactic notation for lists or the notation with square brackets, [,].

Draw a list feature structure containing three animals. Then write two descriptions on separate description cards such that the feature structure satisfies them. Both descriptions should at least describe the color of each animal. The first description should use our normal syntax for the description of lists, the second one the new syntactic sugar with square brackets.