Seminar für Sprachwissenschaft
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Grammar Formalisms and Parsing

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1. **Definition of our current HPSG description language**
   The set of ***descriptions*** *(i.e. well-formed formulas of our logic) over a set $\mathcal{S}$ of sorts and a set $\mathcal{A}$ of attributes is the least set $\mathcal{D}$ such that:*

   - $\sigma \in \mathcal{D} \quad if \quad \sigma \in \mathcal{S}$
   - $\alpha : \phi \in \mathcal{D} \quad if \quad \alpha \in \mathcal{A} \quad and \quad \phi \in \mathcal{D}$
   - $\sim \phi,\ \phi \wedge \psi,\ \phi \vee \psi,\ \phi \rightarrow \psi,\ \phi \leftrightarrow \psi \in \mathcal{D} \qquad if \quad \phi, \psi \in \mathcal{D}$

   Parentheses are used to disambiguate particular descriptions. In the absence of parentheses, we use the following operator precedence conventions (in decreasing order):

   $: \qquad \sim \qquad \wedge \qquad \vee \qquad \rightarrow \qquad \leftrightarrow$

2. **Well-formedness of descriptions: Exercises**
   Given the signature in (3.), which ones of the following descriptions are well-formed descriptions of our formal language, and which ones are not (and why not)?

   (a) `nelist,head:(cat;three).`
   (b) `elist;(nelist,tail):elist.`
   (c) `~yellow;brown.`
   (d) `(~color):black.`
   (e) `woodpecker;legs.`
   (f) `(list,head:bird:legs:number,color:number);elist.`
   (g) `nelist,head:(pet:cat);dog.`
   (h) `head:(parrot,legs:two,color:(yellow;green,~brown)).`
   (i) `head:bird;pet *> color:color,legs:number.`
   (j) `color:red;legs:three <*> ~(bird),green,two.`
   (k) `head,tail *> nelist.`
   (l) `(head:green,color:one);(head:cat,color:cat).`
   (m) `animal:pet:(cat;dog).`
   (n) `~elist <*> nelist:(first,rest).`

(o) `nelist,head:legs:(two;four),color:(green;red;`
`yellow;brown),tail:nelist,head:canary,legs:two,color:yellow,tail:elist.`

3. **Signature**

```
bot
  list
     nelist head:animal tail:list
     elist
  animal legs:number color:color
     bird legs:two
       parrot
       woodpecker
       canary
     pet legs:four
       cat
       dog
  number
     one
     two
     three
     four
  color
     green
     red
     yellow
     brown
.
```

4. **Formalization of descriptions: Exercises**
Given the signature in (3.), formalize the following descriptions using MoMo notation.

(a) Parrots are green, or red, or yellow.
(b) Lists are brown.
(c) If something is a pet, then it has four legs and it is not green.
(d) If something is a list, then it is an empty and non-empty list.
(e) Something is a list if and only if it has a head and a tail.
(f) No animals have one leg and are green.
(g) The first element of a list is not brown, and the third one has two legs.
(h) The second element of a list does not have six legs.
(i) Everything.
(j) Nothing.

5. **Interpretation of descriptions: exercises**
Using MoMo, paint configurations of objects that satisfy each one of the descriptions in (4.).