Practical Grammar Engineering using HPSG
Exercises day 1: part b

Goals:

1. Learn about typed feature structures and unification.
2. Expand the grammar to capture agreement constraints.
3. Expand the grammar to provide an analysis of modification.

Exercises:

1. Bring up the LKB and load grammar2:
   (a) Check out a copy of grammar2 by typing `cvs checkout grammar2` in an xterm window.
   (b) Start emacs and in the Emacs window:
   `<Esc> x lkb`
   (c) Load the grammar by selecting Load / Complete grammar in the "Lkb Top" window, then double-clicking on the directory "grammar2" and on the file "script".
2. Test the grammar by parsing the sentence *The cat gave that dog to those dogs.*
3. Extend the grammar to capture subject-verb agreement, admitting e.g. *The dog barks.* but not **The dogs barks.*. We will introduce constraints on the SPR attribute of lexical entries requiring that the person-number properties match between head and specifier. Rather than using separate features for number and person, we will use types that combine both properties, allowing a more direct encoding of English inflectional morphology.
   (a) Add this small type hierarchy to the file types.tdl, making *pernum* a subtype of *feat-struc*:
   ```
          pernum
          /    \
   3sing   non-3sing
   ```
   (b) Also in the file types.tdl, add the feature AGR to the type *pos*, with its value constrained to be of the type *pernum* that you just added.
   (c) In the file lexicon.tdl, add the appropriate constraint to each verb, restricting the AGR value of its SPR.
   (d) Also in the file lexicon.tdl, add the correct AGR value to each noun.
   (e) Save your changes, then reload the grammar, apply the batch test with the file "agr.items", examine your results, and make any necessary corrections.
4. Extend your analysis to cope with determiner-noun agreement, admitting e.g. *These dogs bark.* but not *These dog barks.*.
   (a) In the file lexicon.tdl, modify each noun's lexical entry by adding the appropriate constraint on the AGR value of its SPR.
   (b) Also in lexicon.tdl, add the correct *agr* value to each determiner.
   (c) Check your revised grammar again using the file "agr.items", and make any necessary corrections.
   (d) Add some additional test examples to this file with varied combinations of mismatch in agreement among determiners, nouns, and verbs. Then run the batch test and examine the results.