

2011 Paper 9 Question 7

Natural Language Processing

- (a) Explain what is meant by *subsumption* and *unification* when applied to feature structures. [5 marks]
- (b) The feature structures below represent a grammar rule and two lexical entries. The rule is intended to allow for adjectival and adverbial modification in phrases such as *big dog* and *suddenly jumps*. Give lexical entries for *big* and *suddenly* and show how the rule applies when these phrases are parsed. [7 marks]

$$\text{modifier-modified rule: } \left[\begin{array}{l} \text{MOTHER } \boxed{1} \\ \text{DTR1 } \left[\text{MOD } \boxed{1} \right] \\ \text{DTR2 } \boxed{1} \left[\text{OBJ } \mathbf{filled} \right] \end{array} \right]$$

$$\text{dog: } \left[\begin{array}{l} \text{HEAD } \left[\text{CAT } \mathbf{noun} \right. \\ \left. \text{AGR } \mathbf{sg} \right] \\ \text{OBJ } \mathbf{filled} \\ \text{SUBJ } \mathbf{filled} \\ \text{MOD } \mathbf{filled} \end{array} \right]$$

$$\text{jumps: } \left[\begin{array}{l} \text{HEAD } \left[\text{CAT } \mathbf{verb} \right. \\ \left. \text{AGR } \mathbf{sg} \right] \\ \text{OBJ } \mathbf{filled} \\ \text{SUBJ } \left[\text{HEAD } \left[\text{CAT } \mathbf{noun} \right] \right] \\ \text{MOD } \mathbf{filled} \end{array} \right]$$

- (c) In the verb-object rule discussed in the lectures, the value of the HEAD feature of the mother is reentrant with the HEAD feature of DTR1, MOTHER SUBJ is reentrant with DTR1 SUBJ, and DTR1 OBJ is reentrant with DTR2. Explain why the pattern of reentrancies in the modifier-modified rule differs from that of the verb-object rule. [6 marks]
- (d) Why is the value of DTR2 OBJ specified as **filled** in the modifier-modified rule? [2 marks]