Tree Adjoining Grammars
Midterm Exam

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30.11.2017

Exercise 1 (From CFG to LTAG, 4 + 4 pts)

(1)
a. The guests snore.
b. Tom enjoys the movie.
*c. * Tom snore the movie.*
*d. * The guests enjoys.*

1. *Specify a CFG (excluding features) that licenses the sentences in (1-a) and (1-b).*
2. *Specify an LTAG along the lines of the discussed design principles that generates the sentences in (1-a) and (1-b). Add the features that are necessary to rule out the sentences in (1-c) and (1-d).*

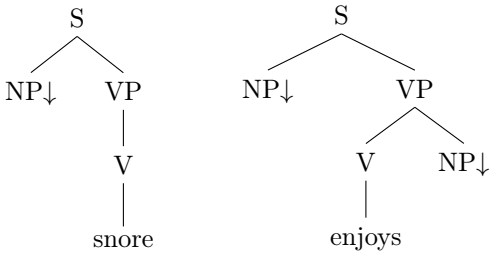
Solution:

1.

S	→	NP	VP
NP	→	Det	NP
VP	→	V	NP
VP	→	V	
NP	→	N	

NP	→	Tom
N	→	guests
N	→	movie
Det	→	the
V	→	snore
V	→	enjoys

2.

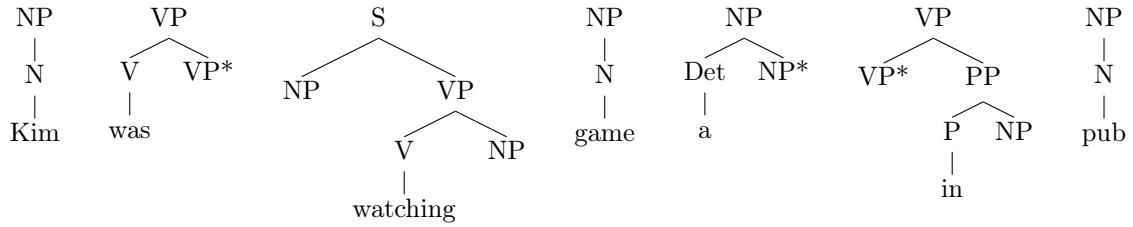


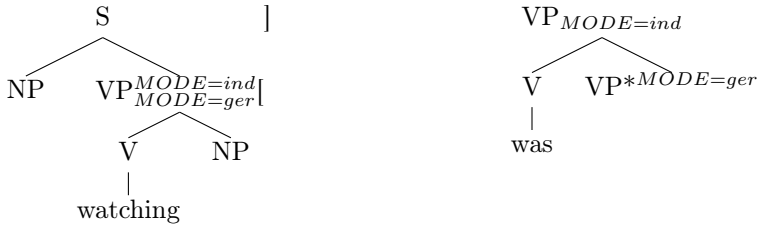
Exercise 2 (Adjunction and Features, 5 + 3 pts)

(2)
a. Kim was watching a game in a pub.
*b. *Kim watching a game in a pub.*
*c. *Kim was was watching a game in a pub.*

1. *Specify the LTAG that generates the sentence in (2-a) with separate elementary trees for all lexical elements in the sentence (no features).*
2. *Specify the* Mode *features for the verbal elementary trees and show how they exclude the sentences in (2-b) and (2-c).*

Solution:

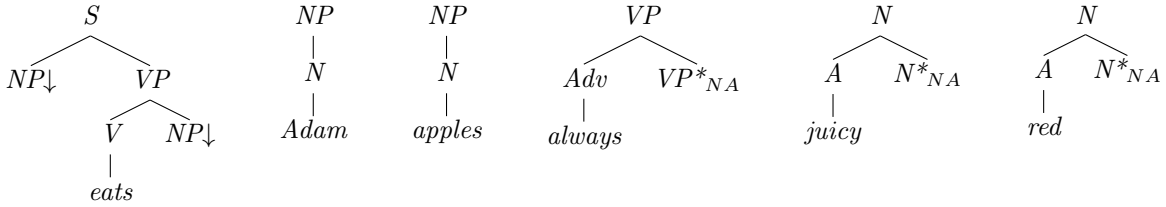
1. 

2. 

Exercise 3 (Derived Tree and Derivation Tree, 2 + 4 pts)

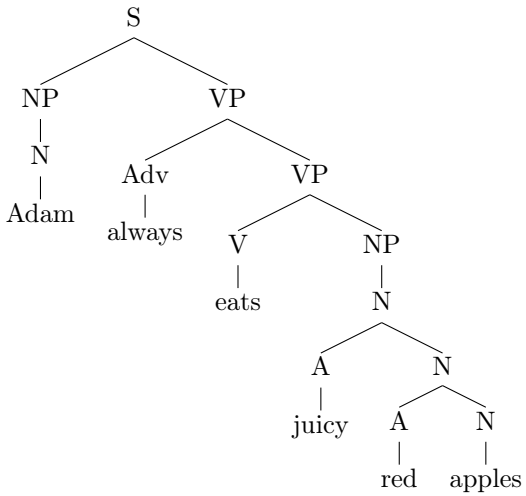
(3) Adam always eats juicy red apples

The elementary trees needed for deriving (3) are the following:

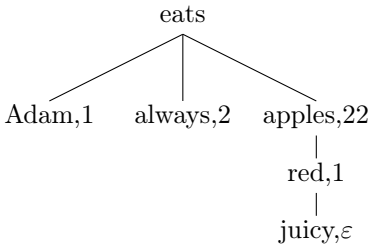


1. *Give the derived tree one obtains for (3) using these trees.*
2. *Give the corresponding derivation tree. You can use the lexical items as names of elementary trees (i.e., as node labels in the derivation tree).*

Solution

1. 

2.



Exercise 4 (Raising & Control, 4 + 6 pts)

(4)
a. The riddle proved to be too difficult.
b. Tom managed to stay awake.
c. Paul wants Kim to help with the housework.
d. Carl struggled to find the way home.
e. The museum seemed to be closed that day.
f. The militia plotted to takeover the government.
g. Paul expects Kim to be quiet.
h. The emperor forced the citizens to serve in the military.

(5) John persuades the children to eat the vegetables.

1. *Classify the examples in (4) as to whether they are cases of object/subject control or object/subject raising. Give a short explanation for your decision.*

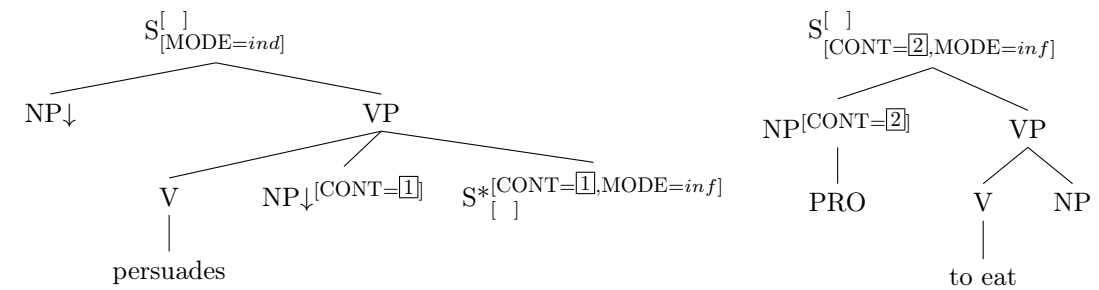
2. *(a) Specify the elementary trees for "persuades" and "to-eat" that are necesssary to derive the sentence in (5) including the features* CONT *and* MODE*.*

   (b) Give the result of adjoining the "persuades" tree into the "to-eat" tree while showing explicitly which top and bottom features are unified during adjunction.

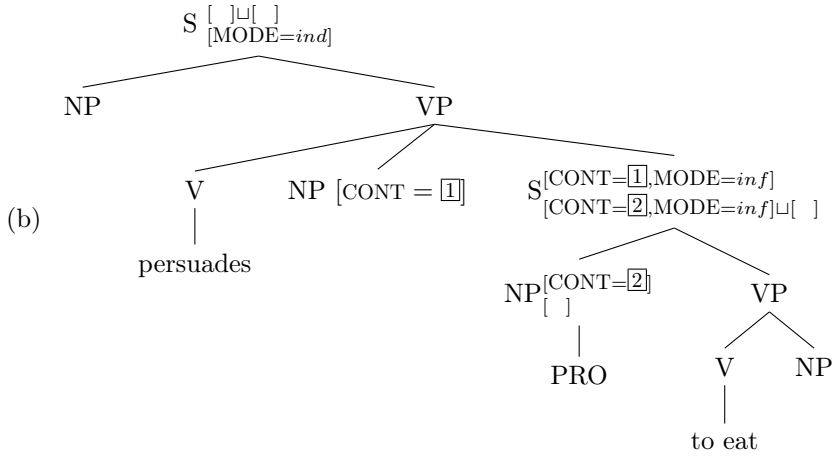
Solution:

1.
(4-a) subject raising
(4-b) subject control
(4-c) object raising
(4-d) subject control
(4-e) subject raising
(4-f) subject control
(4-g) object raising
(4-h) object control

2. (a)



(b)



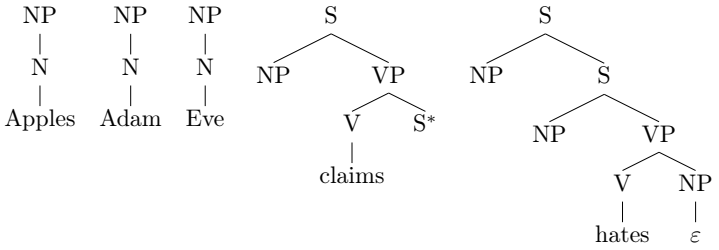
Exercise 5 (Extraction, 9 pts)

(6) *a. Apples Adam claims Eve hates.*
*b. *Apples does Eve hate.*

1. *Give the elementary trees that the XTAG grammar would use for deriving (6-a), without feature structures.*
2. *Now give the elementary trees for "does" and "hate" used to derive (6-b) including the features* INV, INVLINK *and* WH *and explain how these features, via unification, take care of the ungrammaticality of (6-b).*

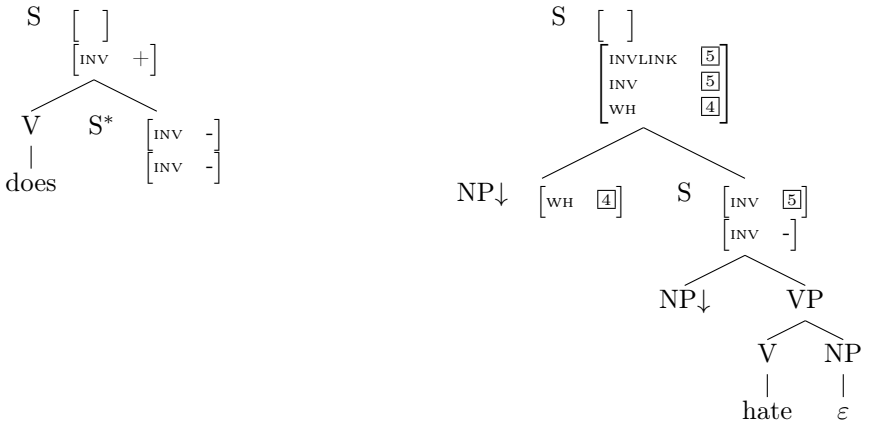
Solution:

1.



(4 pts)

2.



The tree of the auxiliary *does* adjoins to the lower S node in the *hate* tree. Thereby, because of unification, + is assigned to 5. Substitution of *apples* into the highest NP substitution slot means that we obtain the value - for 4.

Consequently, in the root S node of the derived tree, we have INV = INVLINK = + and WH = -.

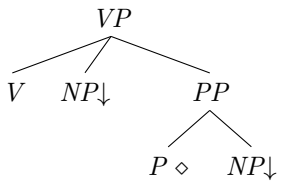
Finally, in the final derived tree, XTAG requires unification of INVLINK and WH in the root node, which fails due to the different values.

(5 pts)

Exercise 6 (XMG: Minimal Models & Class Descriptions, 5 + 4 pts)

(7)
```
?A ->+ ?B; ?A ->+ ?C; ?A ->+ ?D; ?B » ?C; ?B »+ ?D
```

(8)

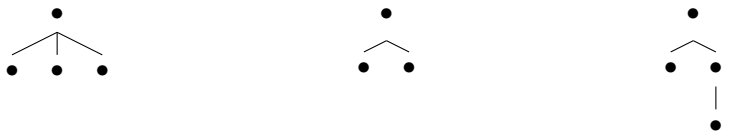


1. *Specify the minimal model that satifies the relations given in the tree description in (7).*
2. *Complete the XMG class description given in (9) so that it corresponds to the tree fragment given in (8). Make sure to properly introduce the relevant type values, nodes, dominance, and prescendence relations.*

(9)
```
type MARK = {...}
type CAT = {...}
property mark :  MARK
feature cat :  CAT

class ditrans
declare ...
{ <syn>{
...
}
}
```

Solution:

1. 

   (the third model can be obtained in two ways, either ?C dominates ?D or ?D dominates ?C)

2. ```
   type MARK = {subst, anchor}
   type CAT = {np,v,vp,pp,p}
   property mark :  MARK
   feature cat :  CAT

   class ditrans
   declare ?VP ?V ?NP1 ?PP ?P ?NP2
   { <syn>{
   node ?VP [cat = vp];
   node ?V [cat= v];
   node ?NP1 (mark = subst) [cat = np];
   ```
   ```

```
node ?PP [cat = pp];
node ?P (mark = anchor) [cat = p];
node ?NP2 (mark = subst) [cat = np];
?VP -> ?V; ?VP -> ?NP1; ?VP -> ?PP; ?PP -> ?P; ?PP -> ?NP2; ?V » ?NP1; ?NP1 »
?PP; ?P » ?NP2
}
}
```