Homework 1
11-722: Grammar Formalisms
Due February 28, 2008

1 Untangling Language Knots

Assume the following building blocks: core sentences, various transitivity alternations, various long distance dependencies, and various embedding operations.

1.1 Core sentences

(1)
a. The doctor examined Sam.
b. The doctor is examining Sam.
c. The doctor has examined Sam.
d. The teacher gave a book to Sam.
e. The teacher is giving a book to Sam.
f. The teacher has given a book to Sam.
g. The girl saw Sam.
h. The girl has seen Sam.
i. The girl sees Sam.
j. Sam loaded the truck with hay.
k. Sam is loading hay onto the truck.
l. Sam has loaded hay onto the truck.
m. Sam smeared the wall with paint.
n. Sam is smearing the wall with paint
o. Sam has smeared the wall with paint.
p. There is a book on the table.
q. There was a book on the table.

1.2 Transitivity Alternations

- **Passive:**
  - Identify the direct object: This will be the noun phrase immediately to the right of the verb, if the verb is transitive. Note that direct object is not equivalent to patient. In *The teacher gave a book to Sam*, *a book* is the direct object. In *The teacher gave Sam a book*, *Sam* is the direct object. The direct object is defined, somewhat circularly, as the NP that becomes the subject of the passive: *A book was given to Sam* or *Sam was given a book*.
  - Put the direct object in subject position.
  - Optionally, put the agent noun phrase (the original subject) in a prepositional phrase with the preposition *by*.
  - Finally, change the verb. This is a bit complicated, and is technically not really part of the passive rule. The verb has to become a past participle (*examined, given, seen, loaded, smeared*). Also, an auxiliary verb must be added: *be* or *get*. If there is already an auxiliary verb, put the old one first, and put the new one between the old one and the main verb.

    (2) a. The wall is being/getting smeared with paint.
    b. The wall has been/gotten smeared with paint.

- **Dative Shift:** This alternation applies to verbs like *give* that have an agent, patient, and recipient. The recipient loses its preposition and moves to a position immediately after the verb. We say that it has become the direct object because it is not eligible to become the subject of the passive. The patient is placed after the recipient.

  (3) The teacher gave Sam a book.

- **Spray-load:** This alternation applies to verbs that have a patient and either a container or surface that the patient is moved to. The container or surface moves to a position immediately to the right of the verb, and loses its preposition. We say that it has become the direct object because it is now eligible to become the subject of the passive. The patient argument appears after the container or surface and has a preposition.

  (4) a. Sam sprayed the wall with paint.
  b. Sam loaded the truch with hay.

1.3 Long Distance Dependencies

- **Wh-question:** Identify one noun phrase and replace it with a wh-question word or phrase like *who* or *what* or *which book*. Move the wh-phrase to the front of the sentence. The position that it vacated is called the gap. Now adjust the auxiliary verbs. If the wh-phrase moved from subject position of the main clause, no adjustments are necessary. If it moved from any other position, invert the subject and the auxiliary verb. If there is no auxiliary verb, insert a form of *do* in the same tense as the original verb and change the original verb to an infinitive.

  (5) a. Which book did the teacher give to Sam?
  b. Who is examining Sam?
  c. Who is the doctor examining?

- **It-cleft:** Take one NP from the sentence, leaving a gap in the position it vacated. Put the sentence in this pattern: *It is/was NP that/who S-with-gap*.

  (6) a. It was Sue who saw Sam.
  b. It was *the wall* that Sam smeared with paint.

- **Relative clause:** Take two sentences that have a common noun phrase such as *The doctor examined Sam* and *The doctor smeared the wall with paint.* Choose one clause as the main clause.

  (7) **The doctor** examined Sam.

  Find the shared noun phrase *the doctor* in the main clause. Note that this NP does not have to be the subject. It can be the object or oblique. Put a relativizer (*that, who, which, or null*) after the NP in the main clause.

  (8) **The doctor who ...** examined Sam.

  Now construct the embedded clause. Delete the noun phrase that the two clauses share. Note that this NP does not need to be the subject as it is in this example.

  (9) **...** smeared the wall with paint.

  Put the embedded clause after the relativizer in the NP of the main clause.

  (10) The doctor who smeared the wall with paint examined Sam.

1.4 Embedding Operations

- It seems that S.
- NP SEEM to VP-infinitive
- That S is likely
- It is likely that S
- NP BE likely to VP-infinitive
- NP TRY to VP-infinitive
- NP believe that S
- NP believe NP to VP-infinitive (note that this can undergo passivization)
- NP persuade NP that S
- NP persuade NP to VP-infinitive
- There BE NP VP-pastparticiple: The input to this rule is a passive without its extra auxiliary verb. Also, NP must be indefinite (can't have *the* or be a proper noun).

  (11) a. A boy seen by the doctor. (passive without auxiliary)
  b. There was a boy seen by the doctor.

- There BE NP VP-presentparticiple: the input is a progressive without its auxiliary. Also, NP must be indefinite (can't have *the* or be a proper noun).

  (12)
  a. A doctor examining Sam. (progressive without auxiliary)
  b. There is a doctor examining Sam.

1.5 Untangle the knots

Write derivations for the following sentences using the operations described above. You will first have to figure out the kernel sentence or sentences. Then list the operations in the order in which they apply. Do you notice anything about the order of operations?

(13) a. The doctor who examined Sam was seen by the teacher.

b. Sam saw the wall that the doctor smeared with paint.

c. Sam saw the paint that the doctor smeared on the wall.

d. It was the wall that Sam smeared with paint that the teacher saw.

e. There was a student given a book by the teacher.

f. There seemed to be a truck loaded with hay.

g. Sam is likely to be persuaded to be examined by the doctor

h. It is likely that the doctor will examine the boy who was given a book by the teacher.

1.6 Make up sentences

Make up five new sentences, as complicated as you like using the operations above. You should identify the kernel sentence or sentences that you started with, but you don't need to write the derivation. I think (hope?) I'll be able to tell if there is a valid derivation.

1.7 Extra credit: five percent

These sentences all have the same structure. How would you derive them?

(14) a. The windows the man you recommended washed are clean.

b. The rat the cat the dog chased bit ate the cheese.

c. Oysters oysters oysters eat eat eat.

2 Do the attached problem from last semester's Grammars and Lexicons exam

3 Find things in the Penn TreeBank or Charniak parsed corpus

Find one example of each long distance dependency and each embedding type from Section 1 of this problem set, but don't use the examples from Section 2 of this problem set. You can find the examples in the treebank or in a corpus that has been parsed with the Charniak parser. Hand in the tree for each example that you find. There are several ways you can do this.

- Open up the treebank and read it.
- Use TGREP to search the treebank.
- Go to the web page of Linguist's Search Engine and type in an example of what you want to find. Edit the tree to remove irrelevant lexical items.