Homework Assignment 8
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Due on Dec. 4, 2002 by 1pm

1 Exercise 1

The following English sentences illustrate a long distance dependency. Based on this dependency, construct a detailed proof showing that English is not a regular language (cf. Relative Clause proof in class). If the proof relies on the claim that some other language is regular or not regular, prove that claim too.

(1) a. John and Mary like to eat and sleep respectively.
    b. John, Mary, and Sue like to eat, sleep and dance respectively.
    c. John, Mary, Sue, and Bob like to eat, sleep, dance and cook respectively.
    d. Etc.

2 Exercise 2

The context-free grammar G1 has the following rules:

S → NP VP
NP → Det N’
N’ → Adj* N’ PP*
N’ → N’ Conj N’
N’ → N
VP → V\textsubscript{trans} NP PP*
VP → V\textsubscript{intrans} PP*
PP → P NP
Det → a | the | some | their | her | my
N → men | women | woman | friend(s) | Barcelona | Thursday | opera | man | town
Adj → good | best | tall | brunette | former | old
V\textsubscript{trans} → married | like(s/d) | help(ed) | saw
V\textsubscript{intrans} → run
P → with | from | on
Conj → and

i. For each of the following sentences, specify whether this grammar generates a tree. If it does, draw the tree. If it doesn’t, say how you would amend the grammar so that it will generate a tree for that sentence.

The tall man run on Thursday.
Good friends help their friends.
The man from Barcelona saw the woman and helped her friend.

ii. Take the original G1 grammar above. How many times is the following sentence ambiguous according to G1? Draw all the trees that G1 generates for the sentence and explain their corresponding meaning (unambiguously) in your own words.

Some old men and women from the town liked the opera.

iii. Give all the possible trees that G1 generates for the following sentence. But note that the sentence itself is not ambiguous. Give semantic reasons as to which tree is the right one for representing the unique meaning of the sentence.

The tall brunette woman married my former best friend.

3 Exercisce 3: Defining connectives

Give a truth table for the English expression *unless*. E.g., Unless it rains, I will go to the party.

<table>
<thead>
<tr>
<th>φ</th>
<th>ψ</th>
<th>unless φ, ψ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>0</td>
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<td></td>
</tr>
</tbody>
</table>

4 Exerciese 4: Translation and inference

Translate the following paragraphs into Propositional Logic. For each of them, if it forms a valid argument, give a proof of validity by using exclusively the rules of inference in p. 117 and the equivalences in p. 110.

A. Tonia or Ramon (or both) will play soccer. Pat will play soccer only if she’s not injured. If Tonia plays, Pat will play. Pat is injured. Hence, Ramon will play.

B. I’ll come to the party if my car does not break down, and I won’t come otherwise. If I do not touch the wiring, my car will not break down. I have no intention to [both touch the wiring and clean the seats]. Unfortunately, I will clean the seats and dust off the trunk. Hence, I will come to the party.