

Computational Syntax

Exam, 1 June 2012 at 9:00-12:00

Folkets Hus, Olof Palmes plats 3, plan 3.

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Grading scale: Max = 60p, VG = 48p, G = 24p.

Aids: the book *Grammatical Framework* (Aarne Ranta, CSLI 2011); markings in the book allowed.

1. Write a BNF (= context-free) grammar that covers the following fragment of English:

- **sentences:** with a subject noun phrase and a verb phrase, e.g. *I love you*
- **verb phrases:** with a two-place verb and an object noun phrase, which is either positive (e.g. *love you*) or negated (e.g. *don't love you*)
- **subject noun phrases:** *I* and *you*
- **object noun phrases:** *me* and *you*
- **two-place verbs:** *love*, *see*

Notice that the lexicon is very small. But there must be separate categories for each of the five items listed above (sentences, etc). (10p)

Write all sentences recognized by your grammar. (2p)

Show the parse trees of *I love you* and *you don't see me* as analysed by your grammar. (3p)

2. Make the context-free grammar of Question 1 into a GF grammar with abstract and concrete syntax, and merging the subject and object noun phrase categories into one category, noun phrase. (10p)

Show the parse trees and abstract syntax trees of *I love you* and *you don't see me* as analysed by this GF grammar. (5p)

3. Using the same abstract syntax as in Question 2, add a Dutch concrete syntax, where the English utterances get their translations as follows:

<i>I love you</i>	<i>ik heb je lief</i>
<i>you love me</i>	<i>je hebt me lief</i>
<i>I don't love you</i>	<i>ik heb je niet lief</i>
<i>you don't love me</i>	<i>je hebt me niet lief</i>
<i>I see you</i>	<i>ik zie je</i>
<i>you see me</i>	<i>je ziet me</i>
<i>I don't see you</i>	<i>ik zie je niet</i>
<i>you don't see me</i>	<i>je ziet me niet</i>

Thus the form of the verb depends on the subject by agreement, and the verb can be discontinuous (*hebt...lief*). (10p)

Show the abstract syntax tree, parse trees, and word alignment for *you don't love me* and *je hebt me niet lief*. (5p)

4. Write a GF grammar for the language

$$a^m b^n c^m d^n$$

that is, for the set of strings with some number m of a 's followed by a number n of b 's followed by m c 's and n d 's. Examples are

the empty string
a a b c c d
a a b b b c c d d d.

(This is an abstract model for certain Swiss German constructions.) (10p)

Show the abstract syntax tree and the parse tree of the string

a a b b b c c d d d. (5p)