

3.1 [*This is exercise 5 on the second exercise sheet*] The lecture slides give lambda terms for some noun phrases such as “every student” or “Bill.” Give corresponding lambda terms for the following:

- (a) exactly one student
- (b) every student except Mary
- (c) only Bill

Give also representations for the complex determiner “exactly one.”

3.2 [*This is exercise 6 on the second exercise sheet*] Extend the sample grammar from the lecture with a syntax rule and a corresponding translation rule for (prenominal) adjectives. Compute a semantic representation for the sentence “a blond student works.” Beta-Reduce the result as far as possible.

3.3 Try to extend the syntax rules and the corresponding semantics construction rules from the lecture (slide 34) so that nouns can be modified by a prepositional phrase.

- (a) Give a complex λ -term for the preposition “at”. The representation should involve a constant at' of type $\langle e, \langle e, t \rangle \rangle$.

Hint 1: The λ -term is similar to the λ -term for transitive verbs.

Hint 2: Assume that the semantic representation for the phrase “student at a university” is $\lambda x(\text{student}'(x) \wedge \exists y(\text{university}'(y) \wedge at'(y)(x)))$.

- (b) Give semantic construction rules for the syntax rules “ $N \rightarrow N PP$ ” and “ $PP \rightarrow P NP$ ”

3.4 Compute a semantic representation for the sentence “every student at a university reads a book” using the extended syntax-semantics interface from 3.3. Beta-Reduce the result as far as possible.

You may assume $\lambda x(\text{student}'(x) \wedge \exists y(\text{university}'(y) \wedge at'(y)(x)))$ as the translation of “student at a university” if you have any troubles with exercise 3.3.

To be turned in Tuesday 2010-05-11.