

1 Interpreting type theory

Compute the truth conditions of the following expressions (with respect to M and g). You may abbreviate intermediate results appropriately, as long as you show the most important interpretation steps. $\text{student}'$ and work' are constants of type $\langle e, t \rangle$, and p^* and j^* are constant of type e . Don't β -reduce anything for now!

1. $\lambda F \lambda G \neg \exists x (F(x) \wedge G(x))(\text{student}')(\text{work}')$
 “No student works.”
2. $\lambda F (F(j^*) \vee F(p^*))(\text{work}')$
 “Either John or Peter works.”

Then β -reduce the terms into a formula of first-order predicate logic (FOL) and compute its truth conditions as a FOL formula. Compare the two interpretations.

2 Noun phrases as λ -expressions

In the lecture slides, lambda terms for some noun phrases are given (“some student”, “every student”, “John”).

Give corresponding lambda terms for the following:

- (a) exactly one student
- (b) at least two students
- (c) every student except Bill
- (d) only Bill
- (e) Bill, but not Mary

Give also representations for the complex determiners “exactly one” and “at least two”.

3 Semantics Construction

For each of the following sentences,

- first, determine the type of all their constituent words,
- then give semantic representations for all words word ,
- combine them compositionally into a representation for the whole sentence,
- and finally β -reduce your results as far as possible (giving also intermediate representations).

- (a) Some blond students work hard.
- (b) John believes that every professor is a criminal.
- (c) Some students don't drink and drive.

Translate the underlined words into appropriate λ -expressions.

Assume trivial atomic representations (like student') for the non-underlined lexical material.

Treat "is a" and "don't" as single words, respectively.

Further assume that "that" and "is a" are semantically empty and translate into identity functions " $\lambda v.v$ " of appropriate type.

Translate "blond" into a lambda term that corresponds to the meaning postulate/axiom for intersective adjectives.

The translation of "don't" should be a lambda term containing negation.

Give a representation to the "and" in sentence (c) which allows to directly combine it with "drink" and "drive" by functional application.

To be turned in by Thursday, 2009-07-02