1 Prepositions

In sentences like the following, prepositional phrases act as intersective noun modifiers in a similar way to intersective adjectives:

- (1) [NP Every [N student [PP at [NP a university]]]] is-intelligent.
- (a) Find an appropriate semantic representation for the preposition "at" in this sentence that is consistent with our analysis of noun phrases. The representation should involve a constant at* of type (e, (e, t)). Hint: Compare the way in which the preposition connects the noun phrase and the noun with the way that a transitive verb connects two noun-phrases.
- (b) Use your representation to construct a semantic representation for (1) by using the semantic construction rules from the lecture, and β-reduce the result as usual.

2 Nested Cooper Storage

Consider the following sentence.

(2) [NP Every [N student [PP at [NP a university]]]] presents a paper.

This sentence is scopally ambiguous (it has five distinct readings).

Derive two readings of the sentence using the Nested Cooper Storage technique from the lecture, and β -reduce the result as usual; you may ignore those parts of the derivation that are not needed for the computation of the two readings.

- (a) One reading in which the quantifier that corresponds to "every student" takes scope over "a university."
- (b) Another reading in which "a university" takes scope over "every student."

Hints: If you have problems in finding an appropriate representation for the preposition "at," you might represent it by the constant at' of type $\langle \langle \langle e, t \rangle, t \rangle, \langle \langle e, t \rangle, \langle e, t \rangle \rangle \rangle$.

You might also use abbreviations for complex λ -expressions during the derivation – for instance *every-student'* for $\lambda P \forall x(student'(x) \rightarrow P(x))$; in this case, replace the abbreviations by the λ -terms they stand for in a final step.

3 Scope Islands

One limitation of Nested Cooper Storage is that it is insensitive towards socalled *scope islands*: It will derive three different readings for the sentence

(3) Some professors believe-that every student is-intelligent

whereas the sentence arguably is not ambiguous.

- (a) Pick a formula that is not a good semantic representation for this sentence, and show how to derive it with Nested Cooper Storage. Analyse "believe-that" as a sentence-embedding verb whose semantic representation has type (t, (e, t)), and "some" simply as an existential quantifier (i.e., λPλQ∃x(P(x) ∧ Q(x))).
- (b) Fix the problem by modifying the rules of Nested Cooper Storage, in such a way that the quantifier store must be emptied at each sentence node. Then show that your analysis in (a) would not be possible with your modified rule system.

To be turned in by Thursday, May 31, 11:15