

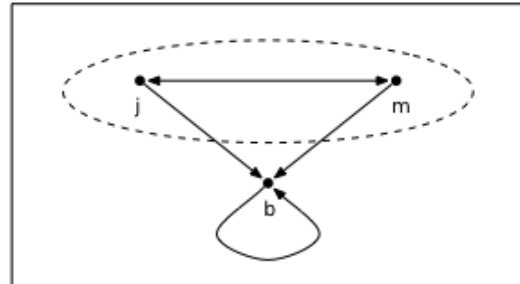
## Semantic Theory 2014 – Exercise sheet 3

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Exercises are due on Tuesday, May 13, 10:15 a.m.

### 3.1 Type-Theoretic Model Structure

The diagram graphically represents a model structure  $M = \langle U, V \rangle$  with a universe consisting of John, Bill, and Mary. (We take  $j, b, m$  to be the entities/persons in the model structure,  $j^*, b^*, m^*$  the individual constants referring to the respective entities, and  $\text{john}', \text{bill}', \text{mary}'$  the type-raised proper names. The dashed line indicates the set of students, the arrow the helping relation.



Give the interpretation function  $V_M$  of the following constants by explicitly specifying the mappings.

- (a)  $j^* \in \text{CON}_e$
- (b)  $\text{student}' \in \text{CON}_{\langle e, t \rangle}$
- (c)  $\text{help}' \in \text{CON}_{\langle e, \langle e, t \rangle \rangle}$
- (d)  $\text{john}' \in \text{CON}_{\langle \langle e, t \rangle, t \rangle}$
- (e)  $\text{everyone}' \in \text{CON}_{\langle \langle e, t \rangle, t \rangle}$

Give the denotations for (b), (c), and (d) also in set notation.

Hint: The domains of the higher-order functions tend to become large. You may skip the explicit specification for some of the argument-value pairs of (d) and (e), and instead just point out the pattern for the remaining cases.

### 3.2 Type-theoretic interpretation

Compute the denotations of the following type-theoretic formulas in model structure  $M$  from Exercise 3.1:

- (a)  $\text{john}'(\text{student}')$
- (b)  $\forall x(\text{help}'(x)(x) \rightarrow \neg \text{student}'(x))$
- (c)  $\text{someone}'(\text{help}'(j^*))$

Compute the truth-conditions for the following type-theoretic formulas (taken from the slides of Lecture 3):

- (d)  $\exists G (\text{hair\_colour}'(G) \wedge G(b^*) \wedge G(j^*))$
- (e)  $\forall F \forall a (\text{sadist}(a) \wedge F(a) \rightarrow F(\text{santa}^*))$

### 3.3 Meaning postulates

(a) The interpretation function must observe the following constraint for type-raised proper names:

$$V_M(\text{john}') = \{S \subseteq U_M \mid j \in S\}, \text{ for some specific entity } j \in U_M$$

Express this constraint as a meaning postulate (Hint: make use of  $j^* \in \text{CON}_e$ ).

(b) An interesting sub-class of attributive adjectives are those ones denoting restrictive modifiers. In Lecture 5, you have seen a meaning postulate for the restrictive adjective *poor*. Try to formulate a meaning postulate that expresses the restrictiveness property of predicate modifiers in a general way. Use  $\text{RMOD} \in \text{CON}\langle\langle\langle e,t \rangle, \langle e,t \rangle \rangle, t \rangle$  as a constant expressing the higher-order predicate “is a restrictive modifier”, and give a type-logical definition (a meaning postulate in terms of a universal equivalence statement) for  $\text{RMOD}$ .

(c) For any restrictive predicate modifier (such as *poor*) the effect of applying the degree particle *very* is another predicate modifier (such as *very poor*), which is even more restrictive: *very poor piano-player* entails *poor piano-player*, which in turn entails *piano-player*. Formulate this semantic effect of *very* as a meaning postulate. Hint: The correct formula will be a universally quantified type-logical implication, with “ $\text{RMOD}$ ” occurring in the antecedent clause.

(b) and (c) are difficult. I do not expect everyone to come up with a correct solution, but try and comment!