Problem Set 8

Due April 4 before class. Submit on IVLE > Files > Student Submission > PS8.

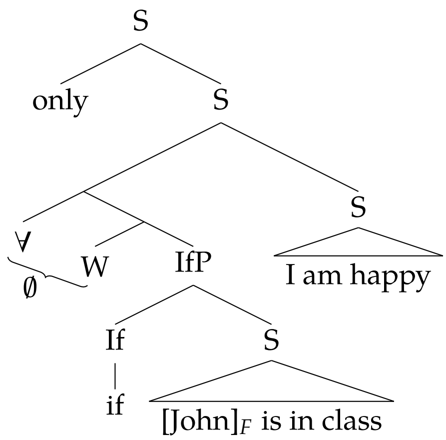
1. ***If* and *only if*:**

   When describing the logical equivalence of two truth conditions (or conditional truth values), we often say "if and only if." Intuitively, we say "p only if q" to mean $q \rightarrow p$.

   Let's see if we can get the meaning of *only if* compositionally. Consider (1).

   (1) I am happy only if [John]$_F$ is in class.

   Assume the following LF.[1]



   Compute the truth conditions for this structure. Give type, $[\![\cdot]\!]^o$ and $[\![\cdot]\!]^f$ denotations, and rules for each node. All the terminal nodes are below. Recall that if there is no focus in constituent α, $[\![\alpha]\!]^f = \left\{[\![\alpha]\!]^o\right\}$. Does this give us the intuitive meaning of "only if"?

   - $[\![\text{John is in class}]\!]^{o,w}$ = 1 iff John is in class in w
   - $[\![\text{John is in class}]\!]^{f,w} = \left\{\begin{array}{l}\text{1 iff John is in class in } w,\\ \text{1 iff Mary is in class in } w,\\ \text{1 iff Bill is in class in } w\end{array}\right\}$
   - $[\![\text{I am happy}]\!]^{o,w}$ = 1 iff I am happy in w
   - $[\![\text{if}]\!]^o = \lambda p_{\langle s,t\rangle} \,.\, \lambda q_{\langle s,t\rangle} \,.\, \lambda w_s \,.\, p(w) = 1 \text{ and } q(w) = 1$
   - $[\![\forall]\!]^o = \lambda p_{\langle s,t\rangle} \,.\, \lambda q_{\langle s,t\rangle} \,.\, \forall w\ [p(w) = 1 \rightarrow q(w) = 1]$
   - $[\![\text{W}]\!]^o = \lambda w_s \,.\, 1$
   - $\left[\!\!\left[\ \textit{only}\ \ \alpha\ \right]\!\!\right] = 1 \text{ iff } \forall p \in [\![\alpha]\!]^f \left(p \neq [\![\alpha]\!]^o \rightarrow p = 0\right)$

     Presupposition: $[\![\alpha]\!]^o$ is true

[1] ...which might be concerningly unrealistic, syntactically, but don't worry about that.

2. **Grading policy:**

   I believe that each student in our class individually has the ability to excel in this class, with enough effort and practice. Therefore, I can say (2) and it would be true.

   (2) Every student can receive an A.

   At the same time, University regulations tell me that students cannot all receive the same grade. Therefore, I can say (3) and it would also be true.

   (3) Every student cannot receive an A.

   Give explicit truth conditions for these sentences with their intended interpretations. Explain why I can believe (2) and (3) at the same time, without contradicting myself.

   <u>Hint:</u> Two things are different between (2) and (3) at LF.

3. **Is semantics difficult?**

   Based on the discussion in class, *even* in example (4) introduces a presupposition that Bill is <u>less likely</u> to pass Semantics as compared to other classes (4a), not <u>more likely</u> (4b).

   (4) Bill will pass even [Semantics]$_F$.

   a. $\rightsquigarrow$ It is <u>less likely</u> that Bill pass Semantics than that he pass any other class.

   b. $\not\rightsquigarrow$ It is <u>more likely</u> that Bill pass Semantics than that he pass any other class.

   But example (5) is ambiguous. The contexts in (a) and (b) are meant to illustrate these two possibilities.

   (5) I don't believe that Bill will pass even [Semantics]$_F$.

   a. <u>Hard class reading:</u>
   All the EL modules are hard, but Semantics is the hardest. *It is <u>less likely</u> that our friend Bill will pass Semantics than that he pass any other class.* Someone claims that Bill is a genius and will certainly pass every class, including Semantics, but I'm not so sure. I don't believe that Bill will pass even [Semantics]$_F$.

   b. <u>Easy class reading:</u>
   Everyone knows that Semantics is the easiest EL module. *It is <u>more likely</u> that our friend Bill pass Semantics than that he pass any other class.* At the same time, we also all know that Bill is a very poor student. We're worried about him failing all his classes. I don't believe that Bill will pass even [Semantics]$_F$.

   Give a possible explanation for how these two readings come about in (5). If it is helpful, give LF trees or computations in your explanation, but this is not required.