Meaning, Reference and Modality
Exercises 9-10-11*

Dynamic Semantics

DPL

Write out the DPL interpretation for the following pair of formulas. Which pairs are equivalent?

(1) a. $\exists x(Px \wedge Qx) \wedge Rx$

b. $\exists x(Px \wedge Qx \wedge Rx)$

(2) a. $\exists x(Px \wedge Qx) \wedge Rx$

b. $\exists y(Py \wedge Qy) \wedge Rx$

(3) a. $Rx \wedge \exists x(Px \wedge Qx)$

b. $Rx \wedge \exists y(Py \wedge Qy)$

(4) a. $\neg \exists x Px \vee Qx$

b. $\exists x Px \rightarrow Qx$

(5) a. $\exists x Px \wedge Qx$

b. $\neg(\exists x Px \rightarrow \neg Qx)$

Update Semantics

Consider the formulas below. Are they valid in Veltman's update semantics?

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(6) a. $\Diamond p \rightarrow p$

b. $p \rightarrow \Diamond p$

(7) a. $\Box p \rightarrow p$

b. $p \rightarrow \Box p$

A formula ϕ is valid iff $\forall s : s \subseteq s[\phi]$

$s[\phi \rightarrow \psi] = \{i \in s |$ if $i \in s[\phi]$ then $i \in s[\phi][\psi]\}$

Dynamic Modal Predicate Logic

The Broken Vase

Consider the broken vase scenario discussed in Groenendijk, Stockhof and Veltman (1996):

(8) a. $\exists x Hx \wedge \Diamond Gx$

b. $\exists x(Hx \wedge \Diamond Gx)$

(6a) and (6b) are not equivalent, given GSV (1996)'s treatment of $\exists x$ as in (A) below. Consider now the global assignment in (B), and discuss the consequences for the broken vase scenario.

(A) $s[\exists x \phi] = \bigcup_{d \in D}(s[x/d][\phi])$

(B) $s[\exists x \phi] = (\bigcup_{d \in D} s[x/d])[\phi]$

Consistent and Coherent

Consider the sequence of sentences below. Treat $\exists x Px$ with a uniqueness requirement $\exists! x Px$. Are they *consistent*? Are they *coherent*? Do the results match your intuitions?

(9) a. Someone has done it. It might be Alice. But it also might not be Alice.

b. $\exists x Px \wedge \Diamond(x = a) \wedge \Diamond(x \neq a)$

(10) a. Someone has done it. It might not be Alice. It is Alice

b. $\exists x Px \wedge \Diamond(x \neq a) \wedge (x = a)$

(11) a. Someone has done and it might be Alice and it might not be Alice.

b. $\exists x(Px \wedge \Diamond(x = a) \wedge \Diamond(x \neq a))$

(12) a. Someone has done it. Alice has done it. Anyone might be Alice. Bob might have done it.

b. $\exists x P x \wedge (x = a) \wedge \forall x(\Diamond(x = a)) \wedge \Diamond(x = b)$

Now drop the uniqueness requirement $\exists! x P x$ and treat $\exists x P x$ as $\exists x P x$. Which ones are now *coherent*? Which ones are now *consistent*?