Veltman style modalities for a propositional language

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(1) It might be sunny. But it's not sunny (easy update)

(2) # It's not sunny. But it might (for all I know) be sunny.

- for atomic formulas: $\lambda ik(p \wedge k(i+p))$, where $i + p$ is interpreted as $i \cap \|p\|$.
- for $\neg_d$: $\lambda P \lambda ik\ (\neg P \wedge k(i - Pik))$.
- for $\wedge_d$: $\lambda P \lambda Q \lambda ik\ Pi(\lambda i' Qi'k)$
- for $\Diamond_d$: $\lambda P \lambda ik\ ki$, with the presupposition that $i_1 + P \neq 0$

Dynamic Diamonds presuppose that their test succeeds. The at issue content of *might* intuitively is to bring a particular epiistemic possibility to mind.

The first order case

We have used two notions of left context—Veltman modalities require left contexts to be sets of worlds or something similar, while modal subordination requires left contexts to contain lists of accessible referents.

Put these together, adding another parameter w for a set of worlds that a continuation needs.

A few details

Our first combination rule for modalized sentences:

(3) $\|S_1.S_2\| = \lambda i_1 i_2 w k_1 k_2 f.\|S_1\|\ i_1\ i_2\ w$
$(\lambda i'_1 i'_2.\|S_2\| i'_1, i_2 k 1 k 2 \Pi_1) k_2 w\ f$

This gives us:

(4) $\lambda \Diamond(\exists x(W(x) \wedge \Diamond(\ (E(sel(x :: i_1 \cup i_2), u) \wedge$
$\top$

Second combination rule for non modalized second sentences affects w

(5) $\|S_1.S_2\| = \lambda i_1 i_2 k_1 k_2 w\ f.\|S_1\|\ i_1\ i_2\ k_1$
$(\lambda i'_1 i'_2.\|S_2\| i'_1, i'_2 k_1 k_2 \Pi_2)\ w + S_2\ f$

Independent but anaphorically linked modalities

(6) Sam wants to marry an Italian. He hopes she will be rich.

(7) Hob thinks a witch has blighted his mare, and Nob thinks she has killed his cow.

First attempt:

(8) $\exists x^{s\to e}\mathcal{B}_h(\text{witch}({}^{\vee}x)\wedge\exists!u(h' s\text{mare}(u)\wedge\text{blighted}({}^{\vee}x,u)))\mathcal{B}$
$\wedge$ killed$(x,u)))$

The value of x within Nob's belief worlds may be disjoint from the value of x in Hob's belief worlds and this we don't want.

Dependent individual concepts

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in TY2:

(9) x is a dependent concept relative to a's and b's beliefs iff $\forall w' \in \mathcal{B}_{a,w}\ \exists w'' \in \mathcal{B}_{b,w}\ x(w') = x(w'')$ and $\forall w'' \in \mathcal{B}_{b,w}\ \exists w' \in \mathcal{B}_{a,w}\ x(w'') = x(w')$

(10) $$\lambda w \exists x^{\textsc{dic}(h,n)} \forall w' \in \mathcal{B}_{h,w}(\mathrm{witch}(x(w'), w') \wedge \exists! u(h's\,\mathrm{mare}(u, w') \wedge \mathrm{blighted}(x(w'), u), w')) \wedge \forall w'' \in \mathcal{B}_{n,w}(\exists! v(h's\,\mathrm{cow}(v, w'') \wedge \mathrm{killed}(x(w''), u, w'')))$$

(11) $$\exists x^{\textsc{dic}(h,n)} B_h(((\mathrm{witch}({}^{\vee}x) \wedge \exists! u(h's\,\mathrm{mare}(u) \wedge \mathrm{blighted}({}^{\vee}x, u))) \wedge B_n(\exists! v(h's\,\mathrm{cow}(v,') \wedge \mathrm{killed}({}^{\vee}x, u)))$$

3 minute sketch of SDRT

Three tasks:

- segmenting a text into E(lementary) D(iscourse) U(nit)s
- computing attachment points of EDUs in a discourse structure
- computing one or more discourse relations between an EDU and its attachment point(s)

A discourse structure or SDRS results from these computations and may contain complex constituents containing multiple EDUs.

An SDRS is a discourse logical form & can be represented in various ways, even as a λ term in a De Groote continuation style semantics (see appendix for some thoughts)

An Example

(12) π_1. John had a great evening last night.

π_2. He had a great meal.

π_3. He ate salmon.

π_4. He devoured lots of cheese.

π_5. He then won a dancing competition.

(12′) $\langle A, \mathcal{F}, \mathit{Last} \rangle$, where:

$$A = \{\pi_0, \pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6, \pi_7\}$$

$$\mathcal{F}(\pi_0) = \mathit{Elaboration}(\pi_1, \pi_6)$$
$$\mathcal{F}(\pi_6) = \mathit{Narration}(\pi_2, \pi_5) \wedge \mathit{Elaboration}(\pi_2, \pi_7)$$
$$\mathcal{F}(\pi_7) = \mathit{Narration}(\pi_3, \pi_4)$$
$$\mathit{Last} = \pi_5$$

a DRS- like representation:

$$
\begin{array}{|l|}
\hline
\pi_0 \\
\hline
\pi_0 : \begin{array}{|l|}
\hline
\pi_1, \pi_6 \\
\hline
\pi_1 : K_{\pi_1} \\
\pi_6 : \begin{array}{|l|}
\hline
\pi_2, \pi_5, \pi_7 \\
\hline
\pi_2 : K_{\pi_2}, \pi_5 : K_{\pi_5} \\
Narration(\pi_2, \pi_5) \\
\pi_7 : \begin{array}{|l|}
\hline
\pi_3, \pi_4 \\
\hline
\pi_3 : K_{\pi_3}, \pi_4 : K_{\pi_4}, \\
Narration(\pi_3, \pi_4) \\
\hline
\end{array} \\
Elaboration(\pi_2, \pi_7) \\
\hline
\end{array} \\
Elaboration(\pi_1, \pi_6) \\
\hline
\end{array} \\
\hline
\end{array}
$$

SDRT continuation style

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(13) (π_1) A man walked in. (π_2) He coughed.

Here we compute a discourse relation between π_1 and π_2. I'll assume it's Narration. The De Groote rule works nicely here:

- $\lambda io\, \pi_1{:}\ \exists x(Mx \wedge Wx \wedge o(i+x))i[\lambda i'\, \pi_2{:}\, C\mathrm{sel}(i') \wedge o(i')] \longrightarrow_\beta$
- $\lambda io\ \pi_1{:}\ \exists x(Mx \wedge Wx \wedge \pi_2{:}\, C\mathrm{sel}(i+x) \wedge \mathrm{Narration}(\pi_1, \pi_2) \wedge o(i+x))$

Let's now consider a different second sentence:

(14) (π_1) A man walked in. (π_3) He was fat.

Let's suppose that π_3 attaches to π_1 with E-Elab. Intuitively, we would like to leave open both for the possibility of continuing the elaboration or description of the man or by talking about something that is linked to the first constituent.

(15) A man walked in. He sported a hat.

(16) A man walked in. He sported a hat. He wanted to buy a new suit.

(17) A man walked in. He sported a hat. Then a woman walked in. She was wearing a fur coat.

These possibilities indicate that we will want to use a *different* discourse rule for the second case. Roughly, we want two continuations that we can use—one for a high attachment and one for a low attachment:

(18) $\lambda i_1 o_1 i o\, \pi_1\!: \exists x(Mx \wedge Wxo_1(i_1{+}x) \wedge \pi_2\!: \exists v Hv \wedge Sv\mathrm{sel}(i{+}x{+}v) \wedge \text{E-Elab}(\pi_1, \pi_2) \wedge o(i{+}x{+}v))$