Lectures 17-18
CROSS-LINGUISTIC COMPOSITION

1. Semantic convergence across structural diversity

ENGLISH (E)

• pronoun

(Ole is home today.)

(1E) He is sick.
he be.TNS sick
$[sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

KALAALLISUT (K)

• -PRN

(1K) Naparsimavuq
naparsima-pu-q
sick-DEC.IV-3SG
$[sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• name

(2E) Ole is sick.
Ole be.TNS sick
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• name

(2K) Ole naparsimavuq.
Ole naparsima-pu-q
Ole sick-DEC.IV-3SG
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• indef. object of tv

(3E) Ole has *bought* *a* *dog*.
Ole hv.TNS buy.ASP A dog
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle];$
$[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• cn-base of iv\cn-suffix

(3K) Ole qimmisivuq.
Ole *qimmiq-si*-pu-q
Ole dog-get-DEC.IV-3SG
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ buy_{\top\omega}\langle\top\delta, y\rangle,\ dog_{\top\omega}\ y];$
$[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• n-modifier

(4E) Ole has bought a *sick* dog.
Ole hv.TNS buy.ASP A sick dog
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ dog_{\top\omega}\ y,\ sick_{\top\omega}\ y,$
$buy_{\top\omega}\langle\top\delta, y\rangle];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• s-modifier (MOD) + [s cn-iv\cn-…]

(4K) Ole naparsimasumik qimmisivuq.
Ole *naparsima-tuq-mik* qimmiq-si-pu-q
Ole sick-n\vp-MOD dog-get-DEC.IV-3SG
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}];$
$[buy_{\top\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\top\omega}\ \bot\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

• negation

(5E) Ole has*n't* bought a sick dog.
Ole hv.TNS=N'T buy.ASP A sick dog

rdg1 $[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [w|\ w \in \top\omega\{|\}];$
$[y|\ dog_{\bot\omega}\ y,\ sick_{\bot\omega}\ y,\ buy_{\bot\omega}\langle\top\delta, y\rangle];$
$[p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

rdg2 $[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ dog_{\top\omega}\ y,\ sick_{\top\omega}\ y];$
$[w|\ w \in \top\omega\{|\}];\ [buy_{\bot\omega}\langle\top\delta, \bot\delta\rangle];$
$[p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

Homework 7 (to be assigned M 4/20, *due* Th 4/23)

• negation

(5K) Ole naparsimasumik qimmisinngilaq.
Ole naparsima-tuq-mik qimmi-si-*nngit*-*la*-q
Ole sick-n\vp-MOD dog-get-not-DEC.NG-3SG
$[\mathbf{x}|\ (\mathbf{x} = ole)°];\ [w|\ w \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\ y];$
$[X|\ X = \bot\delta\{|_{\bot\omega}\}];\ [get_{\bot\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\bot\omega}\ \bot\delta];$
$[p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

2. Update with Centering (UC2) and presupposition

DEFINITION 1.1 The set of UC2 types is the smallest set **Typ** such that:
- $t, \delta, \omega, s \in \mathbf{Typ}$
- $(ab) \in \mathbf{Typ}$, if $a, b \in \mathbf{Typ}$

The set of discourse object types is the subset $\mathbf{DTyp} = \{\delta, \omega, \omega t\} \cup \{(at): a \in \{\delta, \omega, \omega t\}\}$

ABBREVIATIONS 1

$\mathrm{W} := s\omega$	$\Omega := \omega t$	$a_1 \ldots a_n b := (a_1 \ldots (a_n b))$
$\mathrm{D} := s\delta$	$[\,] := (st)st$	$a_1 \ldots a_n[\,] := [a_1 \ldots a_n]$

DEFINITION 1.2 (Basic UC2 terms). For each type $a \in \mathbf{Typ}$, there is a set of a-constants, $\mathbf{Con}_a$, a set of plain a-variables, $^{\perp}\mathbf{Var}_a$, and a set of topic-setting a-variables, $^{\top}\mathbf{Var}_a$, including:

$a \in \mathbf{Typ}$	$^{\perp}\mathbf{Var}_a$	$^{\top}\mathbf{Var}_a$	$\mathbf{Con}_a$	Name of objects
δ	x, y	$\mathbf{x}, \mathbf{y}$	ole	(ordinary) individuals
ω	w, v	$\mathbf{w}, \mathbf{v}$		worlds
Ω	p, q	$\mathbf{p}, \boldsymbol{q}$		propositions
δt	X, Y	$\mathbf{X}, \mathbf{Y}$		sets of individuals
Ωt	Q	$\mathbf{Q}$		sets of propositions
$\omega\delta t$			$dog, sick, \ldots$	$\omega\delta$-relations
s	i, j, k, h			indices (*aka* topic-background lists)
st	I, J			infotention states
$[\,]$	K			updates
D	$\underline{x}, \underline{y}$			dynamic δ-concepts
W	$\underline{w}, \underline{v}$			dynamic ω-concepts
[W]	$\underline{W}, \underline{V}$			dynamic propositions
[DW]	$\underline{P}$			dynamic verbal properties
[WD]	$\underline{N}$			dynamic nominal properties

DEFINITION 1.3 (UC2 syntax). For each type $a \in \mathbf{Typ}$ the set of a-terms is defined as follows:

b	$A \in \mathbf{Term}_a$	if $A \in \mathbf{Con}_a \cup {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$
a	$\top a_n, \perp a_n \in \mathbf{Term}_{sa}$	if $a \in \mathbf{DTyp}$ & $n \in \{1, 2, \ldots\}$
{}	$A\{B\} \in \mathbf{Term}_{at}$	if $a \in \mathbf{DTyp}$, $A \in \mathbf{Term}_{sa}$ & $B \in \mathbf{Term}_{st}$
·	$(u_a \cdot B) \in \mathbf{Term}_s$	if $a \in \mathbf{DTyp}$, $u_a \in {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$ & $B \in \mathbf{Term}_s$
;	$(A; B), (A\ ^{\top}; B), (A\ ^{\perp}; B) \in \mathbf{Term}_{(st)st}$	if $A, B \in \mathbf{Term}_{(st)st}$
λ	$\lambda u_a(B) \in \mathbf{Term}_{ab}$	if $u_a \in {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$ & $B \in \mathbf{Term}_b$
A	$AB \in \mathbf{Term}_a$	if $A \in \mathbf{Term}_{ba}$ & $B \in \mathbf{Term}_b$
C	$\neg A, (A \to B), (A \wedge B), (A \vee B) \in \mathbf{Term}_t$	if $A, B \in \mathbf{Term}_t$
Q	$\forall u_a B, \exists u_a B \in \mathbf{Term}_t$	if $u_a \in {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$ & $B \in \mathbf{Term}_t$
=	$(A = B) \in \mathbf{Term}_t$	if $A, B \in \mathbf{Term}_a$

DEFINITION 2.1 (UC2 frames). A UC2 frame is a set of sets $\{D_a\}_{a \in \mathbf{Typ}}$ such that:

i. $D_t = \{1, 0\}$, D_δ, and D_ω are non-empty pairwise disjoint sets
ii. $D_s = \cup_{n, m \geq 0} (D^n \times D^m)$, where $D = \cup_{a \in \mathbf{DTyp}} D_a$
iii. $D_{ab} = \{\mathtt{f} \mid \varnothing \subset \mathrm{Dom}\ \mathtt{f} \subseteq D_a\ \&\ \mathrm{Ran}\ \mathtt{f} \subseteq D_b\}$

ABBREVIATIONS 2 (lists, projections, dot-extensions). Let $D = \cup_{a \in \mathbf{DTyp}} D_a$.

- For $\mathtt{i} = \langle \mathtt{i}_1, \mathtt{i}_2 \rangle \in D^n \times D^m$, $\top\mathtt{i} = \mathtt{i}_1$ is the *topic list* & $\perp\mathtt{i} = \mathtt{i}_2$ is the *background list* of $\mathtt{i}$
- For $\mathtt{x} \in D^{n+m}$, $(\mathtt{x})_n$ is $\mathtt{x}_n$ (nth coordinate) & $(\mathtt{x})_a$ is the subsequence of type a coordinates
- For $\mathtt{d} \in D$, $\mathtt{x} \in D^n$: $(\mathtt{d} \cdot \langle\,\rangle) = \langle \mathtt{d} \rangle$ & $(\mathtt{d} \cdot \mathtt{x}) := \langle \mathtt{d}, \mathtt{x}_1, \ldots, \mathtt{x}_n \rangle$ ($\mathtt{d}$-*extensions*)
- For $\mathtt{x} \in D^n$, $\mathtt{y} \in D^{n+m}$: $\mathtt{y}$ *dot-extends* $\mathtt{x}$, $\mathtt{y} \cdot\!> \mathtt{x}$, iff $\exists \mathtt{d}_1 \ldots \mathtt{d}_m \in D$: $\mathtt{y} = (\mathtt{d}_1 \cdot \ldots (\mathtt{d}_m \cdot \mathtt{x}))$

DEFINITION 2.2 (UC2-models and assignments)

- A UC2-*model* is a pair, $M = \langle \{D_a\}_{a \in \mathbf{Typ}}, [\![\cdot]\!] \rangle$, s.t. (i) $\{D_a\}_{a \in \mathbf{Typ}}$ is a standard UC2-frame, (ii) $[\![\cdot]\!]$ is an *interpretation function* that assigns to each $\alpha \in \mathbf{Con}_a$ a denotation $[\![\alpha]\!] \in D_a$.
- An *M-assignment* is a function g that assigns $g(u) \in D_a$ to each $u \in {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$. If $\mathtt{d} \in D_a$ then $g[u/\mathtt{d}]$ is the M-assignment s.t. (i) $g[u/\mathtt{d}](u') = g(u')$ for all $u' \neq u$, (ii) $g[u/d](u) = \mathtt{d}$.

ABBREVIATIONS 3 (Functions & sets). For $\mathtt{f} \in D_{a1\ldots an\, t}$ and $\langle \mathtt{a}_1, \ldots, \mathtt{a}_n \rangle \in D_{a1} \times \ldots \times D_{an}$:

- $\mathtt{f}(\mathtt{a}_1, \ldots, \mathtt{a}_n) := \mathtt{f}(\mathtt{a}_1)\ldots(\mathtt{a}_n)$
- ${}^{\{\}}(\mathtt{f}) = \{\langle \mathtt{a}_1, \ldots \mathtt{a}_n \rangle : \mathtt{f}(\mathtt{a}_1, \ldots \mathtt{a}_n) = 1\}$ (*set characterized* by function $\mathtt{f}$)
- ${}^{\chi}(\mathtt{A})$ (*characteristic function* of set $\mathtt{A}$) is the function $\mathtt{f}$ such that ${}^{\{\}}(\mathtt{f}) = \mathtt{A}$

DEFINITION 2.3 (UC2 semantics). The value $[\![A]\!]^g$ of a term A on a model $M = \langle \{D_a\}_{a \in \mathbf{Typ}}, [\![\cdot]\!] \rangle$ under an assignment g is defined as follows (Note: we write (i) $\mathtt{cf}$ for $\mathtt{f(c)}$, (ii) '$X \doteq Y$' for 'X is Y, if Y is defined, else X is undefined', (iii) '$X[Y/Z]$' for the result of replacing every occurrence of Y in X with Z, and (iv) use the Von Neumann definition of 0 and 1, so $0 = \varnothing$ and $1 = \{\varnothing\}$)

b	$[\![A]\!]^g$	$=$	$[\![A]\!]$	if $A \in \mathbf{Con}_a$
		$=$	$g(A)$	if $A \in {}^{\top}\mathbf{Var}_a \cup {}^{\perp}\mathbf{Var}_a$
a	$[\![\top a_n]\!]^g(\mathtt{i})$	$\doteq$	$((\top\mathtt{i})_a)_n$	for any $\mathtt{i} \in D_s$
	$[\![\perp a_n]\!]^g(\mathtt{i})$	$\doteq$	$((\perp\mathtt{i})_a)_n$	for any $\mathtt{i} \in D_s$
{}	$[\![A\{B\}]\!]^g$	$\doteq$	${}^{\chi}\{[\![A]\!]^g(\mathtt{i}) \mid \mathtt{i} \in {}^{\{\}}[\![B]\!]^g\}$	
·	$[\![(u_a \cdot B)]\!]^g$	$\doteq$	$\langle (g(u_a) \cdot \top[\![B]\!]^g), \perp[\![B]\!]^g \rangle$	for any $u_a \in {}^{\top}\mathbf{Var}_a$
		$\doteq$	$\langle \top[\![B]\!]^g, (g(u_a) \cdot \perp[\![B]\!]^g) \rangle$	for any $u_a \in {}^{\perp}\mathbf{Var}_a$
;	$\mathtt{c}[\![(A; B)]\!]^g$	$\doteq$	$\mathtt{c}[\![A]\!]^g[\![B]\!]^g$	for any $\mathtt{c} \in D_{st}$
	$\mathtt{c}[\![A^{\top}; B]\!]^g$	$\doteq$	$\{\mathtt{k} \in \mathtt{c}[\![(A; B)]\!]^g \mid \exists a(\exists \mathtt{j} \in \mathtt{c}[\![A]\!]^g \exists \mathtt{i} \in \mathtt{c}: \top\mathtt{j} \mathbin{\cdot\!>} \top\mathtt{i} \;\&\; (\top\mathtt{j})_1 \in D_a$ $\& \; \exists n: [\![B]\!]^g \neq [\![B[\top a_1/\top a_n]]\!]^g)\}$	
	$\mathtt{c}[\![A^{\perp}; B]\!]^g$	$\doteq$	$\{\mathtt{k} \in \mathtt{c}[\![(A; B)]\!]^g \mid \exists a(\exists \mathtt{j} \in \mathtt{c}[\![A]\!]^g \exists \mathtt{i} \in \mathtt{c}: \perp\mathtt{j} \mathbin{\cdot\!>} \perp\mathtt{i} \;\&\; (\perp\mathtt{j})_1 \in D_a$ $\& \; \exists n: [\![B]\!]^g \neq [\![B[\perp a_1/\perp a_n]]\!]^g)\}$	
$\boldsymbol{\lambda}$	$[\![\lambda u_a(B)]\!]^g(\mathtt{d})$	$\doteq$	$[\![B]\!]^{g[u/\mathtt{d}]}$	for any $\mathtt{d} \in D_a$
A	$[\![AB]\!]^g$	$\doteq$	$[\![A]\!]^g([\![B]\!]^g)$	
C	$[\![\neg A]\!]^g$	$\doteq$	$(1 - [\![A]\!]^g)$	
	$[\![(A \rightarrow B)]\!]^g$	$\doteq$	$(1 - ([\![A]\!]^g - [\![B]\!]^g))$	
	$[\![(A \wedge B)]\!]^g$	$\doteq$	$([\![A]\!]^g \cap [\![B]\!]^g)$	
	$[\![(A \vee B)]\!]^g$	$\doteq$	$([\![A]\!]^g \cup [\![B]\!]^g)$	
Q	$[\![\forall u_a A]\!]^g$	$=$	1	if $\forall \mathtt{d} \in D_a: [\![A]\!]^{g[u/\mathtt{d}]} = 1$
		$=$	0	otherwise
	$[\![\exists u_a A]\!]^g$	$=$	1	if $\exists \mathtt{d} \in D_a: [\![A]\!]^{g[u/\mathtt{d}]} = 1$
		$=$	0	otherwise
=	$[\![(A = B)]\!]^g$	$=$	1	if $[\![A]\!]^g, [\![B]\!]^g \in D_a \;\&\; [\![A]\!]^g = [\![B]\!]^g$
		$=$	0	if $[\![A]\!]^g, [\![B]\!]^g \in D_a \;\&\; [\![A]\!]^g \neq [\![B]\!]^g$

DEFINITION 3.1 (Initial context & default state). An *initial context* is a proposition $\mathtt{p}_0 \in D_{\Omega}$ s.t. ${}^{\{\}}\mathtt{p}_0 \neq \varnothing$. This induces the *default infotention state* $*\mathtt{p}_0 = {}^{\chi}\{\langle\langle \mathtt{w}, \mathtt{p}_0 \rangle, \langle\,\rangle\rangle \mid \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\}$.

DEFINITION 3.2 (Topic, assertion, truth value). For a model M, initial context $\mathtt{p}_0$, and $(st)st$-term K:

i. $\top_{M,\mathtt{p}0}\,\mathsf{K} := \{(\top\mathtt{i})_1 \mid \forall g: \mathtt{i} \in {}^{\{\}}(*\mathtt{p}_0[\![\mathsf{K}]\!]^g)\}$ (set of *primary topics* introduced by K wrt M and $\mathtt{p}_0$)

ii. Given M and $\mathtt{p}_0$, K can be used to *assert* a proposition $\mathtt{q} \in D_{\Omega}$, iff $\top_{M,\mathtt{p}0}\,\mathsf{K} = \{\mathtt{q}\}$

iii. K is *true* in world $\mathtt{w}$ wrt M and $\mathtt{p}_0$, iff $\exists \mathtt{q} \in D_{\Omega}: \top_{M,\mathtt{p}0}\,\mathsf{K} = \{\mathtt{q}\} \;\&\; \mathtt{w} \in {}^{\{\}}\mathtt{q}$
K is *false* in world $\mathtt{w}$ wrt M and $\mathtt{p}_0$, iff $\exists \mathtt{q} \in D_{\Omega}: \top_{M,\mathtt{p}0}\,\mathsf{K} = \{\mathtt{q}\} \;\&\; \mathtt{w} \notin {}^{\{\}}\mathtt{q}$

ABBREVIATIONS 4 (Syntactic sugar)

i. Set theory

$A_a \in B_{at}$	:=	BA	
$A_a \notin B_{at}$	:=	$\neg BA$	

ii. Dynamic terms

$\top a, \bot a$	:=	$\top a_1, \bot a_1$	if $a \in$ **DTyp**
$A_a{}^{\circ}$	:=	$\lambda i(A)$	if $a \in$ **DTyp**
	:=	A	if $a \in \{sb \mid b \in$ **DTyp**$\}$

iii. (Local) conditions

$(B_W\, A)$	:=	$\lambda i(B\, W^{\circ}i\, A^{\circ}i)$
$B_W\langle A_1, \ldots, A_n\rangle$	:=	$\lambda i(B\, W^{\circ}i\, A_1{}^{\circ}i \ldots A_n{}^{\circ}i)$
$(A = B)^{\circ}$	:=	$\lambda i(A^{\circ}i = B^{\circ}i)$
(C_1, C_2)	:=	$\lambda i(C_1 i \wedge C_2 i)$

iv. Local drt-boxes

$[C]$	:=	$\lambda I\lambda j(Ij \wedge Cj)$
$[u_1\ldots u_n]$	:=	$\lambda I\lambda j\, \exists u_1\ldots u_n \exists i(j = (u_1 \cdot \ldots(u_n \cdot i)) \wedge Ii)$
$[u_1\ldots u_n \mid C]$	:=	$\lambda I\lambda j\, \exists u_1\ldots u_n \exists i(j = (u_1 \cdot \ldots(u_n \cdot i)) \wedge Ii \wedge Ci)$

v. Substates & global drt-boxes

$I_{B:i}$	:=	$\lambda j(Ij \wedge Bj = Bi)$	
$[A'\,\mathsf{R}\,A\{\mid\}]$	:=	$\lambda I\lambda j\,(Ij \wedge A'\,\mathsf{R}\,A\{I\})$	$\mathsf{R} \in \{=, \in, \notin\}$
$[A'\,\mathsf{R}\,A\{\mid_B\}]$	:=	$\lambda I\lambda j\,(Ij \wedge A'\,\mathsf{R}\,A\{I_{B:j}\})$	$\mathsf{R} \in \{=, \in, \notin\}$
$[u \mid u\,\mathsf{R}\,A\{\mid\}]$	:=	$\lambda I\lambda j\, \exists u \exists i(j = (u \cdot i) \wedge Ii \wedge u\,\mathsf{R}\,A\{I\})$	$\mathsf{R} \in \{=, \in, \notin\}$
$[u \mid u\,\mathsf{R}\,A\{\mid_B\}]$	:=	$\lambda I\lambda j\, \exists u \exists i(j = (u \cdot i) \wedge Ii \wedge u\,\mathsf{R}\,A\{I_{B:i}\})$	$\mathsf{R} \in \{=, \in, \notin\}$
(∂K)	:=	$\lambda I\lambda j\,(Ij \wedge KI = I)$	(Beaver presupposition)
$\mathbf{0}$	:=	$\lambda I\lambda j\, \neg(j = j)$	(absurd update)

3. English and Kalaallisut in CCG + UC2

- UNIVERSAL RULES

Forward application

(>) X/Y: β_{ab} Y: α_a $\Rightarrow_>$ X: $\beta\alpha$

Backward application

(<) Y: α_a X\Y: β_{ab} $\Rightarrow_<$ X: $\beta\alpha$

Forward composition

(>**B**) X/Y: β_{ab} Y/Z: α_{ca} $\Rightarrow_{>\mathbf{B}}$ X/Z: $\lambda\upsilon_c(\beta\alpha\upsilon)$

Backward composition

(<**B**) Y\Z: α_{ca} X\Y: β_{ab} $\Rightarrow_{<\mathbf{B}}$ X\Z: $\lambda\upsilon_c(\beta\alpha\upsilon)$

- CATEGORY-TO-TYPE CORRESPONDENCE, **tp**:

tp(s) = [ ]	**tp**(np) = D	**tp**(X/Y) = **tp**(Y)**tp**(X)
tp(<u>s</u>) = [W]	**tp**(n) = [WD]	**tp**(X\Y) = **tp**(Y)**tp**(X)
	tp(vp) = [DW]	**tp**(X′) = **tp**(X)

- ENGLISH LEXICON (fragment 3)

i. English categories: AB-categories based on {s, $\underline{s}$, np, n, n′}.

E-abbreviations: vp := $\underline{s}\backslash np_N$
tv := vp/np_A

ii. Eng. item |– Category X: UC2-translation of type **tp**(X)

• Lexical cat's: (pro)nouns, adjectives & verbs

he	|–	np_N: $\top\delta$
	|–	np_N: $\bot\delta$
Ole	|–	$\underline{s}/vp$: $\lambda \underline{P}\lambda \underline{w}([\mathbf{x}\vert\ (\mathbf{x} = ole)^\circ]; \underline{P}\ \top\delta\ \underline{w})$
	|–	$vp\backslash(vp/np_A)$: $\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y\vert\ (y = ole)^\circ]; \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$
dog	|–	n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$
sick	|–	n′: $\lambda \underline{w}\lambda \underline{x}[sick_{\underline{w}}\ \underline{x}]$
	|–	n/n: $\lambda \underline{N}\lambda \underline{w}\lambda \underline{x}([sick_{\underline{w}}\ \underline{x}]; \underline{N}\ \underline{w}\ \underline{x})$
buy.ASP	|–	vp/np_A: $\lambda \underline{y}\lambda \underline{x}\lambda \underline{w}[buy_{\underline{w}}\langle \underline{x}, \underline{y}\rangle]$

• Grammatical cat's: determiners, auxiliaries, prosody

A	|–	n′/n: $\lambda \underline{N}(\underline{N})$
	|–	$\underline{s}$/vp/n: $\lambda \underline{N}\lambda \underline{P}\lambda \underline{w}([\mathbf{x}]; \underline{N}\ \underline{w}\ \top\delta; \underline{P}\ \top\delta\ \underline{w})$
	|–	$vp\backslash(vp/np_A)/n$: $\lambda \underline{N}\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y]; \underline{N}\ \underline{w}\ \bot\delta; \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$
HV.TNS	|–	vp/vp: $\lambda \underline{P}(\underline{P})$
BE.TNS	|–	vp/n′: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}(\underline{N}\ \underline{w}\ \underline{x})$
HV.TNS=N'T	|–	vp/vp: $\lambda \underline{P}\lambda \underline{x}\lambda \underline{w}([v\vert\ v \in \underline{w}\{\vert\}]; \underline{P}\ \underline{x}\ \bot\omega; [p\vert\ p = \bot\omega\{\vert\}]; [\underline{w} \notin \bot\Omega])$
BE.TNS=N'T	|–	vp/n′: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}([v\vert\ v \in \underline{w}\{\vert\}]; \underline{N}\ \bot\omega\ \underline{x}; [p\vert\ p = \bot\omega\{\vert\}]; [\underline{w} \notin \bot\Omega])$
. (prosody)	|–	$\underline{s}\backslash s$: $\lambda \underline{W}(\underline{W}\top\omega; [\mathbf{p}\vert\ \mathbf{p} = \top\omega\{\vert\}])$

- KALAALLISUT LEXICON (fragment 1)

i. Kalaallisut categories: AB-categories based on {s, vp, np, n}

ii. Kal. item |– Category X: UC2-translation of type **tp**(X)

• Lexical cat's: roots & derivation

Ole-	|–	n: $\lambda \underline{w}\lambda \underline{x}[(\underline{x} = ole)^\circ]$
dog-	|–	n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$
sick-	|–	vp: $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$
-get	|–	vp\n: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}([y\vert\ buy_{\underline{w}}\langle \underline{x}, y\rangle]; \underline{N}\ \underline{w}\ \bot\delta)$
	|–	vp\n: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}(\partial[\bot\delta t = \bot\delta\{\vert_{\underline{w}}\}]; [buy_{\underline{w}}\langle \underline{x}, \bot\delta\rangle]; \underline{N}\ \underline{w}\ \bot\delta)$
-not	|–	vp\vp: $\lambda \underline{P}\lambda \underline{x}\lambda \underline{w}([v\vert\ v \in \underline{w}\{\vert\}]; \underline{P}\ \underline{x}\ \bot\omega; [p\vert\ p = \bot\omega\{\vert\}]; [\underline{w} \notin \bot\Omega])$
	|–	vp\vp: $\lambda \underline{P}\lambda \underline{x}\lambda \underline{w}(\partial[\bot\omega \in \underline{w}\{\vert\}]; \underline{P}\ \underline{x}\ \bot\omega; [p\vert\ p = \bot\omega\{\vert\}]; [\underline{w} \notin \bot\Omega])$
-n\vp	|–	n\vp: $\lambda \underline{P}\lambda \underline{w}\lambda \underline{x}(\underline{P}\ \underline{x}\ \underline{w})$

• Grammatical cat's: inflection

-DEC.IV	|–	s\vp/np: $\lambda \underline{x}\lambda \underline{P}(\underline{P}\ \underline{x}\ \top\omega\ ; [\mathbf{p}\vert\ \mathbf{p} = \top\omega\{\vert\}])$
-DEC.NG	|–	s\vp/np: $\lambda \underline{x}\lambda \underline{P}(\underline{P}\ \underline{x}\ \top\omega^{\bot}; (\partial[\top\omega \notin \bot\Omega]; [\mathbf{p}\vert\ \mathbf{p} = \top\omega\{\vert\}]))$
-3SG	|–	np: $\top\delta$
-Ø	|–	s/s\n: $\lambda \underline{N}\lambda K(([\mathbf{x}]; \underline{N}\ \top\omega\ \top\delta)^{\top}; K)$
		s/s\n: $\lambda \underline{N}\lambda K(([y]; \underline{N}\ \top\omega\ \bot\delta)^{\bot}; K)$
-MOD	|–	s/s\n: $\lambda \underline{N}\lambda K(([y]; \underline{N}\ \top\omega\ \bot\delta; [X\vert\ X = \bot\delta\{\vert_{\top\omega}\}])^{\bot}; K)$
	|–	s/s\n: $\lambda \underline{N}\lambda K(([w\vert\ w \in \top\omega\{\vert\}]; [y]; \underline{N}\ \bot\omega\ \bot\delta; [X\vert\ X = \bot\delta\{\vert_{\bot\omega}\}])^{\bot}; K)$

4. Compositional analyses in CCG + UC2

• ENGLISH

(1′$_E$) he | BE.TNS | sick | .

np$_N$: $\top\delta$ | vp/n′: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}(\underline{N}\ \underline{w}\ \underline{x})$ | n′: $\lambda \underline{w}\lambda \underline{x}[sick_{\underline{w}}\ \underline{x}]$ | $\underline{s}$\s: $\lambda \underline{W}(\underline{W}\top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

——————— >

vp (:= $\underline{s}$\np$_N$): $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$

——————— <

$\underline{s}$: $\lambda \underline{w}([sick_{\underline{w}}\ \top\delta])$

——————— <

s: $([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

(2′$_E$) Ole | BE.TNS sick | .

$\underline{s}$/vp: $\lambda \underline{P}\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ \underline{P}\ \top\delta\ \underline{w})$ | vp: $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$ | $\underline{s}$\s: $\lambda \underline{W}(\underline{W}\top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega])$

——————— <

$\underline{s}$: $\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [sick_{\underline{w}}\ \top\delta])$

——————— <

s: $([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [sick_{\top\omega}\ \top\delta]);\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

cat → tp

s → [ ]

$\underline{s}$ → [W]

np → D

n → [WD], n′ → [WD]

vp (:= $\underline{s}$\np$_N$) → [DW]

tv (:= vp/np$_A$) → [DDW]

where

W := $s\omega$		$\underline{w} \in {}^{\bot}\mathrm{Var}_{W}$
D := $s\delta$		$\underline{x} \in {}^{\bot}\mathrm{Var}_{D}$
[ ] := $(st)st$		$K \in {}^{\bot}\mathrm{Var}_{[]}$
[ab] := $a(b[\ ])$		$\underline{W} \in {}^{\bot}\mathrm{Var}_{[W]}$
		$\underline{P} \in {}^{\bot}\mathrm{Var}_{[DW]}$
		$\underline{N} \in {}^{\bot}\mathrm{Var}_{[WD]}$
		⋮

• KALAALLISUT

(1′$_K$) **Morphology 1:** s-word with $\top\delta$

sick- | -DEC.IV | -3SG

vp: $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$ | s\vp/np: $\lambda \underline{x}\lambda \underline{P}(\underline{P}\ \underline{x}\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$ | np: $\top\delta$

——————— >

s\vp: $\lambda \underline{P}(\underline{P}\ \top\delta\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

——————— <

s: $([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

(2′$_K$) **Morphology 2**: s-modifier (unmarked)

$\top$-rdg (sub): add ${}^{\top}\delta$ & look for comment

Ole- | -Ø

n: $\lambda \underline{w}\lambda \underline{x}[(\underline{x} = ole)°]$ | s/s\n: $\lambda \underline{N}\lambda K(([\mathbf{x}];\ \underline{N}\ \top\omega\ \top\delta)\ {}^{\top};\ K)$

——————— <

s/s: $\lambda K(([\mathbf{x}];\ [(\top\delta = ole)°])\ {}^{\top};\ K)$

$\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)°]\ {}^{\top};\ K)$

$\bot$-rdg (obj): add ${}^{\bot}\delta$ & look for elaboration

Ole- | -Ø

n: $\lambda \underline{w}\lambda \underline{x}[(\underline{x} = ole)°]$ | s/s\n: $\lambda \underline{N}\lambda K(([y];\ \underline{N}\ \top\omega\ \bot\delta)\ {}^{\bot};\ K)$

——————— <

s/s: $\lambda K(([y];\ [(\bot\delta = ole)°])\ {}^{\bot};\ K)$

$\lambda K([y|\ (y = ole)°]\ {}^{\bot};\ K)$

Syntax

✓ topic-comment sequence ($A\ {}^{\top};\ B$)

(2″$_K$) Ole-Ø | sick-DEC.IV-3SG

s/s: $\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)°]\ {}^{\top};\ K)$ | s: $([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

——————— >

s: $[\mathbf{x}|\ (\mathbf{x} = ole)°]\ {}^{\top};\ ([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

$[\mathbf{x}|\ (\mathbf{x} = ole)°]\ ;\ ([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

* background-elaboration sequence ($A\ {}^{\bot};\ B$)

Ole-Ø | sick-DEC.IV-3SG

s/s: $\lambda K([y|\ (y = ole)°]\ {}^{\bot};\ K)$ | s: $([sick_{\top\omega}\ \top\delta];\ \ldots)$

——————— >

s: $[y|\ (y = ole)°]\ {}^{\bot};\ ([sick_{\top\omega}\ \top\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

— — — — ? (no $\bot\delta$)

$\mathbf{0}$ (:= $\lambda I\lambda j\ \neg(j = j)$) (ABSURD UPDATE)

• ENGLISH (3_E)

($3'_E$) **Syntax 1**: indefinite object

A | dog

vp\tv/n: $\lambda \underline{N}\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y];\ \underline{N}\ \underline{w}\ \bot\delta;\ \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$ | n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$ >

vp\tv: $\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y];\ [dog_{\underline{w}}\ \bot\delta];\ \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$

$\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y|\ dog_{\underline{w}}\ y];\ \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$

Syntax 2: transitive sentence

Ole | HV.TNS | buy.ASP | A dog | .

$\underline{s}$/vp: $\lambda \underline{P}\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ \underline{P}\top\delta\underline{w})$ | vp/vp: $\lambda \underline{P}(\underline{P})$ | tv (:= vp/np$_A$) $\lambda \underline{y}\lambda \underline{x}\lambda \underline{w}[buy_{\underline{w}}\langle \underline{x}, \underline{y}\rangle]$ | vp\tv: $\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y|\ dog_{\underline{w}}\ y];\ \underline{R}\ \bot\delta\ \underline{w})$ | $\underline{s}$\s: $\lambda \underline{W}(\underline{W}\top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

>**B**

tv: $\lambda \underline{y}\lambda \underline{x}\lambda \underline{w}[buy_{\underline{w}}\langle \underline{x}, \underline{y}\rangle]$

>

vp: $\lambda \underline{x}\lambda \underline{w}([y|\ dog_{\underline{w}}\ y];\ [buy_{\underline{w}}\langle \underline{x}, \bot\delta\rangle])$

$\lambda \underline{x}\lambda \underline{w}\ [y|\ dog_{\underline{w}}\ y,\ buy_{\underline{w}}\langle \underline{x}, y\rangle]$

<

$\underline{s}$: $\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ dog_{\underline{w}}\ y,\ buy_{\underline{w}}\langle\top\delta, y\rangle])$

<

s: $([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

KALAALLISUT (3_K)

($3'_K$) **Morphology**: n- + -vp\n

(cf. English *theory* + *-ize* → *theorize*)

dog- | -get | -DEC.IV | -3SG

n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$ | n\vp $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}([y|\ buy_{\underline{w}}\langle \underline{x}, y\rangle];\ \underline{N}\ \underline{w}\ \bot\delta)$ | s\vp/np: $\lambda \underline{x}\ \underline{P}(\underline{P}\ \underline{x}\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$ | np: $\top\delta$

< | >

vp: $\lambda \underline{x}\lambda \underline{w}([y|\ buy_{\underline{w}}\langle \underline{x}, y\rangle];\ [dog_{\underline{w}}\ \bot\delta])$

$\lambda \underline{x}\lambda \underline{w}\ [y|\ buy_{\underline{w}}\langle \underline{x}, y\rangle,\ dog_{\underline{w}}\ y]$

s\vp: $\lambda \underline{P}(\underline{P}\ \top\delta\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

<

s: $([y|\ buy_{\top\omega}\langle\top\delta, y\rangle,\ dog_{\top\omega}\ y];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

Syntax

Ole-Ø | dog-get-DEC.IV-3SG

s/s: $\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)°]^{\top};\ K)$ | s: $([y|\ buy_{\top\omega}\langle\top\omega, y\rangle,\ dog_{\top\omega}\ y];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

>

s: $([\mathbf{x}|\ (\mathbf{x} = ole)°]^{\top};\ ([y|\ buy_{\top\omega}\langle\top\delta, y\rangle,\ dog_{\top\omega}\ y];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ buy_{\top\omega}\langle\top\delta, y\rangle,\ dog_{\top\omega}\ y];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

Updates for (3_E) ≡ (3_K)

1 $*\mathtt{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$

$= {}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\ \rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\}$ $=: \mathtt{c}_1$

2 $\mathtt{c}_1[\![[y|\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle]]\!]^g$

$= {}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle \mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w})\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w})\}$ $=: \mathtt{c}_2$

3 $\mathtt{c}_2[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

$= {}^{\chi}\{\langle\langle \mathtt{p}_1, [\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle \mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w})\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w})$

$\&\ \mathtt{p}_1 = {}^{\chi}\{\mathtt{v} \in {}^{\{\}}\mathtt{p}_0|\ \exists \mathtt{d}': \mathtt{d}' \in {}^{\{\}}[\![dog]\!](\mathtt{v})\ \&\ \langle[\![ole]\!], \mathtt{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{v})\}\}$ $=: \mathtt{c}_3$

Example: Let $\mathtt{p}_0 = {}^{\chi}\{\mathtt{w}_0, \mathtt{w}_1, \mathtt{w}_2\}$,

and $\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_0)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_0)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_1)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_1)\} = \{\mathtt{d}_1\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_2)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_2)\} = \{\mathtt{d}_1, \mathtt{d}_2\}$

Then:

$*\mathtt{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)°]]\!]^g$ — $\mathtt{c}_1[\![[y|\ dog_{\top\omega}\, y,\ buy_{\top\omega}\langle\top\delta, y\rangle]]\!]^g$ — $\mathtt{c}_2[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

${}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}_0, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\ \rangle\rangle\}$

${}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle\}$

${}^{\chi}\{\langle\langle{}^{\chi}\{\mathtt{w}_1, \mathtt{w}_2\}, [\![ole]\!], \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle,$
$\langle\langle{}^{\chi}\{\mathtt{w}_1, \mathtt{w}_2\}, [\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle,$
$\langle\langle{}^{\chi}\{\mathtt{w}_1, \mathtt{w}_2\}, [\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle\}$

ENGLISH (4_E)

($4'_E$) **Syntax 1:** n/n + n

A — *sick* — dog

vp\tv/n: $\lambda \underline{N}\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y];\ \underline{N}\ \underline{w}\ \bot\delta;\ \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$

n/n: $\lambda \underline{N}\lambda \underline{w}\lambda \underline{x}([sick_{\underline{w}}\ \underline{x}];\ \underline{N}\ \underline{w}\ \underline{x})$

n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$

—————— >

n: $\lambda \underline{w}\lambda \underline{x}[sick_{\underline{w}}\ \underline{x},\ dog_{\underline{w}}\ \underline{x}]$

—————— >

vp\tv: $\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y|\ sick_{\underline{w}}\ y,\ dog_{\underline{w}}\ y];\ \underline{R}\ \bot\delta\ \underline{x}\ \underline{w})$

Syntax 2: sentence

Ole — HV.TNS buy.ASP — A *sick* dog — .

(HV.TNS buy.ASP: >**B**)

s/vp: $\lambda \underline{P}\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ \underline{P}\top\delta\underline{w})$

tv: $\lambda \underline{y}\lambda \underline{x}\lambda \underline{w}[buy_{\underline{w}}\langle \underline{x}, \underline{y}\rangle]$

vp\tv: $\lambda \underline{R}\lambda \underline{x}\lambda \underline{w}([y|\ sick_{\underline{w}}\ y,\ dog_{\underline{w}}\ y];\ \underline{R}\ \bot\delta\ \underline{w})$

s\s: $\lambda \underline{W}(\underline{W}\top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

—————— >

vp: $\lambda \underline{x}\lambda \underline{w}[y|\ sick_{\underline{w}}\ y,\ dog_{\underline{w}}\ y,\ buy_{\underline{w}}\langle \underline{x}, y\rangle]$

—————— <

s: $\lambda \underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ sick_{\underline{w}}\ y,\ dog_{\underline{w}}\ y,\ buy_{\underline{w}}\langle\top\delta, y\rangle])$

—————— <

s: $([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [y|\ sick_{\top\omega}\ y,\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

Updates

1 $*\mathtt{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$

$= {}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\ \rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\}$ $=: \mathtt{c}_1$

2 $\mathtt{c}_1[\![[y|\ sick_{\top\omega}\ y,\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle]]\!]^g$

$= {}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w})\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w})\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w})\}$ $=: \mathtt{c}_2$

3 $\mathtt{c}_2[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

$= {}^{\chi}\{\langle\langle\mathtt{p}_1, [\![ole]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w})\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w})\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w})$
$\&\ \mathtt{p}_1 = {}^{\chi}\{\mathtt{v} \in {}^{\{\}}\mathtt{p}_0|\ \exists \mathtt{d}'\!:\ \mathtt{d}' \in {}^{\{\}}[\![sick]\!](\mathtt{v})\ \&\ \mathtt{d}' \in {}^{\{\}}[\![dog]\!](\mathtt{v})\ \&\ \langle[\![ole]\!], \mathtt{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{v})\}\}$ $=: \mathtt{c}_3$

Example: Let $\mathtt{p}_0 = {}^{\chi}\{\mathtt{w}_0, \mathtt{w}_1, \mathtt{w}_2, \mathtt{w}_3\}$

and $\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w}_0)\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_0)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_0)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w}_1)\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_1)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_1)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w}_2)\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_2)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_2)\} = \{\mathtt{d}_2\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![sick]\!](\mathtt{w}_3)\ \&\ \mathtt{d} \in {}^{\{\}}[\![dog]\!](\mathtt{w}_3)\ \&\ \langle[\![ole]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathtt{w}_3)\} = \{\mathtt{d}_1\}$

Then:

$*\mathtt{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)°]]\!]^g$ — $\mathtt{c}_1[\![[y|\ sick_{\top\omega}\ y,\ dog_{\top\omega}\ y,\ buy_{\top\omega}\langle\top\delta, y\rangle]]\!]^g$ — $\mathtt{c}_2[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

${}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}_0, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\ \rangle\rangle\}$
$\langle\langle[\![ole]\!], \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\ \rangle\rangle\}$

${}^{\chi}\{\langle\langle[\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle,$
$\langle\langle[\![ole]\!], \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle\}$

${}^{\chi}\{\langle\langle{}^{\chi}\{\mathtt{w}_2, \mathtt{w}_3\}, [\![ole]\!], \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle,$
$\langle\langle{}^{\chi}\{\mathtt{w}_2, \mathtt{w}_3\}, [\![ole]\!], \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle\}$

KALAALLISUT (4_K)

($4'_K$) **Morphology 1.** MOD(ifier) s/s

sick- | -n\vp | -MOD

vp: $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$ | n\vp: $\lambda \underline{P}\lambda \underline{w}\lambda \underline{x}(\underline{P}\ \underline{x}\ \underline{w})$ | s/s\n: $\lambda \underline{N}\lambda K([y];\ \underline{N}\ \top\omega\ \bot\delta;\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K)$

$\rule{}{}$ <

n: $\lambda \underline{w}\lambda \underline{x}\ ([sick_{\underline{w}}\ \underline{x}]$

$\rule{}{}$ <

s/s: $\lambda K(([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K)$

Morphology 2. s with anaphoric *-get*

dog- | *-get* | -DEC.IV | -3SG

n: $\lambda \underline{w}\lambda \underline{x}[dog_{\underline{w}}\ \underline{x}]$ | vp\n: $\lambda \underline{N}\lambda \underline{x}\lambda \underline{w}(\partial[\bot\delta t = \bot\delta\{|_{\underline{w}}\}];\ [buy_{\underline{w}}\langle \underline{x}, \bot\delta\rangle];\ \underline{N}\ \underline{w}\ \bot\delta)$ | s\vp/np: $\lambda \underline{x}\ \underline{P}(\underline{P}\ \underline{x}\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$ | np: $\top\delta$

$\rule{}{}$ < $\rule{}{}$ >

vp: $\lambda \underline{x}\lambda \underline{w}\ (\partial[\bot\delta t = \bot\delta\{|_{\underline{w}}\}];\ [buy_{\underline{w}}\langle \underline{x}, \bot\delta\rangle,\ dog_{\underline{w}}\ \bot\delta]$ | s\vp: $\lambda \underline{P}(\underline{P}\ \top\delta\ \top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

$\rule{}{}$ <

s: $(\partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}];\ [buy_{\top\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\top\omega}\ \bot\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

✓ **Syntax** w/anaphoric *-get*

Ole | sick-n\vp-MOD | dog-get-DEC.IV-3SG

$\rule{}{}$ < $\rule{}{}$ <

s/s: $\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ K)$ | s/s: $\lambda K(([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K)$ | s: $\partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}];\ \ldots[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

$\rule{}{}$ >**B**

s/s: $\lambda K(([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K))$

$\rule{}{}$ >

s: $([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ (\partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}];\ [buy_{\top\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\top\omega}\ \bot\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])))$

$([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}];\ [y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}];\ \partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}];\ [buy_{\top\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\top\omega}\ \bot\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

$([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}];\ [y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}];\ [buy_{\top\omega}\langle\top\delta, \bot\delta\rangle,\ dog_{\top\omega}\ \bot\delta];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

cf. * **Syntax** w/non-anaphoric *-get*

Ole | sick-n\vp-MOD | dog-*get*-DEC.IV-3SG

$\rule{}{}$ < $\rule{}{}$ <

s/s: $\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ K)$ | s/s: $\lambda K(([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K)$ | s: $[y|\ buy_{\top\omega}\langle\top\delta, y\rangle, \ldots];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]$

$\rule{}{}$ >**B**

s/s: $\lambda K(([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ K))$

$\rule{}{}$ >

s: $([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([y|\ sick_{\top\omega}\ y];\ [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot};\ ([y|\ buy_{\top\omega}\langle\top\delta, y\rangle,\ dog_{\top\omega}\ y];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])))$

–? (no $\bot\delta t$)

$\mathbf{0}$ (:= $\lambda I\lambda j\ \neg(j = j)$)

• **Updates**

1 $\ast p_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$

= $^{\chi}\{\langle\langle[\![ole]\!], w, p_0\rangle, \langle\ \rangle\rangle|\ w \in {}^{\{\}}p_0\}$ =: c_1

2 $c_1[\![[y|\ sick_{\top\omega}\ y]]\!]^g$

= $^{\chi}\{\langle\langle[\![ole]\!], w, p_0\rangle, \langle d\rangle\rangle|\ w \in {}^{\{\}}p_0\ \&\ d \in {}^{\{\}}[\![sick]\!](w)\}$ =: c_2

3 $c_2[\![[X|\ X = \bot\delta\{|_{\top\omega}\}]]\!]^g$

= $^{\chi}\{\langle\langle[\![ole]\!], w, p_0\rangle, \langle X, d\rangle\rangle|\ w \in {}^{\{\}}p_0\ \&\ d \in {}^{\{\}}[\![sick]\!](w)\ \&\ X = {}^{\chi}\{d'|\ d' \in {}^{\{\}}[\![sick]\!](w)\}\}$ =: c_3

∂3 $c_3[\![\partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}]]\!]^g$

= $^{\chi}\{j \in c_3|\ c_3[\![[\bot\delta t = \bot\delta\{|_{\top\omega}\}]]\!]^g = c_3\}$ = c_3

4 $\mathtt{c}_3[\![[\mathit{buy}_{\top\omega}\langle\top\delta, \bot\delta\rangle, \mathit{dog}_{\top\omega}\,\bot\delta]]\!]^g$

$= {}^{\chi}\{\langle\langle[\![\mathit{ole}]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\mathtt{X}, \mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w})\ \&\ \mathtt{X} = {}^{\chi}\{\mathtt{d}'|\ \mathtt{d}' \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w})\}$
$\quad \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w})\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w})\}$ $=: \mathtt{c}_4$

5 $\mathtt{c}_4[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

$= {}^{\chi}\{\langle\langle\mathtt{p}_1, [\![\mathit{ole}]\!], \mathtt{w}, \mathtt{p}_0\rangle, \langle\mathtt{X}, \mathtt{d}\rangle\rangle|\ \mathtt{w} \in {}^{\{\}}\mathtt{p}_0\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w})\ \&\ \mathtt{X} = {}^{\chi}\{\mathtt{d}'|\ \mathtt{d}' \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w})\}$
$\quad \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w})\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w})$
$\quad \&\ \mathtt{p}_1 = {}^{\chi}\{\mathtt{v} \in {}^{\{\}}\mathtt{p}_0|\ \exists\mathtt{d}': \mathtt{d}' \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{v})\ \&\ \mathtt{d}' \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{v})\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}'\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{v})\}\}$ $=: \mathtt{c}_5$

Example: Suppose $\mathtt{p}_0 = {}^{\chi}\{\mathtt{w}_0, \mathtt{w}_1, \mathtt{w}_2, \mathtt{w}_3\}$

and $[\![\mathit{ole}]\!] = \mathtt{d}_0$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_0)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_1)\} = \{\mathtt{d}_2\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_2)\} = \{\mathtt{d}_1, \mathtt{d}_2\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_3)\} = \{\mathtt{d}_0, \mathtt{d}_1\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_0)\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w}_0)\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w}_0)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_1)\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w}_1)\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w}_1)\} = \{\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_2)\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w}_2)\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w}_2)\} = \{\mathtt{d}_2\}$

$\{\mathtt{d}|\ \mathtt{d} \in {}^{\{\}}[\![\mathit{sick}]\!](\mathtt{w}_3)\ \&\ \mathtt{d} \in {}^{\{\}}[\![\mathit{dog}]\!](\mathtt{w}_3)\ \&\ \langle[\![\mathit{ole}]\!], \mathtt{d}\rangle \in {}^{\{\}}[\![\mathit{buy}]\!](\mathtt{w}_3)\} = \{\mathtt{d}_1\}$

then

$*\mathtt{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = \mathit{ole})^\circ]]\!]^g$	$\mathtt{c}_1[\![[y|\ \mathit{sick}_{\top\omega}\, y]]\!]^g$	$\mathtt{c}_2[\![[X|\ X = \bot\delta\{|_{\top\omega}\}]]\!]^g$
${}^{\chi}\{\langle\langle\mathtt{d}_0, \mathtt{w}_0, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$		
$\langle\langle\mathtt{d}_0, \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$	${}^{\chi}\{\langle\langle\mathtt{d}_0, \mathtt{w}_1, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle,$	${}^{\chi}\{\langle\langle\mathtt{d}_0, \mathtt{w}_1, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$
$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\ \rangle\rangle,$	$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle,$	$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_1\rangle\rangle,$
	$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle\mathtt{d}_2\rangle\rangle,$	$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$
$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\ \rangle\rangle\}$	$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\mathtt{d}_0\rangle\rangle,$	$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_0\rangle\rangle,$
	$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle\mathtt{d}_1\rangle\rangle\}$	$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_1\rangle\rangle\}$

$\mathtt{c}_3[\![\partial[\bot\delta t = \bot\delta\{|_{\top\omega}\}]]\!]^g$	$\mathtt{c}_3[\![[\mathit{buy}_{\top\omega}\langle\top\delta, \bot\delta\rangle, \mathit{dog}_{\top\omega}\,\bot\delta]]\!]^g$	$\mathtt{c}_4[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$
${}^{\chi}\{\langle\langle\mathtt{d}_0, \mathtt{w}_1, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$		
$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_1\rangle\rangle,$		
$\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$	${}^{\chi}\{\langle\langle\mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$	${}^{\chi}\{\langle\langle{}^{\chi}\{\mathtt{w}_2, \mathtt{w}_3\}, \mathtt{d}_0, \mathtt{w}_2, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_1, \mathtt{d}_2\}, \mathtt{d}_2\rangle\rangle,$
$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_0\rangle\rangle,$		
$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_1\rangle\rangle\}$	$\langle\langle\mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_1\rangle\rangle\}$	$\langle\langle{}^{\chi}\{\mathtt{w}_2, \mathtt{w}_3\}, \mathtt{d}_0, \mathtt{w}_3, \mathtt{p}_0\rangle, \langle{}^{\chi}\{\mathtt{d}_0, \mathtt{d}_1\}, \mathtt{d}_1\rangle\rangle\}$

Homework 7

Complete the following analysis of Kalaallisut (5_K).
NOTE: Given the lexical ambiguity of '-MOD', '-get', and '-not' in Kalaallisut fragment 1, there are seven other analyses to consider. For now, don't worry about other lexical entries (unless you want to)—we'll come back to them when we discuss the solution to this homework.

• KALAALLISUT (5_K)

(5_K) Ole naparsimasumik qimmisinngilaq.
Ole naparsima-tuq-mik qimmiq-si-nngit-la-q
Ole sick-n\vp-MOD dog-get-not-DEC.NG-3SG

($5'_K$) **Morphology 1:** (MOD)ifier s for negated s-word
sick- -n\vp -MOD
⋮

Morphology 2: negated vp-base
dog- -get -not -DEC.NG -3SG
⋮

✓ Syntax
Ole sick-n\vp-MOD dog-get-not-DEC.NG-3SG
⋮
——————————————————————————————————————>
s:
$([\mathbf{x}|\ (\mathbf{x} = ole)^\circ]^{\top}; (([v|\ v \in \top\omega\{|\}]; [y|\ sick_{\bot\omega}\, y]; [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot}; (\partial[\bot\omega \in \top\omega\{|\}]; \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]; [buy_{\bot\omega}\langle\top\delta, \bot\delta\rangle,$
$dog_{\bot\omega}\,\bot\delta]; [p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])))$

$([\mathbf{x}|\ (\mathbf{x} = ole)^\circ]; [v|\ v \in \top\omega\{|\}]; [y|\ sick_{\bot\omega}\, y]; [X|\ X = \bot\delta\{|_{\bot\omega}\}]; \partial[\bot\omega \in \top\omega\{|\}]; \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]; [buy_{\bot\omega}\langle\top\delta, \bot\delta\rangle,$
$dog_{\bot\omega}\,\bot\delta]; [p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

Updates

1 $*\mathrm{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$
$= {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle\ \rangle\rangle|\ \mathrm{w} \in {}^{\{\}}\mathrm{p}_0\}$ $=: \mathrm{c}_1$
⋮

8 $\mathrm{c}_7[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$
$= {}^{\chi}\{\langle\langle\mathrm{p}_2, [\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle\mathrm{p}_1, \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})$
$\&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists\mathrm{d}'\!: \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}$
$\&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1\ \&\ \mathrm{p}_2 = {}^{\chi}\{\mathrm{w}' \in {}^{\{\}}\mathrm{p}_0|\ \mathrm{w}' \notin {}^{\{\}}\mathrm{p}_1\}\}$ $=: \mathrm{c}_8$

Example: Let $\mathrm{p}_0 = {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1, \mathrm{w}_2, \mathrm{w}_3\}$,
$[\![ole]\!] = \mathrm{d}_0$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_0)\} = \{\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_1)\} = \{\mathrm{d}_2\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_2)\} = \{\mathrm{d}_1, \mathrm{d}_2\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_3)\} = \{\mathrm{d}_0, \mathrm{d}_1\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_0)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_0)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_0)\} = \{\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_1)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_1)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_1)\} = \{\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_2)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_2)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_2)\} = \{\mathrm{d}_2\}$
$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_3)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_3)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_3)\} = \{\mathrm{d}_1\}$

Then:
⋮

Solution to homework 7 (and related issues)

KALAALLISUT (5_K)

($5'_K$) **Morphology 1:** (MOD)ifier s for negated s-word

sick- | -n\vp | -MOD

vp: $\lambda \underline{x}\lambda \underline{w}[sick_{\underline{w}}\ \underline{x}]$

n\vp: $\lambda \underline{P}\lambda \underline{w}\lambda \underline{x}(\underline{P}\ \underline{x}\ \underline{w})$

s/s\n: $\lambda \underline{N}\lambda K([v|\ v \in \top\omega\{|\}];\ [y];\ \underline{N}\ \bot\omega\ \bot\delta;\ [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot};\ K)$

—— <

n: $\lambda \underline{w}\lambda \underline{x}\ ([sick_{\underline{w}}\ \underline{x}]$

—— <

s/s: $\lambda K(([v|\ v \in \top\omega\{|\}];\ [y];\ [sick_{\bot\omega}\ \bot\delta];\ [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot};\ K)$

$\lambda K(([v|\ v \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\ y];\ [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot};\ K)$

Morphology 2a: negated vp-base

dog-get- | -not

vp: $\lambda \underline{x}\lambda \underline{w}\ (\partial[\bot\delta t = \bot\delta\{|_{\underline{w}}\}];\ [buy_{\underline{w}}\langle \underline{x}, \bot\delta\rangle,\ dog_{\underline{w}}\ \bot\delta])$ ——<

vp\vp: $\lambda \underline{P}\lambda \underline{x}\lambda \underline{w}(\partial[\bot\omega \in \underline{w}\{|\}];\ \underline{P}\ \underline{x}\ \bot\omega;\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$ ——>

—— <

vp: $\lambda \underline{x}\lambda \underline{w}(\partial[\bot\omega \in \underline{w}\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];\ [buy_{\bot\omega}\langle \underline{x}, \bot\delta\rangle,\ dog_{\bot\omega}\ \bot\delta];\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

Morphology 2b: negated s-word

dog-get-not- | -DEC.NG | -3SG

vp: $\lambda \underline{x}\lambda \underline{w}(\partial[\bot\omega \in \underline{w}\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];$
$[buy_{\bot\omega}\langle \underline{x}, \bot\delta\rangle,\ dog_{\bot\omega}\ \bot\delta];\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

s\vp/np: $\lambda \underline{x}\ \underline{P}(\underline{P}\ \underline{x}\ \top\omega^{\bot};\ (\partial[\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

np: $\top\delta$

—— >

s\vp: $\lambda \underline{P}(\underline{P}\ \top\delta\ \top\omega^{\bot};\ (\partial[\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

—— <

s: $(\partial[\bot\omega \in \top\omega\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];\ [buy_{\bot\omega}\langle \top\delta, \bot\delta\rangle,\ dog_{\bot\omega}\ \bot\delta];\ [p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ \partial[\top\omega \notin \bot\Omega];$
$[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

✓ Syntax

Ole sick-n\vp-MOD | dog-get-not-DEC.NG-3SG

—— >**B** | —— <

s/s: $\lambda K([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([v|\ v \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\ y];$
$[X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot};\ K))$

s: $(\partial[\bot\omega \in \top\omega\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];\ [buy_{\bot\omega}\langle \top\delta, \bot\delta\rangle,\ dog_{\bot\omega}\ \bot\delta];$
$[p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ \partial[\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

—— >

s:

$([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top};\ (([v|\ v \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\ y];\ [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot};\ (\partial[\bot\omega \in \top\omega\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];\ [buy_{\bot\omega}\langle \top\delta, \bot\delta\rangle,$
$dog_{\bot\omega}\ \bot\delta];\ [p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ \partial[\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])))$

$([\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}];\ [v|\ v \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\ y];\ [X|\ X = \bot\delta\{|_{\bot\omega}\}];\ \partial[\bot\omega \in \top\omega\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];\ [buy_{\bot\omega}\langle \top\delta, \bot\delta\rangle,$
$dog_{\bot\omega}\ \bot\delta];\ [p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ \partial[\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

Updates

1 $*\mathrm{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle\ \rangle\rangle|\ \mathrm{w} \in {}^{\{\}}\mathrm{p}_0\}$ $=: \mathrm{c}_1$

2 $\mathrm{c}_1[\![[v|\ v \in \top\omega\{|\}]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\}$ $=: \mathrm{c}_2$

3 $\mathrm{c}_2[\![[y|\ sick_{\bot\omega}\, y]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$ $=: \mathrm{c}_3$

4 $\mathrm{c}_3[\![[X|\ X = \bot\delta\{|_{\bot\omega}\}]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}\}$ $=: \mathrm{c}_4$

∂2 $\mathrm{c}_4[\![[\bot\omega \in \top\omega\{|\}]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ ((\bot\mathrm{j})_\omega)_1 \in \{((\top\mathrm{i})_\omega)_1|\ \mathrm{i} \in {}^{\{\}}\mathrm{c}_4\}\}$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \mathrm{v} \in \{\mathrm{w}'|\ \exists \mathrm{i} \in {}^{\{\}}\mathrm{c}_4\colon \mathrm{w}' = ((\top\mathrm{i})_\omega)_1\}\}$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}\ \&\ \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\}$ $= \mathrm{c}_4$

$\mathrm{c}_4[\![\partial[\bot\omega \in \top\omega\{|\}]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ \mathrm{c}_4[\![[\bot\omega \in \top\omega\{|\}]]\!]^g = \mathrm{c}_4\}$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ \mathrm{c}_4 = \mathrm{c}_4\}$ $= \mathrm{c}_4$

∂4 $\mathrm{c}_4[\![[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ ((\bot\mathrm{j})_{\delta t})_1 = {}^{\chi}\{((\bot\mathrm{i})_\delta)_1|\ \mathrm{i} \in {}^{\{\}}\mathrm{c}_4\ \&\ ((\bot\mathrm{i})_\omega)_1 = ((\bot\mathrm{j})_\omega)_1\}\}$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}''|\ \exists \mathrm{i} \in {}^{\{\}}\mathrm{c}_4\colon ((\bot\mathrm{i})_\omega)_1 = \mathrm{v}\ \ \&\ \mathrm{d}'' = ((\bot\mathrm{i})_\delta)_1\}\}$ $= \mathrm{c}_4$

$\mathrm{c}_4[\![\partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ \mathrm{c}_4[\![[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]]\!]^g = \mathrm{c}_4\}$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_4|\ \mathrm{c}_4 = \mathrm{c}_4\}$ $= \mathrm{c}_4$

5 $\mathrm{c}_4[\![[buy_{\bot\omega}\langle\top\delta, \bot\delta\rangle, dog_{\bot\omega}\, \bot\delta]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})\}$ $=: \mathrm{c}_5$

6 $\mathrm{c}_5[\![[p|\ p = \bot\omega\{|\}]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})$
$\quad \&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\colon \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}\}$ $=: \mathrm{c}_6$

7 $\mathrm{c}_6[\![[\top\omega \notin \bot\Omega]]\!]^g$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})$
$\quad \&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\colon \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}$
$\quad \&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1\}$ $=: \mathrm{c}_7$

∂7 $\mathrm{c}_7[\![[\top\omega \notin \bot\Omega]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_7|\ ((\top\mathrm{j})_\omega)_1 \notin {}^{\{\}}((\bot\mathrm{j})_\Omega)_1\}$

$= \ {}^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{X}, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{X} = {}^{\chi}\{\mathrm{d}'|\ \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{v})\}$
$\quad \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})$
$\quad \&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\colon \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}$
$\quad \&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1\ \&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1\}$ $= \mathrm{c}_7$

$\mathrm{c}_7[\![\partial[\top\omega \notin \bot\Omega]]\!]^g$

$= \ {}^{\chi}\{\mathrm{j} \in \mathrm{c}_7|\ \mathrm{c}_7[\![[\bot\omega \notin\ \bot\Omega]]\!]^g = \mathrm{c}_7\}$ $= \mathrm{c}_7$

8 $c_7 \llbracket [\mathbf{p} |\ \mathbf{p} = \top\omega\{|\}] \rrbracket^g$

$= {}^{\chi}\{\langle\langle p_2, \llbracket ole \rrbracket, w, p_0\rangle, \langle p_1, X, d, v\rangle\rangle |\ w, v \in {}^{\{\}}p_0\ \&\ d \in {}^{\{\}}\llbracket sick \rrbracket(v)\ \&\ X = {}^{\chi}\{d' |\ d' \in {}^{\{\}}\llbracket sick \rrbracket(v)\}$
$\quad \&\ \langle \llbracket ole \rrbracket, d\rangle \in {}^{\{\}}\llbracket buy \rrbracket(v)\ \&\ d \in {}^{\{\}}\llbracket dog \rrbracket(v)$
$\quad \&\ p_1 = {}^{\chi}\{u \in {}^{\{\}}p_0 |\ \exists d': d' \in {}^{\{\}}\llbracket sick \rrbracket(u)\ \&\ d' \in {}^{\{\}}\llbracket dog \rrbracket(u)\ \&\ \langle \llbracket ole \rrbracket, d'\rangle \in {}^{\{\}}\llbracket buy \rrbracket(u)\}$
$\quad \&\ w \notin {}^{\{\}}p_1\ \&\ p_2 = {}^{\chi}\{w' \in {}^{\{\}}p_0 |\ w' \notin {}^{\{\}}p_1\}\}$ $=: c_8$

Example: Let $p_0 = {}^{\chi}\{w_0, w_1, w_2, w_3\}$,

$\llbracket ole \rrbracket = d_0$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_0)\} = \{\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_1)\} = \{d_2\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_2)\} = \{d_1, d_2\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_3)\} = \{d_0, d_1\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_0)\ \&\ d \in {}^{\{\}}\llbracket dog \rrbracket(w_0)\ \&\ \langle \llbracket ole \rrbracket, d\rangle \in {}^{\{\}}\llbracket buy \rrbracket(w_0)\} = \{\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_1)\ \&\ d \in {}^{\{\}}\llbracket dog \rrbracket(w_1)\ \&\ \langle \llbracket ole \rrbracket, d\rangle \in {}^{\{\}}\llbracket buy \rrbracket(w_1)\} = \{\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_2)\ \&\ d \in {}^{\{\}}\llbracket dog \rrbracket(w_2)\ \&\ \langle \llbracket ole \rrbracket, d\rangle \in {}^{\{\}}\llbracket buy \rrbracket(w_2)\} = \{d_2\}$
$\{d |\ d \in {}^{\{\}}\llbracket sick \rrbracket(w_3)\ \&\ d \in {}^{\{\}}\llbracket dog \rrbracket(w_3)\ \&\ \langle \llbracket ole \rrbracket, d\rangle \in {}^{\{\}}\llbracket buy \rrbracket(w_3)\} = \{d_1\}$

Then:

$*p_0\llbracket [\mathbf{x} |\ (\mathbf{x} = ole)°] \rrbracket^g$	$c_1\llbracket [v |\ v \in \top\omega\{|\}] \rrbracket^g$	$c_2\llbracket [y |\ sick_{\perp\omega}\, y] \rrbracket^g$	$c_3\llbracket [X |\ X = \perp\delta\{|_{\perp\omega}\}] \rrbracket^g$
${}^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle\ \rangle\rangle,$	${}^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle w_0\rangle\rangle,$	${}^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle d_2, w_1\rangle\rangle,$	${}^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle {}^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
	$\langle\langle d_0, w_0, p_0\rangle, \langle w_1\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle d_1, w_2\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
	$\langle\langle d_0, w_0, p_0\rangle, \langle w_2\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle d_2, w_2\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
	$\langle\langle d_0, w_0, p_0\rangle, \langle w_3\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle d_0, w_3\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_0, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle\ \rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle w_0\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle d_1, w_3\rangle\rangle,$	$\langle\langle d_0, w_0, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_1, w_3\rangle\rangle,$
	$\langle\langle d_0, w_1, p_0\rangle, \langle w_1\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle d_2, w_1\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle {}^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
	$\langle\langle d_0, w_1, p_0\rangle, \langle w_2\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle d_1, w_2\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
	$\langle\langle d_0, w_1, p_0\rangle, \langle w_3\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle d_2, w_2\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle\ \rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle w_0\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle d_0, w_3\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_0, w_3\rangle\rangle,$
	$\langle\langle d_0, w_2, p_0\rangle, \langle w_1\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle d_1, w_3\rangle\rangle,$	$\langle\langle d_0, w_1, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_1, w_3\rangle\rangle,$
	$\langle\langle d_0, w_2, p_0\rangle, \langle w_2\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle d_2, w_1\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle {}^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
	$\langle\langle d_0, w_2, p_0\rangle, \langle w_3\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle d_1, w_2\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle\ \rangle\rangle\}$	$\langle\langle d_0, w_3, p_0\rangle, \langle w_0\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle d_2, w_2\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
	$\langle\langle d_0, w_3, p_0\rangle, \langle w_1\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle d_0, w_3\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_0, w_3\rangle\rangle,$
	$\langle\langle d_0, w_3, p_0\rangle, \langle w_2\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle d_1, w_3\rangle\rangle,$	$\langle\langle d_0, w_2, p_0\rangle, \langle {}^{\chi}\langle d_0, d_1\}, d_1, w_3\rangle\rangle,$
	$\langle\langle d_0, w_3, p_0\rangle, \langle w_3\rangle\rangle\}$	$\langle\langle d_0, w_3, p_0\rangle, \langle d_2, w_1\rangle\rangle,$	$\langle\langle d_0, w_3, p_0\rangle, \langle {}^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
		$\langle\langle d_0, w_3, p_0\rangle, \langle d_1, w_2\rangle\rangle,$	$\langle\langle d_0, w_3, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
		$\langle\langle d_0, w_3, p_0\rangle, \langle d_2, w_2\rangle\rangle,$	$\langle\langle d_0, w_3, p_0\rangle, \langle {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
		$\langle\langle d_0, w_3, p_0\rangle, \langle d_0, w_3\rangle\rangle,$	$\langle\langle d_0, w_3, p_0\rangle, \langle {}^{\chi}\{d_0, d_1\}, d_0, w_3\rangle\rangle,$
		$\langle\langle d_0, w_3, p_0\rangle, \langle d_1, w_3\rangle\rangle\}$	$\langle\langle d_0, w_3, p_0\rangle, \langle {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_4\llbracket\partial[\bot\omega \in \top\omega\{|\}];\ \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]\rrbracket^g$

$^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_0, w_3\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_0, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_0, w_3\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_2\}, d_2, w_1\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_1, w_2\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_0, w_3\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_4\llbracket[buy_{\bot\omega}\langle\top\delta, \bot\delta\rangle, dog_{\bot\omega}\,\bot\delta]\rrbracket^g$

$^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_5\llbracket[p|\ p = \bot\omega\{|\}]\rrbracket^g$

$^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_2, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_3, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_6\llbracket[\top\omega \notin \bot\Omega]\rrbracket^g$

$^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_7\llbracket\partial[\top\omega \notin \bot\Omega]\rrbracket^g$

$^{\chi}\{\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

$c_7\llbracket[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]\rrbracket^g$

$^{\chi}\{\langle\langle^{\chi}\{w_0, w_1\}, d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle^{\chi}\{w_0, w_1\}, d_0, w_0, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle,$
$\langle\langle^{\chi}\{w_0, w_1\}, d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_1, d_2\}, d_2, w_2\rangle\rangle,$
$\langle\langle^{\chi}\{w_0, w_1\}, d_0, w_1, p_0\rangle, \langle^{\chi}\{w_2, w_3\}, {}^{\chi}\{d_0, d_1\}, d_1, w_3\rangle\rangle\}$

Absurd (or equivalent) updates:

$[\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top}; (([w|\ w \in \top\omega\{|\}]; [y|\ sick_{\bot\omega}\,y]; [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot}; (\partial[\bot\omega \in \top\omega\{|\}]; [y|\ get_{\bot\omega}\langle\top\delta, y\rangle, dog_{\bot\omega}\,y];$
$[p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv \mathbf{0}$ (no $\bot\delta t$ in the box after $^{\bot}$;)

$[\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top}; (([w|\ w \in \top\omega\{|\}]; [y|\ sick_{\bot\omega}\,y]; [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot}; ([v|\ v \in \top\omega\{|\}]; \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}];$
$[get_{\bot\omega}\langle\top\delta, \bot\delta\rangle, dog_{\bot\omega}\,\bot\delta]; [p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv \mathbf{0}$ (presupposition failure due to $\bot\omega$ reset by $[v|\ v \in \top\omega\{|\}]$)

$[\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top}; (([w|\ w \in \top\omega\{|\}]; [y|\ sick_{\bot\omega}\,y]; [X|\ X = \bot\delta\{|_{\bot\omega}\}])^{\bot}; ([v|\ v \in \top\omega\{|\}]; [y|\ get_{\bot\omega}\langle\top\delta, y\rangle, dog_{\bot\omega}\,y];$
$[p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv \mathbf{0}$ (no $\bot\delta t$ in the box after $^{\bot}$;)

$[\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]^{\top}; (([y|\ sick_{\top\omega}\,y]; [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot}; (\partial[\bot\omega \in \top\omega\{|\}]; \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]; [get_{\bot\omega}\langle\top\delta, \bot\delta\rangle, dog_{\bot\omega}\,\bot\delta];$
$[p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv \mathbf{0}$ (presupposition failure for any realistic $\llbracket\cdot\rrbracket$, due to $\top\omega$ in $[X|\ X = \bot\delta\{|_{\top\omega}\}]$ vs. $\bot\omega$ in $\partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]$)

$[\mathbf{x}|\ (\mathbf{x} = ole)°]^{\top}; (([y|\ sick_{\top\omega}\, y]; [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot}; (\partial[\bot\omega \in \top\omega\{|\}]; [y|\ get_{\bot\omega}\langle\top\delta, y\rangle, dog_{\bot\omega}\, y]; [p|\ p = \bot\omega\{|\}];$
$[\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv$ **0** (no $\bot\delta t$ in the box after $^{\bot}$;)

$[\mathbf{x}|\ (\mathbf{x} = ole)°]^{\top}; (([y|\ sick_{\top\omega}\, y]; [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot}; ([v|\ v \in \top\omega\{|\}]; \partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]; [get_{\bot\omega}\langle\top\delta, \bot\delta\rangle, dog_{\bot\omega}\, \bot\delta];$
$[p|\ p = \bot\omega\{|\}]; [\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv$ **0** (presupposition failure for any realistic $[\![\cdot]\!]$, due to $\top\omega$ in $[X|\ X = \bot\delta\{|_{\top\omega}\}]$ vs. $\bot\omega$ in $\partial[\bot\delta t = \bot\delta\{|_{\bot\omega}\}]$)

$[\mathbf{x}|\ (\mathbf{x} = ole)°]^{\top}; (([y|\ sick_{\top\omega}\, y]; [X|\ X = \bot\delta\{|_{\top\omega}\}])^{\bot}; ([v|\ v \in \top\omega\{|\}]; [y|\ get_{\bot\omega}\langle\top\delta, y\rangle, dog_{\bot\omega}\, y]; [p|\ p = \bot\omega\{|\}];$
$[\top\omega \notin \bot\Omega]; \partial[\top\omega \notin \bot\Omega]; [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]))$

$\equiv$ **0** (no $\bot\delta t$ in the box after $^{\bot}$;)

cf. ENGLISH (5_E)

($5'_E$) • **Syntax 1:** negated vp

HV.TNS=*N'T* | buy.ASP A sick dog

vp/vp: $\lambda\underline{P}\lambda\underline{x}\lambda\underline{w}([v|\ v \in \underline{w}\{|\}];\ \underline{P}\ \underline{x}\ \bot\omega;\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

tv: vp: $\lambda\underline{x}\lambda\underline{w}[y|\ sick_{\underline{w}}\, y, dog_{\underline{w}}\, y, buy_{\underline{w}}\langle\underline{x}, y\rangle]$ <

——————————————————————— >

vp:
$\lambda\underline{x}\lambda\underline{w}([v|\ v \in \underline{w}\{|\}];\ [y|\ sick_{\bot\omega}\, y, dog_{\bot\omega}\, y, buy_{\bot\omega}\langle\underline{x}, y\rangle];\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

• **Syntax 2:** sentence

Ole | HV.TNS=*N'T* buy.ASP A sick dog | .

$\underline{s}$/vp: $\lambda\underline{P}\lambda\underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ \underline{P}\top\delta\underline{w})$

vp: $\lambda\underline{x}\lambda\underline{w}([v|\ v \in \underline{w}\{|\}];\ \ldots;\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

$\underline{s}$\s: $\lambda\underline{W}(\underline{W}\top\omega;\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

——————————————————————— >

$\underline{s}$: $\lambda\underline{w}([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [v|\ v \in \underline{w}\{|\}];\ [y|\ sick_{\bot\omega}\, y, dog_{\bot\omega}\, y, buy_{\bot\omega}\langle\underline{x}, y\rangle];\ [p|\ p = \bot\omega\{|\}];\ [\underline{w} \notin \bot\Omega])$

——————————————————————— <

s: $([\mathbf{x}|\ (\mathbf{x} = ole)°];\ [v|\ v \in \top\omega\{|\}];\ [y|\ sick_{\bot\omega}\, y, dog_{\bot\omega}\, y, buy_{\bot\omega}\langle\underline{x}, y\rangle];\ [p|\ p = \bot\omega\{|\}];\ [\top\omega \notin \bot\Omega];\ [\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}])$

• **Updates**

1 $*\mathrm{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)]]\!]^g$

$= \ ^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle\ \rangle\rangle|\ \mathrm{w} \in {}^{\{\}}\mathrm{p}_0\}$ $=: \mathrm{c}_1$

2 $\mathrm{c}_1[\![[v|\ v \in \top\omega\{|\}]]\!]^g$

$= \ ^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\}$ $=: \mathrm{c}_2$

3 $\mathrm{c}_2[\![[y|\ sick_{\bot\omega}\, y, dog_{\bot\omega}\, y, buy_{\bot\omega}\langle\tau\delta, y\rangle]]\!]^g$

$= \ ^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})\}$ $=: \mathrm{c}_3$

4 $\mathrm{c}_3[\![[p|\ p = \bot\omega\{|\}]]\!]^g$

$= \ ^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})$
$\&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\!: \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}\}$ $=: \mathrm{c}_4$

5 $\mathrm{c}_4[\![[\top\omega \notin \bot\Omega]]\!]^g$

$= \ ^{\chi}\{\langle\langle[\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})$
$\&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\!: \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}\ \&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1\}$ $=: \mathrm{c}_5$

6 $\mathrm{c}_5[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

$= \ ^{\chi}\{\langle\langle \mathrm{p}_2, [\![ole]\!], \mathrm{w}, \mathrm{p}_0\rangle, \langle \mathrm{p}_1, \mathrm{d}, \mathrm{v}\rangle\rangle|\ \mathrm{w}, \mathrm{v} \in {}^{\{\}}\mathrm{p}_0\ \&\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{v})\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{v})\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{v})$
$\&\ \mathrm{p}_1 = {}^{\chi}\{\mathrm{u} \in {}^{\{\}}\mathrm{p}_0|\ \exists \mathrm{d}'\!: \mathrm{d}' \in {}^{\{\}}[\![sick]\!](\mathrm{u})\ \&\ \mathrm{d}' \in {}^{\{\}}[\![dog]\!](\mathrm{u})\ \&\ \langle[\![ole]\!], \mathrm{d}'\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{u})\}\ \&\ \mathrm{w} \notin {}^{\{\}}\mathrm{p}_1$
$\&\ \mathrm{p}_2 = {}^{\chi}\{\mathrm{w}' \in {}^{\{\}}\mathrm{p}_0|\ \mathrm{w}' \notin {}^{\{\}}\mathrm{p}_1\}\}$ $=: \mathrm{c}_6$

Example: Let $\mathrm{p}_0 = {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1, \mathrm{w}_2, \mathrm{w}_3\}$,

$[\![ole]\!] = \mathrm{d}_0$

$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_0)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_0)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_0)\} = \{\}$

$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_1)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_1)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_1)\} = \{\}$

$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_2)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_2)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_2)\} = \{\mathrm{d}_2\}$

$\{\mathrm{d}|\ \mathrm{d} \in {}^{\{\}}[\![sick]\!](\mathrm{w}_3)\ \&\ \mathrm{d} \in {}^{\{\}}[\![dog]\!](\mathrm{w}_3)\ \&\ \langle[\![ole]\!], \mathrm{d}\rangle \in {}^{\{\}}[\![buy]\!](\mathrm{w}_3)\} = \{\mathrm{d}_1\}$

Then:

$*\mathrm{p}_0[\![[\mathbf{x}|\ (\mathbf{x} = ole)^{\circ}]]\!]^g$

${}^{\chi}\{\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle\ \rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_3, \mathrm{p}_0\rangle, \langle\ \rangle\rangle\}$

$\mathrm{c}_1[\![[v|\ v \in \top\omega\{|\}]]\!]^g$

${}^{\chi}\{\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{w}_0\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{w}_1\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{w}_0\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{w}_1\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{w}_0\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{w}_1\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_3, \mathrm{p}_0\rangle, \langle \mathrm{w}_0\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_3, \mathrm{p}_0\rangle, \langle \mathrm{w}_1\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_3, \mathrm{p}_0\rangle, \langle \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_3, \mathrm{p}_0\rangle, \langle \mathrm{w}_3\rangle\rangle\}$

$\mathrm{c}_2[\![[y|\ sick_{\perp\omega}\,y,\ dog_{\perp\omega}\,y,\ buy_{\perp\omega}\langle\top\delta, y\rangle]]\!]^g$

${}^{\chi}\{\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle \mathrm{d}_1, \mathrm{w}_3\rangle\rangle\}$

$\mathrm{c}_3[\![[p|\ p = \perp\omega\{|\}]]\!]^g$

${}^{\chi}\{\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\langle \mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}`, \mathrm{p}_0\rangle, \langle {}^{\chi}\langle \mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_2, \mathrm{p}_0\rangle, \langle {}^{\chi}\langle \mathrm{w}_2, \mathrm{w}_3\},\ \mathrm{d}_1, \mathrm{w}_3\rangle\rangle\}$

$\mathrm{c}_4[\![[\top\omega \notin \perp\Omega]]\!]^g$

${}^{\chi}\{\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_1, \mathrm{w}_3\rangle\rangle\}$

$\mathrm{c}_5[\![[\mathbf{p}|\ \mathbf{p} = \top\omega\{|\}]]\!]^g$

${}^{\chi}\{\langle\langle {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1\}, \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1\}, \mathrm{d}_0, \mathrm{w}_0, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_1, \mathrm{w}_3\rangle\rangle,$
$\langle\langle {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1\}, \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_2, \mathrm{w}_2\rangle\rangle,$
$\langle\langle {}^{\chi}\{\mathrm{w}_0, \mathrm{w}_1\}, \mathrm{d}_0, \mathrm{w}_1, \mathrm{p}_0\rangle, \langle {}^{\chi}\{\mathrm{w}_2, \mathrm{w}_3\}, \mathrm{d}_1, \mathrm{w}_3\rangle\rangle\}$