Multidimensional Compositional Dynamic Semantics

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The Problem

Previous compositional systems (Muskens 1996, Charlow 2014) for dynamic semantics (e.g. Groenendijk and Stokhof 1991) encode **the order of composition** in quantifiers' lexical entries although it **is non-arbitrary**.

The Solution

- Calculate a **static semantic value** and a **dynamic semantic value** for each node.
- **Convert from static to dynamic** meanings at key nodes (Matrix Ss, NPs) via Dynamic Lift ($\Uparrow$) .
- **Convert from dynamic to static** meanings when performing Abstraction ($\boldsymbol{\lambda_x}$).
- Use the **Copy Theory of Movement** (Chomsky 1995) to handle anaphora in quantifiers.

The System

Abbreviations

Trivial Formula: $\top = \{\langle g, g\rangle : 1{=}1\}$
Dynamic Lift: $\Uparrow\alpha = \langle\!\langle \alpha \rangle\!\rangle; \{\langle g, g\rangle : [\![\alpha]\!]^g{=}1\}$
$\Uparrow^x\alpha = \langle\!\langle \alpha \rangle\!\rangle; \{\langle g, g\rangle : [\![\alpha]\!]^g(g(x)){=}1\}$

Dynamic Semantic Values

(DS) $\langle\!\langle [\mathrm{S}_1\ \mathrm{S}_2] \rangle\!\rangle = \Uparrow \mathrm{S}_1; \Uparrow \mathrm{S}_2$ [Discourse Sequencing]
(ID) $\langle\!\langle [\mathrm{D}^x\ \mathrm{NP}] \rangle\!\rangle = [x]; \Uparrow^x \mathrm{NP}$ [Indefinite DPs]
(BN) $\langle\!\langle [\beta\ \gamma\ ] \rangle\!\rangle = \langle\!\langle \beta \rangle\!\rangle; \langle\!\langle \gamma \rangle\!\rangle$ [Other Branching Nodes]
(TN) $\langle\!\langle \mathrm{X}^0 \rangle\!\rangle = \top$ [Terminal Nodes]
(PA) $\langle\!\langle [\lambda_x\ \beta] \rangle\!\rangle = \top$ [Abstraction]

Static Semantic Values

Almost any static semantic theory will work! Heim and Kratzer (1998) is shown here, with the following changes:

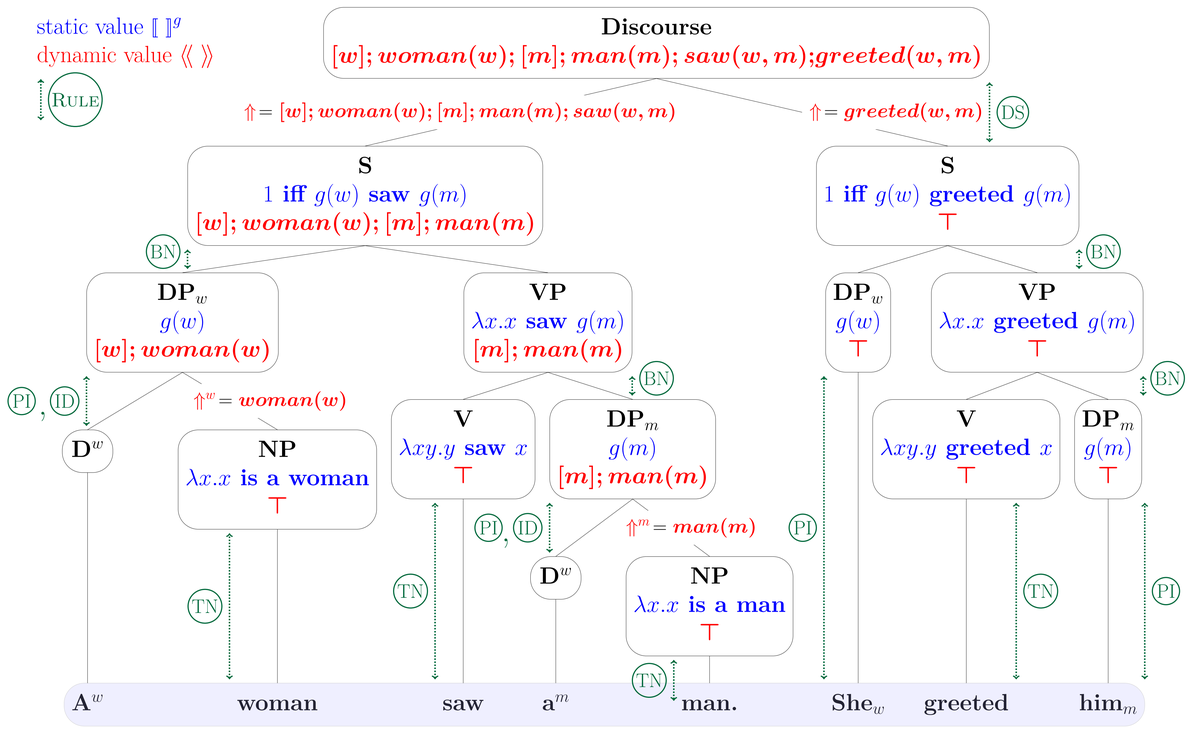
(PI) $[\![\mathrm{DP}_x]\!]^g = \mathrm{g(x)}$ [Pronouns & Indefinites]
(Replaces Traces and Pronouns Rule)

(PA) $[\![\lambda_x\ \beta]\!]^g = \lambda y.y{\in}\{h(x) : g(\Uparrow\beta)h\}$ [Abstraction (type t)]
$[\![\lambda^x_x\ \beta]\!]^g = \lambda y.y{\in}\{h(x) : g(\Uparrow^x\beta)h\}$ [Abstraction (type et]
(Replaces Predicate Abstraction Rule)

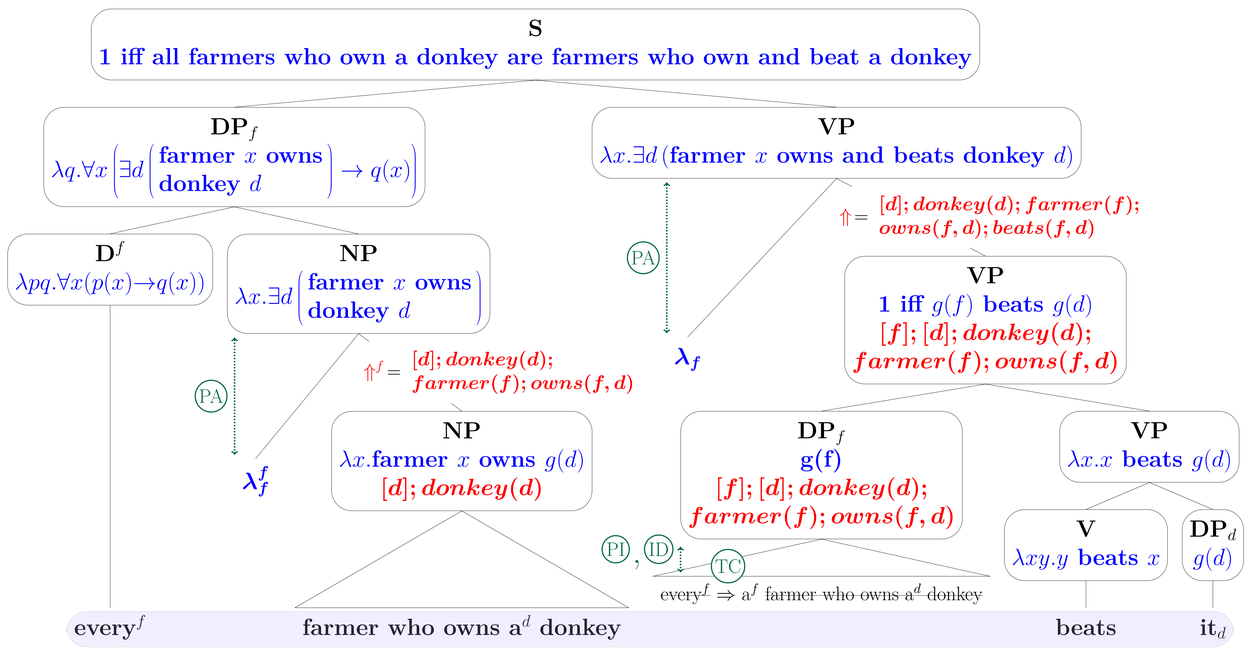
Trace Conversion (cf. Fox 2002)

(TC) Lower copy DPs act like Indefinites [Trace Conversion]

Example 1: Simple Cross-sentential Anaphora



Example 2: Donkey Anaphora



Empirical Advantage: Crossover

In this system, it's the **lower copy** of a raised quantifier (the one inside the VP) that effectively **binds coindexed pronouns** within its nuclear scope:

(1) … [VP **Every**^{g} **girl helped a**^{f} **friend of hers**$_g$]
$\Uparrow$ = [g]; girl(g); [f]; friend(f, g); helped(f, g)

Thus, **Weak Crossover** is correctly ruled out due to **free variables** in the inherently left-to-right formula:

(2) *… [VP **A**^{f} **friend of hers**$_g$ **helped every**^{g} **girl**]
$\Uparrow$ = [f]; friend(f, g); [g]; girl(g); helped(f, g)

Strong Crossover is out, too, as long as we assume pronouns have some content (e.g. "female" or "AGENT"):

(3) *… [VP **She**$_g$ **helped every**^{g} **girl**]
$\Uparrow$ = female(g); [g]; girl(g); helped(f, g)

The same goes for **"E-type Crossover"** where donkey anaphora is blocked when the quantifier trace is too low:

(4) *… [VP **A**^{f} **friend of hers**$_s$ **helped every**^{b} **boy with a**^{s} **sister**]
$\Uparrow$ = [f]; friend(f, s); [b]; boy(b); [s]; sister(s, b); helped(f, s)

(5) *… [VP **She**$_s$ **helped every**^{b} **boy with a**^{s} **sister**]
$\Uparrow$ = female(s); [b]; boy(b); [s]; sister(s, b); helped(f, s)

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