Continuations as a semantics-pragmatics interface for presuppositions

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Research questions

- How can all the components of a theory of presupposition be integrated in a single formal framework?
- What is the nature of the principles underlying the projection problem for presuppositions?

Take-home messages

- The projection of a presupposition can be conceptualised as an exception (as in computer programming), logical operators and quantifiers as exception handlers.
- In a proof-theoretic approach, cancellation of a presupposition can be seen as provability and the effect of operators can be based on a principle of plausibility of hypotheses.
- The above can be implemented in continuation semantics.

Some data

Mainly from Soames (1982), Heim (1983), Schlenker (2011).

(1) If the problem was difficult, then Morton isn't the **one** who **solved it**.

(2) **If John is 64 years old,** he knows that **he can't be hired**.

(3) If the king has a son, the king's son is bald.

(4) Mary knows that **there are infinitely many primes**.

Logical *vs.* heuristic principles

- If regularities in the data are accounted for by a principle that is a consequence of the logic used, any irregularity requires either changing the whole system or patching it with an additional layer.
- This is usually done by resorting to pragmatic mechanisms that often (i) are not rigorously integrated to the initial formalism and (ii) lead to new incorrect predictions.
- Instead, one could build a very expressive framework in which regularities are accounted for by heuristics, robust in their ability to handle irregularities.

Continuation semantics

- Can be seen as a generalisation of Montague (1973)'s type raising. It is a powerful tool to formalise the syntax-semantics interface (Barker & Shan 2014).
- (*À la* de Groote 2006) Each term has access to a local context variable (c) and its continuation, i.e., the future of the computation (ϕ).
- Lets one intertwine semantics and pragmatics (in the form of algorithms) rigorously in a single framework.
- A typical term performs some computation which includes executing its continuation on an updated context:

(5) $\lambda c\phi.\ [\cdots(\phi c')\cdots]$

- In our case, a context c consists of a list of formulas $[\phi_1, \cdots \phi_n]$ and represents the formula $\exists x_1, \cdots x_m.\ \phi_1 \wedge \cdots \wedge \phi_n$ where the x_i are the free variables of the ϕ_j.

Exceptions for presupposition

- When a presupposition is not satisfied, one needs to interrupt the flow of computation to either accommodate it or raise an objection (*Wait, do you mean that [...]?*).
- This is exactly what exceptions (from computer programming) allow one to do.

Triggering and accommodating

- If the presupposition cannot be proven from the local context, an exception is raised (extending Lebedeva 2012):

(6) $[\![\text{know}]\!] = \lambda Psc\phi.$
$\quad \texttt{if}(\textit{prove}(P, c)) : \textit{know}(s, Pc\,\textbf{stop}) \wedge \phi c'\,;$
$\quad \texttt{else} : \texttt{raise}\ \textbf{Presupposition}(P)$

- An occurrence of **gacc** scopes over each sentence S: it executes S and catches any presupposition P to accommodate it, i.e., to compute P with S as part of its continuation:

(7) $\textbf{gacc} = \lambda Sc\phi.\ (Sc\phi)\ \texttt{handle}\ \textbf{Presupposition}(P)$
$\quad \texttt{with}\ \textbf{gacc}\ Pc(\lambda c'.\ Sc'\phi)$

Conditionals (*if A, B*)

- In (9), a handler catches the presuppositions coming from the consequent and decides, through an algorithm $\textit{choice}_{if}$, whether to weaken it (2) or not (1).

(8) $[\![\text{if}]\!]_1 = \lambda ABc\phi.\ \neg(Ac(\lambda c'.\ \neg Bc'\,\textbf{stop})) \wedge \phi c'$

(9) $[\![\text{if}]\!]_2 = \lambda ABc\phi.\ \neg(Ac(\lambda c'.\ (\neg Bc'\,\textbf{stop})\ \texttt{handle}$
$\quad \textbf{Presupposition}(P)\ \texttt{with}$
$\qquad \texttt{if}\ \textit{choice}_{if}(c, A, P) : \texttt{raise}\ \textbf{Presupposition}(P)$
$\qquad \texttt{else} : \texttt{raise}\ \textbf{Presupposition}([\![\text{if}]\!]_1 AP)$
$\quad)) \wedge \phi c'$

- Always weakening leads to the predictions of satisfaction theory (e.g., Heim 1983); never leads to the ones of DRT (van der Sandt 1992); but the most plausible option can be selected as done by Lassiter (2012) with a probability measure *pr*:

(10) $pr_{(p::c)}(q) = \frac{pr_c(p \wedge q)}{pr_c(p)}$

A theory of presupposition?

- Cancellation of a presupposition is due to **provability** (with biases and bounded rationality) from the local context (4).
- The projection problem is governed by **plausibility**: upon catching a presupposition failure, logical operators and quantifiers generate a list of alternatives and project the most plausible one given the context.

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