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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:

$$(5) \lambda c\phi. [\dots(\phi c')\dots]$$
- In our case, a context c consists of a list of formulas $[\phi_1, \dots, \phi_n]$ and represents the formula $\exists x_1, \dots, x_m. \phi_1 \wedge \dots \wedge \phi_n$ 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):

$$(6) \llbracket \text{know} \rrbracket = \lambda Psc\phi. \text{if}(\text{prove}(P, c)) : \text{know}(s, Pc \text{ stop}) \wedge \phi c' ; \text{else} : \text{raise } \text{Presupposition}(P)$$
- 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:

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

Conditionals (*if A, B*)

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

$$(8) \llbracket \text{if} \rrbracket_1 = \lambda ABC\phi. \neg(\text{Ac}(\lambda c'. \neg \text{Bc}' \text{stop})) \wedge \phi c'$$

$$(9) \llbracket \text{if} \rrbracket_2 = \lambda ABC\phi. \neg(\text{Ac}(\lambda c'. (\neg \text{Bc}' \text{stop}) \text{ handle } \text{Presupposition}(P) \text{ with } \text{if } \text{choice}_{\text{if}}(c, A, P) : \text{raise } \text{Presupposition}(P) \text{ else} : \text{raise } \text{Presupposition}(\llbracket \text{if} \rrbracket_1 AP))) \wedge \phi c'$$
- 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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