

Continuation-based semantics for conventional implicatures and the Japanese benefactive

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Potts' (2005) innovative theory of conventional implicatures (CIs) has provided us with a formal tool for investigating an empirical domain hitherto largely unexplored. The central property of his CI logic is its multidimensionality, which is intended to capture the independence of CI meanings from ordinary truth conditions (which Potts calls the 'at-issue' meaning): most importantly, the combinatoric system is defined in such a way that it computes the two kinds of meaning independently. As a convenient way to achieve this effect, Potts introduces a type distinction between at-issue and CI meanings in the semantic translation language and furthermore crucially makes use of representational devices to keep at-issue and CI meanings separate. This design architecture of the theory (in particular, the type distinction in the translation language) entails (1), which supposedly captures a meaningful generalization about CIs:

- (1) No lexical item contributes both an at-issue and a CI meaning. (Potts 2005: 48)

It turns out, however, that the necessity to treat CIs separately from at-issue meanings does not immediately call for a representational treatment (as stressed, for example, by Amaral et al. (2007)), nor is the purported generalization in (1) secure. Evidence against (1) comes from the so-called benefactive constructions in Japanese:

- (2) Taroo-ga Hanako-ni piano-o hii-te morat-ta.
Taro-NOM Hanako-DAT piano-ACC play BENEFACTOR-PAST
at-issue: 'Taro made Hanako play the piano.'
CI: 'Hanako's playing the piano was beneficial to Taro.'

The subject-oriented benefactive verb *morau* identifies its dative argument (Hanako) as the logical subject of the embedded verb (*hii-te* 'play'); the sentence as a whole describes some kind of causative event in which Taro (the matrix subject) makes Hanako play the piano, which is a beneficial state of affairs for him. The benefactive meaning involved here is a CI rather than a presupposition or an at-issue meaning: unlike presuppositions, it does not need to be in the common ground of the utterance context and the truth of the sentence can be judged independently of its truth (thus, 'Yes, he did make Hanako play the piano, but it wasn't for the benefit of him' is a felicitous response to (2)), yet, unlike at-issue meanings, it scopes out of 'presupposition holes' (e.g. the negation of (2) conveys the same CI as (2)). Thus, *morau* contributes both an at-issue causative meaning and a benefactive CI, clearly falsifying (1).

Now, the basic idea underlying Potts' theory is that CIs are chunks of meaning that are conventionally associated with certain lexical items or constructions but which are evaluated outside the local contexts in which they appear. This, then, is a kind of 'delayed evaluation', which the mechanism of continuations (Barker 2002, Barker & Shan 2006, 2008) is suited to handle. Guided by this intuition, we propose in this paper a novel, non-representational analysis of CIs in terms of continuations. Our approach, while fully maintaining the essential insights of Potts (2005), is both theoretically more parsimonious (by completely dispensing with a phenomenon-specific representational device) and empirically more adequate (by straightforwardly handling the problematic Japanese benefactive case) than Potts' (2005) original theory.

We first illustrate our approach by translating Potts' treatment of the expressive adjective *damn* in our system. The idea in a nutshell is to posit a special continuation level (a continuation level can be thought of as a layer of meaning that is kept separate from the local meaning composition but that takes effect when a larger context that licenses its evaluation is found) for storing CIs, which then successively get inherited to larger expressions and are evaluated only in the context of matrix assertions (the restriction on the evaluation context is imposed by positing a special syntactic category *Assn* (which never embeds under other categories) for matrix assertions together with a unary syntactic rule $\text{Assn} \rightarrow \text{S}$ without any meaning change). Adopting the 'tower notation' of Barker & Shan (2008), the lexical entry for *damn* can be specified as follows (this notation should not be confused as a representational trick; all of our semantic translations can be rewritten using ordinary lambda terms):

- (3) $\langle \text{damn}; \frac{\text{Assn}|\text{Assn}}{\text{N}}/\text{N}; \lambda X. \frac{\text{bad}^{(\text{X})} \wedge []}{\text{X}} \rangle$

This combines with the noun *republicans* by function application to yield the following:

$$(4) \langle \textit{damn republicans}; \frac{\text{Assn}|\text{Assn}}{\text{N}}; \frac{\text{bad}(\ulcorner \text{republicans} \urcorner) \wedge []}{\text{republicans}} \rangle$$

The syntactic category in (4) should be read counterclockwise from the bottom: the expression behaves as an N in its local context and takes scope over Assn (top right corner) to return an expression of category Assn (top left corner). Correspondingly, in semantics, the term below the line denotes the local meaning contribution and the term above the line specifies the semantic effect that obtains when the continuized meaning is evaluated in the appropriate larger context: roughly, this semantic tower says that the CI encoding the speaker’s negative attitude toward republicans (shown above the line) is to be added to the assertion of the sentence (which, as in (5), is calculated below the line and consists solely of the at-issue content before this evaluation of the CI). The grammar is equipped with continuation-sensitive syntactic and semantic combinatoric rules that compose the local meanings and continuized meanings separately at each step of the derivation (see Barker & Shan (2006, 2008) for details). Thus, with the assumption that a general type-lifting rule assigns ‘lifted’ categories and meanings to other expressions (with the continuation level like (4) but making substantial contributions only to the local, at-issue meaning), the analysis of the whole sentence goes through to derive the following:

$$(5) \langle \textit{the damn republicans are cutting taxes}; \frac{\text{Assn}|\text{Assn}}{\text{Assn}}; \frac{\text{bad}(\ulcorner \text{republicans} \urcorner) \wedge []}{\text{cut-tax}(\ulcorner \text{republicans} \urcorner(x))} \rangle$$

At this point, since the local syntactic category matches the input category (top right corner) of the continuation, an operation called ‘Lower’ can be applied to collapse the continuation level and the at-issue level by plugging the term below the line to the hole designated by [] in the term above the line, which yields the final translation $\text{bad}(\ulcorner \text{republicans} \urcorner) \wedge \text{cut-tax}(\ulcorner \text{republicans} \urcorner(x))$ for the whole sentence. (For simplicity, here the at-issue and CI meanings are conjoined by \wedge , but a more formally adequate treatment should employ the product operator \bullet in place of \wedge to maintain the separate status of the CI meaning from the at-issue meaning.)

Unlike Potts’ system, our continuation-based system does not entail (1). Thus, an analysis of the Japanese benefactive is straightforward with the lexical entry for *morau* in (6):

$$(6) \langle \textit{morau}; (\text{NP}_n \backslash \text{S}) \backslash \text{NP}_d \backslash \text{NP}_n \backslash \frac{\text{Assn}|\text{Assn}}{\text{S}}; \lambda f \lambda x \lambda y. \frac{\text{benef}(y, f(x)) \wedge []}{\text{cause}(y, f(x))} \rangle$$

The verb subcategorizes for an embedded VP (or $\text{NP}_n \backslash \text{S}$) and identifies its unsaturated subject slot with its own dative argument and further adds an at-issue meaning that a causative relation holds between its own subject and the embedded event and a CI meaning that a benefiting relation holds between the two. By supplying the arguments and projecting the matrix S to Assn, the whole sentence is analyzed as follows:

$$(7) \langle (2); \frac{\text{Assn}|\text{Assn}}{\text{Assn}}; \frac{\text{benef}(\text{t}, \text{play-piano}(\text{h})) \wedge []}{\text{cause}(\text{t}, \text{play-piano}(\text{h}))} \rangle$$

The fact that CIs scope over operators such as negation also straightforwardly falls out by assuming that such operators take scope over the category S. This ensures that these operators are always integrated with the at-issue meanings before Lower merges the CI and at-issue meanings. Thus, the independence of CIs from at-issue meanings is captured fully adequately.

So, what do we learn from this continuation-based analysis of CIs? In a sense, we have verified Potts’ (2005: 73) promissory remark that his CI logic can be recast in non-representational terms with the help of what he would (quite aptly) characterize as ‘semantically informed syntactic categories’: as is clearly visualized in the tower notation, the syntactic category Assn for the continuation level is what separates the CI and at-issue ‘dimensions’ for us. More illuminating, however, is the conclusion that we seem to have arrived at that, even for a phenomenon like CIs (for which a representational account initially seems particularly apt), a non-representational alternative turns out to be more promising both empirically and theoretically. This result, we believe, has significant implications for the ongoing debate between representational and non-representational approaches to semantics.

References Amaral, P., C. Roberts & E. A. Smith. 2007. Review of *The Logic of Conventional Implicatures* by Chris Potts. *L&P* 30: 707–749. Barker, C. 2002. Continuations and the nature of quantification. *NALS* 10:211–242. Barker, C. & C.-C. Shan. 2008. Donkey anaphora is in-scope binding. *Semantics and Pragmatics* 1:1–42. Potts, C. 2005. *The Logic of Conventional Implicatures*. OUP. Shan, C.-C. & C. Barker 2006. Explaining crossover and superiority as left-to-right evaluation. *L&P* 29: 91–134.