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Prospects for a Syntactic Analysis of Conservativity

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Recent suggestions that the conservativity property of natural language detemerminers is related to the copy theory of movement are reviewed. It is found that copy theory in its present form is not sufficient to guarantee that non-conservative determiners have trivial truth conditions in quantifier raising constructions. Possible augmentations of copy theory are discussed.

Keywords Generalized Quantifier Theory, Copy Theory, Conservativity

Introduction

The model theoretic tradition in semantic analysis maintains that determiners denote functions from properties to sets of properties, where in an extensional model a property is a set of individuals. For a determiner d and properties p and q I write '$d(p,q)$' for '$[d(p)](q)$' and refer to p as d's 'restrictor' and to q as its 'nuclear scope'. Barwise and Cooper (1981) and Keenan and Stavi (1986) claim that natural language determiners denote 'conservative' functions. The denotation of a conservative determiner function is insensitive to that portion of the nuclear scope that is not included in the restrictor. Keenan and Stavi define conservativity as in (1a). Put another way, conservative determiners display the equivalency in (1b) for any choice of p and q.

(1) a. A function f is *conservative* iff for all properties p, q $p \in f(q)$ iff $(p \wedge q) \in f(q)$.
b. $[\![d(p,q)]\!] = [\![d(p,p \wedge q)]\!]$

Fox (2002) and Sportiche (2005) entertain the possibility that the conservativity property of determiners falls out from the copy theory of movement (Chomsky 1993) in combination with the fact that natural language determiners are what Barwise and Cooper call 'sieves', that is, functions that are neither always true nor always false, which Sportiche characterizes as a prerequisite for learnability. This claim is evaluated here. It is found that copy theory in its present form is not sufficient to derive the conservativity property but that in combination with an additional stipulation the suggestion made by Fox and Sportiche is feasible.

1 The Semantic Consequences of Copy Theory

To capture reconstruction effects within a theory of syntactic movement, Chomsky (1993) claims that movement of a term leaves a copy of that term in the extraction site. Fox (2002) claims that moved DPs are interpreted by a transform that he calls 'Trace Conversion', defined in (2), where the expression $\lambda y(y=x)$ modifes Pred and x is the variable bound by the moved quantifier. Raising of the quantifier *every boy* in (3a) derives the representation in (3b), which is interpreted by trace conversion as in (3c).

(2) (Det) Pred $\rightarrow$ the [Pred $\lambda y(y=x)$]

(3) a. a girl talked to every boy
b. every boy$_x$ [a girl talked to [every boy]$_x$]
c. every boy$_x$ [a girl talked to [the [boy $\wedge$ $\lambda y(y=x)$]]]

In a footnote, Fox remarks that for a determiner D that is not conservative, “figuring out the truth value of D(A,B) requires verifying membership in B for individuals that are not members of A. However, given the copy theory of movement and Trace Conversion, the (characteristic function of the) second argument of D is a partial function defined only for elements that are members of A. It is reasonable to assume that this situation would yield systematic presupposition failure” (p. 67).

Sportiche (2005) claims that while determiners are base generated in functional structure above the verb phrase, the determiner’s restriction is base generated in a theta position, where it is subject to selectional constraints locally imposed by the predicate. The base structure of the sentence *Every cat slept* is roughly that in (4a), in which the determiner *every* is VP external and the restriction *cat* is in a VP internal theta position. Movement of *cat* into the restriction of *every* leaves a copy in the theta position, deriving the representation in (4b). The two VP internal predicates are interpreted intersectively, so that the representation in (4b) asserts that every cat is a cat who slept.

(4) a. [$_{\text{TP}}$ every [$_{\text{VP}}$ cat sleep]]
b. [$_{\text{TP}}$ every cat [$_{\text{VP}}$ cat sleep]]

Sportiche remarks that if D were non-conservative, then “if the syntactic structure of D NP VP really is D NP [NP V’], such a sentence would always be false for any NP, since it would say that [some non-NPs] have the property NP (and the property V’)” (p. 85).

Consider the hypothetical determiner *flish* with the denotation in (5a). *Flish* is true of properties p and q iff there are more than three q’s that are not p’s. The sentence *Flish linguists are vegetarians* is true if there are more than three vegetarians who are not linguists (5b). For *flish* to be conservative, the expression *flish(linguist,vegetarian)*, which has the truth conditions spelled out in (5b), would have to be equivalent to the expression *flish(linguist, linguist $\wedge$ vegetarian)*, which has the truth conditions spelled out out in (5c). That this is not so is evident. *Flish* is non-conservative.

(5) a. $[\![\text{flish(p,q)}]\!] = 1$ iff $|[\![\text{q}]\!]-[\![\text{p}]\!]| \geq 3$
b. $[\![\text{flish(linguist, vegetarian)}]\!]$ =1 iff there are more than three vegetarians who are not linguists
c. $[\![\text{flish(linguist, linguist} \wedge \text{vegetarian)}]\!]$ = 1 iff there are more than three vegetarians who are linguists who are not linguists

Consider now the interpretation of this hypothetical non-conservative determiner in intensional contexts. (6) asserts, according to (5a), that there are more than three things that seem to be in the garden that are not unicorns (i.e., several non-unicorns seem to be in the garden).

(6) Flish unicorns seem to be in the garden.

On the Fox/Sportiche account, (6) has the LF in (7), with a representation of the quantifier restrictor inside the nuclear scope.

(7) Flish unicorns [seem to be unicorns in the garden]

This LF is interpreted as the assertion that there are more than three things that seem to be unicorns in the garden, that are not in fact unicorns. This assertion is likely to be true in the real world if three things that could be mistaken for unicorns are in the garden, but would be false if there were only two non-unicorns in the garden or if three things in the garden actually did turn out to be unicorns. As cases like this show, positing a copy of the quantifier restriction in the base position of the quantifier does not alway lead to the systematic contradiction equivalent in effect to the conservativity restriction. That copy theory does not always produce structures that mimic conservativity is evident in the side-by-side comparison in (8). (8a) is the interpretation imposed on (6) by conservativity. (8b) is the LF postulated by Fox and by Sportiche.

(8) a. flish(unicorns, unicorns $\wedge$ seem to be in the garden)
    b. flish(unicorns, seem to be unicorns in the garden)

There is a difference in the scope of the 'double' of the quantifier restriction in the two formulas. The restriction is predicate external in (8a) and predicate internal in (8b). (8b) does not restrict the meaning of *flish* to the conservative (systematically contradictory) one.

2 Possible Directions

Fox casts his copy of the quantifier restriction as a definite description to ensure that the result of Trace Conversion is individual-denoting. Trace Conversion creates an LF with an occurrence of the word *the*. Though Fox does not elaborate on the interpretation of this term, his paraphase of (9a) as (9b) suggests that *the* in his formula has roughly the same meaning as its metalanguage counterpart, which is arguably world invariant.

(9) a. every boy a girl talked to every boy [derived structure]
    b. For every boy x, there is a girl who talked to *the boy x* [interpretation after trace conversion]

Definite descriptions presuppose the existence of an instance of the restrictor property, so that, for example, *the unicorn* in (10) is understood to be an actual unicorn though it may or may not actually be in the garden (Strawson 1950).

(10) It seems that the unicorn is in the garden.

The fact that definite descriptions do not interact with intensional operators would ensure that traces, if they are definite descriptions, always attribute the property denoted by the restrictor of their antecedent to a real-world entity. Then (7) would denote the contradictory assertion that there are more than three *actual* unicorns in the garden, that are not unicorns. But the existence presupposition of definite descriptions is too strong a requirement for the trace of raised quantifiers, since it would commit to the existence of an instance of the quantifier restriction whenever movement obtains. Movement has arguably obtained in (11a), where the subject *no unicorn* occurs to the left of the auxiliary (Koopman and Sportiche 1991). But however the trace conversion in (11b) is interpreted, the function of *the* there does not have the effect of asserting the existence of a unicorn in the real world. If it did, (11a) would make the contradictory assertion that no unicorn will be the unique real-world unicorn on exhibit at the state fair this year. The term *the* in Fox's Trace Conversion is therefore not the English word *the*, and the existence presupposition of the English word *the* will not help us derive conservativity.

(11) a. No unicorn will be on exhibit at the state fair this year.
b. no unicorn$_x$ will be [the [unicorn $\wedge$ $\lambda y(y = x)$]] on exhibit at the state fair

Sportiche mentions a similar issue in connection with the example in (12) (modified slightly from his (147), p. 85).

(12) Which democrat doesn't John think won?

The fact that the individual in question is a democrat is not necessarily asserted to be part of the thought attributed to John. That is, (13a) represents a better characterization of the meaning of (12) than (13b). If (12) were interpreted along the lines of (13b), then we could answer "Bill" if John does not think that Bill is a democrat, regardless whether he thinks he won.

(13) a. For which democrat *x*, John doesn't think that *x* won
b. For which democrat *x*, John doesn't think that *x* is a democrat and *x* won

Sportiche claims that the restriction of *which* and its copy are not two distinct objects for the purposes of semantic computation and consequently cannot differ in the value of their world variable. An implementation of this idea might look like the following. Assume that *think* is interpreted along the lines presented in Heim and Kratzer's (1998) implementation of Hintikka's (1962) analysis of the meaning of *believe*. The sentence *John thinks that x won* is represented in (14), where "dox$_w$(John, w')" reads "w' is compatible with what John believes in w".

(14) $[\![\text{John thinks that x won}]\!]^w = \forall w'\ \text{dox}_w(\text{John}, w') \rightarrow [\![x \text{ wins}]\!]^{w'}{=}1$

If we coordinate *x won* with *x is a democrat* we get the problem that Sportiche describes—that we have attributed to John the belief that *x* is a democrat (15).

(15) $\forall w'\ \text{dox}_w(\text{John}, w') \rightarrow [\![x \text{ wins}]\!]^{w'}{=}1 \text{ and } [\![x \text{ is a democrat}]\!]^{w'}{=}1$

If we assume as Sportiche suggests that the description *democrat* inherits the world variable of its antecedent—the value with respect to which the matrix clause is interpreted (the 'real' world)—we get (16).

(16) $\forall w'\ \text{dox}_w(\text{John}, w') \rightarrow [\![x \text{ wins}]\!]^{w'}{=}1$ and $[\![x \text{ is a democrat}]\!]^{w}{=}1$

We could extend this characterization to the problem that (7) presents, taking *seem* to quantify over worlds experientially accessible to an implicit experiencer y.

(17) $\forall w'\ \text{exp}_w(y, w') \rightarrow [\![x \text{ is in the garden}]\!]^{w'}{=}1$ and $[\![x \text{ is a unicorn}]\!]^{w}{=}1$

Now the descriptions *democrat* and *unicorn* contain no variables bound within the scope of the world quantifiers *think* and *seem* respectively. We have, in effect, semantically removed these descriptions from the world-creating predicate in which they occur in the surface structure. The 'in situ' description is for all practical purposes interpreted outside the scope of the clausemate intensional predicate. In configurational terms, we interpret a representation like (18a) (cf. (8b)) as if it were the one in (18b) (cf. (8a)).

(18) a. $[\ldots p \ldots]_q$
b. $[p \wedge q]$

Without a semantic intervention of the type Sportiche suggests, the in situ copy of the raised quantifier in each of these cases is too low in the structure to have the effect of the representation in (18b). That is, the problem with the copy theory explanation of conservativity arises because of the low scope of the copy. Consequently, copy theories of movement would straightforwardly derive the conservativity restriction if they raised the copy, or, more plausibly, if they required a raised quantifier to adjoin a copy of its restriction to its nuclear scope *en passant* (whether or not it also leaves a copy in the base position), deriving a representation like (19b) from (19a), where Q is any quantifier (recall though that according to Sportiche only the restriction is included in the base structure in (19a), not the quantifier).

(19) a. [seems to be Q unicorn in the garden]]]
b. [Q unicorn$_i$ [[unicorn]$_i$ [seems to be unicorn$_i$ in the garden]]]

If this is so, then movement could in fact be held indirectly responsible for the conservativity property of determiners, though the lowest copy would play no role in this effect, and we still need a way of ensuring that the lowest copy is interpreted with respect to the same world as its antecedent. The fact that movement is successive cyclic presents a possible explanation for the representation in (19b), but I know of no evidence specifically corroborating the intermediate step in that representation.

Conclusion

I conclude that the copy theory of movement in its present form does not readily lend itself to an explanation for the conservativity property of natural language determiners. In a revised theory which posits an obligatory final step of movement through a position directly below the ultimate landing site, the conservativity restriction could be characterized as an aftereffect of the resulting syntactic structure, but the copy in the base position plays no role, and in fact must be effectively invisible for some purposes.

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