Interpreting Dependent NPs

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In the Stat’imc’ets quantifier system no generalised quantifier can take scope over another and Stat’imc’ets therefore only has cumulative readings for QNP V QNP sentences (cf. Davis, Matthewson).

Each boy drank 5 beers

in Stat’imc’ets can only mean that while all boys participated in the drinking, the total beer consumed was not more than 5 beers. ”Each” merely means that the predication applies to all boys as individuals, ”5” merely that the cardinality of the NP denotation is 5. Frame semantics predicts the cumulative reading merely by the idea of projection through thematic roles: the beers are the projection of the set of events denoted by the verb through the theme role, the boys its projection through the agent role.

The Stat’imc’ets data gives an argument for frames (or interpreted dependency trees, or certain kinds of event semantics) as the basis for NL semantics rather than (extensions of) first order logic, since in the latter formalism quantifiers are predicted to have scope over each other by default and cumulative readings have to be painfully reconstructed. The Stat’imc’ets data seem to show that rather than scope taking readings, cumulative readings are the typologically unmarked case for QNP V QNP sentences and in the absence of marking (floating quantifiers and corresponding determiners like both, each and every) the cumulative interpretation also seems the default in English.

Stat’imc’ets has however a formally distinct category of dependent NPs which together with possessive NPs allow for readings dependent on quantifiers (cf. Matthewson). These readings need to be accounted for, just like the possibility of the Stat’imc’ets system leading to a system like English in which all NPs can be dependent.

The talk will present a semantics for dependent NPs using a new attribute domina which links a dependent NP to its dominant NP (or other operator). Dependent NPs will have denotations that are functions from some domain to their ordinary denotations, with the domain determined by the denotation of the dominant NP. The domina attribute can only link NPs that are reachable by functions \( f_1 \) and \( f_2 \) from a superordinate verb node, denoting a set of events. In the simplest case, \( f_1 \) and \( f_2 \) are theta roles of the verb. The dependent NP will denote a function \( F \), from a domain \( D \) to its possible normal denotations, with \( D \) determined by the denotation of the dominant NP. In again the simplest case -when the dominant NP is not itself dependent on another NP, \( D \) is just the denotation of the dominant NP. It must now be the case, that \( F(x) \) is the projection under \( f_2 \) of the verb extension restricted to those events \( e \) in which \( f_1(e) = x \).

Continuing our earlier example and assuming a domina link from ”five beers” to ”each boy”, “five beers” denotes a function \( F \) from the boys to sets of five beers, such that if \( x \) is a boy, \( F(x) \) are the five beers that \( x \) drank. If one can find the set of beer drinking events, the set of boys and \( F \) as indicated, the sentence is true.

If the dominant NP itself denotes a function \( G \), the domain \( D \) of the dependent NP is \( \{ \langle x, y \rangle : x \in \text{domain}(G), y \in G(x) \} \).
Dependent NP interpretations would naturally arise out of special cumulative interpretations of sentences with possessive NPs like:

The boys like their aunts.

In such interpretations, minimally, one needs a function from the boys to some of the aunts, such that its range covers the aunts. If aunthood matters, as it is bound to be, the function that maps each boy to his own aunts is a prominent one, so prominent that it can lead to reanalysis in which their aunts is a dependent NP. If special dependent NPs derive from possessives, this would be the source of the typological possibility to have quantifiers in the scope of other quantifiers.

The new treatment has considerable advantages over FOL based approaches to quantifiers over quantifiers, next to its typological credentials. The treatment of the Barry Schein mixed cases (cf. Schein) is particularly easy. (In: Each basketball player learnt two new tricks from these videos, just add a domina arrow from the two new tricks to the basketball players. (forced by ”each”)

1. The dependent pronoun problem is trivialised. In All my colleagues fight with their wives. But they do not beat them just interpret “they” and “them” as their antecedents, inferring the domina arrow from the types.

2. The quantifier scope ambiguities are much reduced. Only plural NP (counting each and every NPs as plural) give rise to different readings when they dominate or not. Cumulative readings for a singular NP is just the readings in which they have wide scope. Island constraints are predicted by the constraint on dependency that both dominant and dependent NP are at the end of a path starting in the same verbal node. Most importantly: one gets a grasp on disambiguation: marking and absurdity drive one from the default cumulative readings to inserting dependencies.

3. The treatment overcomes the disharmony established by Zwicky between semantic and syntactic heads by abolishing generalised quantifiers in favour of functional denotations for dependent NPs. It allows a semantics for dependency grammar in which the syntactic head is always also the semantic head.

4. Viola Schmitt’s account of conjunction in which all conjunctions can give rise to cumulative readings can be incorporated. In fact it adds to the account by predicting that in: John and Bill both kissed Sue and Maria ”Sue and Maria” is dependent on ”John and Bill” denoting a constant function, which gives the reading in which both boys kissed both girls.

5. Dependency on negation should give a handle on NPIs. But that is work for the future.

It seems not possible to define dependent NPs in an extension of first order logic. The restriction that the dominant and dependent NP are both functionally linked to a superordinate verb node is essential and that notion makes sense only in frame semantics (or closely related styles of semantics).

References