Wide-scope distributivity

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I. Overview: We propose an analysis of what we call wide-scope distributivity (WSD). WSD sentences, like (1-3), are interpreted as if a plural definite description or a pronoun were interpreted distributively, taking scope over a scope island (e.g. disjunction, when-clauses). These cases pose an immediate challenge to approaches that only posit a distributivity operator operating on predicates (e.g. $[\![D\ \alpha]\!] = \lambda X.\ \forall x \in \textbf{Atom}(X), [\![\alpha]\!](x)$ c.f. Link, 1983, Winter, 2000, Beck and Sauerland, 2000, a.o.), since the operator would need to apply to a predicate that can only be formed by an island-escaping movement. We argue that this data calls for an analysis where distributivity operators carry indices (as found in plural logics: Berg, 1996, Nouwen, 2003 for instance) and can be separated and remote from the plurality they distribute over. Specifically, our analysis of the WSD modifies the Skolem function approach of Sudo, 2014, adapting the semantics of the distributivity operator to this design specification.

II. Data: Speakers report that (1) can be read as "every participant was either made sleepy or made sick", (2) as "For every new book, the librarian didn't both label it and shelve it", and (3) as "each of these employees is such that when he/she arrived, Alex smiled". The corresponding universal statements cannot receive such interpretations, indicating that the relevant readings are not derived through QR.

(1) **Pretext:** *What are the results of the experiment?*
   a. Well, either the drug made the participants sick or it made them sleepy (but no one was cured)
   b.?? Well, either the drug made every participant sick or it made him/them sleepy (but no one was cured)

(2) **Context:** *Usually, the librarian labels all of the new books and shelves them. This time, he split these tasks between his assistant and him: he labelled some of the books and shelved the others and his assistant did the rest.*
   a. This time, the librarian didn't both label the new books and shelve them.
   b.?? This time, the librarian didn't both label every new book and shelve it/them.

(3) **Context:** *the employees have different work hours and do not all arrive at the same time.*
   a. When these employees arrived this morning, Alex smiled (but she didn't smile when those ones did.)
   b. # When each of these employees arrived this morning, Alex smiled (but she didn't smile when those ones did.)

WSD has not, to our knowledge, been discussed in full in previous literature. The cases discussed in the literature (e.g. [the people who voted for Street and Weinberg]$_\alpha$ thought they would win from Dimitriadis, 2000) all have the antecedent plurality embedded in a relative clause. Standard accounts of these cases (Dimitriadis, 2000; Sudo, 2014) therefore assume that *they* is akin to a paycheck pronoun (=the person x voted for) whose variable is truly bound by the mediating DP (= α). Such an analysis cannot however extend to the cases of conjunction and disjunction presented above, since no DP there can play the role of the intermediary α.

For (3), one could conceive an analysis where the when-clause and the plural definite are read cumulatively (=all the times that together contain the arrivals of these employees), assuming that times just as individuals have plural counterparts (Ferreira, 2004). This would correctly ensure that the sentence is felicitous when the employees arrive at different times. Such a move is problematic however: it results in over-generating cumulative readings for sentences like "when two employees arrived, . . . " (=all the times that together contain the arrivals of two employees), predicting the when-clause to be felicitous when the arrivals of the two employees happened at different times, contrary to speakers' intuitions.

III. Analysis: We posit an index-bearing distributivity operator that can freely be inserted at any scope position. This operator acts as a universal quantifier over Skolem functions (definitions in 4).

(4) $[\![D_j\ \alpha]\!]$ = true iff $\forall f \in$ **Skolem**, $[\![\alpha]\!]^{g[j/f]}$ where **Skolem** $= \{f \in D_{ee} \mid \forall X \in D_e,\ f(X) \preceq X\}$

We adopt the assumption from Sudo (2014) that pronouns may bear complex indices such as $j(i)$. Pronouns bearing the index $j(i)$ refer to the image of $g(i)$ by the function $g(j)$ (see (6)). With this assumption, the Skolem function made available by an operator D_j at index j can be used to create distributive readings of plural pronouns in its scope (cf derivation in (5))

(5) D_1 either [they$_{1(2)}$ turned sick] or [they$_{1(2)}$ turned sleepy]. $(g[1 \mapsto \texttt{subjects}'])$

a. $[\![\text{they}_{1(2)}\text{ turned sick}]\!]^{g[2/f]} = \texttt{sick}'\left[g(2)(g(1))\right] = \texttt{sick}'\left[f(\texttt{subjects}')\right]$

b. $[\![\text{they}_{1(2)}\text{ turned sick or they}_{1(2)}\text{ turned sleepy}]\!]^{g[2/f]} = \texttt{sick}'\left[f(\texttt{subjects}')\right] \vee \texttt{sleepy}'\left[f(\texttt{subjects}')\right]$

c. $[\![(5)]\!]$ = true iff $\forall f$, $\texttt{sick}'\left[f(\texttt{subjects}')\right] \vee \texttt{sleepy}'\left[f(\texttt{subjects}')\right]$
iff $\forall x \in \texttt{subjects}'$, $\texttt{sick}'(x) \vee \texttt{sleepy}'(x)$

To extend this analysis of WSD to other referential DPs, we propose that referential DPs which carry an index are interpreted just like pronouns, in line with familiarity approaches to referential expressions (Heim, 1982; Roberts, 2003), with the presupposition that their descriptive content match the referent of their innermost index (see (7)). This ensures that while referring to singularities, the range of values that a referential DP takes is the plurality provided by its descriptive content. These new assumptions allow a derivation of (1) parallel to that in (5) and similarly for (2) and (3), informally derived in (8).

(6) a. $[\![pro_{\text{i}}]\!]^g = g(i)$

b. $[\![pro_{\text{j(i)}}]\!]^g = g(j)[g(i)]$

(7) a. $[\![\textbf{DP}_{\text{i}}]\!]^g = g(i)$
pres.: $g(i) = [\![\textbf{DP}]\!]^g$

b. $[\![DP_{\text{j(i)}}]\!]^g = g(j)[g(i)]$
pres.: $g(i) = [\![\textbf{DP}]\!]^g$

(8) a. $[\![(1)]\!]$ = true iff $\forall f$, $\texttt{sick}'\left[f(g(i))\right] \vee \texttt{sleepy}'\left[f(g(i))\right])$
$\rightsquigarrow$ **presupposition:** $g(i)$ = the subjects

b. $[\![(2)]\!]$ = true iff $\forall f$, $\neg\left(\texttt{label}'\left[f(g(i))\right] \wedge \texttt{shelf}'\left[f(g(i))\right]\right)$
$\rightsquigarrow$ **presupposition:** $g(i)$ = the books

c. $[\![(3)]\!]$ = true iff $\forall f$, when $f(g(i))$ arrived, Alex smiled.
$\rightsquigarrow$ **presupposition:** $g(i)$ = these employees

By limiting the use of indices to pronouns and referential expressions, we correctly predict the lack of WSD readings for other expressions like wide-scoping indefinites, a fact observed by Ruys (1992):

(9) If two relatives of mine die, I'll inherit a house. ($\exists r_1, r_2, \forall x \in r1, r2$, if x dies, I'll inherit a house.)

IV. Comparison with previous work: The data bear resonance with the work of Schmitt (2015) (see also Schmitt (2013), Haslinger and Schmitt (2018)). Schmitt studies cases like (10) where two pluralities separated by a island stand in a cumulative relation.

(10) The two lawyers have pronounced that the two proposals are against the law

She argues that (10) for instance is to be read as "$\forall l \in \texttt{lawyer}', \exists p \in \texttt{proposal}'$, *l pronounced p illegal and* $\forall p \in \texttt{proposal}', \exists l \in \texttt{lawyer}'$, *l pronounced p illegal*". The corresponding truth-conditions for (1) (="$\forall s_1, \exists s_2$, *the drug made* s_1 *sleepy or it made* s_2 *sick and* $\forall s_2, \exists s_1$, *the drug made* s_1 *sleepy or it made* s_2 *sick.*") result, after simplification, in the unattested weak reading in (11). It is therefore unclear that the readings studied in Schmitt (2015) and those in (1-3) should be given a uniform treatment.

(11) [The drug made some subject sick] and [the drug made some subject sleepy]

V. Conclusion: The data presented here is not accounted by a distributivity operator applying to predicates formed at LF. We propose instead a distributivity operator that carries an index and quantifies over Skolem functions. These Skolem functions may then only be accessed by referential expressions, accounting for the limited distributions of WSD. Furthermore, as the relationship between the descriptive content of

a referential expression and its denotation is indirect, our account can be extended to capture the "fake" participant/number features of plural dependent pronouns (Rullmann, 2002; Sudo, 2014).

Selected references: ■ Ruys, Eduard Gerbrandus (1992). *The scope of indefinites*. LEd. ISBN: 9054340096. ■ Schmitt, Viola (2015). "Cross-categorial plurality and plural composition". In: ■ Sudo, Yasutada (2014). "Dependent plural pronouns with Skolemized choice functions". In: *Natural Language Semantics* 22.3, pp. 265–297. ISSN: 0925-854X.