

A Glue Semantics Approach to Distance Distributivity

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1 Introduction

This paper provides a novel analysis of distance distributivity (e.g., Choe 1987, Safir and Stowell 1988, Zimmermann 2002, Dotlačil 2012) in Polish and other languages, which does not rely on coindexation or binding and does not involve empty categories. The account is couched within Glue Semantics (Dalrymple 1999). The resource-sensitive approach of Glue Semantics, based on functional structure, allows for more flexibility in combining meanings than strict rule-to-rule compositionality; we show that this flexibility is useful – if not crucial – for cross-linguistic analyses of distance distributivity.

Distance distributivity is illustrated by the following examples from English, German and Polish; the common feature is that the distributive element (*each, jeweils, po*) combines directly with the distributed NP (*distributive share*; cf. *two sausages* below) and that the plural NP denoting the restriction of the distribution (*sorting key*; cf. *boys*) may be expressed at some distance from the distributive element.

- (1) The boys have bought two sausages each.
- (2) Die Jungen haben jeweils zwei Würstchen gekauft. (German; Zimmermann 2002, p. 37)
the boys have DIST two sausages bought
- (3) Chłopcy kupili po dwie kiełbaski. (Polish)
boys bought DIST two sausages

Zimmermann 2002 – couched in the transformational grammar and roughly following the approach to semantics outlined in Heim and Kratzer 1998 – remains the most comprehensive account of distance distributivity in German and cross-linguistically, but it's not without problems. Dotlačil 2012 notes that on Zimmermann's account the relation between the distributive share and the sorting key must be expressed by a constituent in the syntactic tree (e.g., such a constituent exists for *have bought* in (1)), but examples where no such constituent may be posited are easily found, as in *Alex and Sasha visited the capitals of three states each* (there is no constituent corresponding exactly to *visited the capitals of*, even at LF, as movement out of NPs is prohibited). Moreover, while Zimmermann (2002) seeks to provide an account not relying on LF movement, he acknowledges that his analysis must assume such covert movement for some run-of-the-mill examples¹ (pp. 271ff.). Finally, his analysis does not seem to handle cases where the sorting key is syntactically embedded in the distributive share, as in the Polish example (4), whose schematic constituent structure is given in (5). While similar constructions are found in other languages,² we believe they – and the difficulties they cause – have not been noticed in the distance distributivity literature so far.

- (4) Przybyło po 3 przedstawicieli 25 krajów. (Polish)
arrive.PAST DIST 3 representatives 25.GEN countries.GEN
'3 representatives arrived from each of 25 countries.'
lit. '3 representatives of 25 countries each arrived.'
- (5) Przybyło [po [3 [przedstawicieli [25 krajów]]]].

2 Analysis

We propose an analysis which is free from such problems: it does not assume that the relation between the distributive share and the sorting key is expressed by a syntactic constituent, it is uniformly expressed at the interface between f-structure and s(ematic)-structure, and it correctly handles constructions exemplified by (4). The main idea of the account is that the semantic impact of *po* activates only once the distributive share combines semantically with the verb and creates a property *S*, e.g., once the meaning of *Przybyło (po) 3 przedstawicieli* (λY .) 3 representatives (of *Y*) arrived' in (4) above becomes available, but before the meaning of the sorting key (*25 krajów* '25 countries') is consumed. The meaning of *po* combines with this property *S* and produces a new property, $S' = \lambda Z.all(X, |X| = 1 \wedge X \subseteq Z, S(X))$. As a result, instead of *S* holding of an object *Z* (the sorting key), it must hold of all singleton subsets of *Z*. This new property combines with the sorting key, giving the appropriate meaning.

This analysis does not presuppose that the sorting key must bind the distributive share (Dotlačil 2012) or that it is otherwise coindexed with the distributive share (Zimmermann 2002). When the sorting key is expressed as an object and *po* is contained in the subject (see fn. 1 for a corresponding German example), the verb semantically combines with the subject first, producing a property which subsequently combines with the distributive meaning of *po* and with the sorting key. We illustrate this analysis in more detail on the basis of (4), whose f-structure is given in (7).

¹ Jeweils ein Offizier begleitete die Ballerinen nach Haus.
DIST one officer accompanied the ballerinas to home
'Each ballerina was accompanied home by one officer.'

(German; Zimmermann 2002, p. 27)

² Jeweils 3 Abgeordnete aus 25 Ländern trafen ein.
DIST 3 representatives from 25 countries arrived

(German; Malte Zimmermann, p.c.)

3 Worked-out example

While we cannot give all lexical entries here for lack of space, we show the meaning resources of particular word combinations. We follow Dotlačil 2012 and treat type e objects as sets. For example, $country^s$ is the property of being a non-empty set of countries. On this view, the standard subset relation \subseteq is defined on type e objects. Additionally, we assume that po equates the semantic structure of its object with the semantic structure of the whole po -phrase so, here, $\boxed{1}_\sigma = \boxed{2}_\sigma$.³

- (6) **po**:
 $\lambda S.\lambda Z.all(X, |X| = 1 \wedge X \subseteq Z, S(X)) :$
 $\forall G, H. [G \multimap H] \multimap [G \multimap H]$
- (7)
$$\left[\begin{array}{c} \text{PRED 'ARRIVED'} \langle \boxed{1} \rangle \\ \text{SUBJ } \boxed{0} \\ \text{OBJ } \boxed{1} \\ \text{PRED 'PO'} \langle \boxed{2} \rangle \\ \text{SPEC '3'} \\ \text{PRED 'REPRESENTATIVE'} \langle \boxed{3} \rangle \\ \text{OBJ } \boxed{2} \\ \text{SPEC '25'} \\ \text{PRED 'COUNTRY'} \end{array} \right]$$

- (8) **25 krajów**:
 $\lambda S.exists(X, |X| = 25 \wedge country^s(X), S(X)) : \forall H. [\boxed{3}_\sigma \multimap H] \multimap H$

- (9) **3 przedstawiciele**:
 $\lambda S.\lambda Y.exists(X, |X| = 3 \wedge representative^s(X, Y), S(X)) : \forall H. [\boxed{2}_\sigma \multimap H] \multimap [\boxed{3}_\sigma \multimap H]$

- (10) **przybyło**:
 $\lambda X.arrived(X) : \boxed{1}_\sigma \multimap \boxed{0}_\sigma \equiv$
 $\lambda X.arrived(X) : \boxed{2}_\sigma \multimap \boxed{0}_\sigma$ (see fn. 3)

- (11) **przybyło + 3 przedstawiciele** ($S \mapsto arrived, H \mapsto \boxed{0}_\sigma$):
 $\lambda Y.exists(X, |X| = 3 \wedge representative^s(X, Y), arrived(X)) : \boxed{3}_\sigma \multimap \boxed{0}_\sigma$

- (12) **po + przybyło 3 przedstawiciele** (assuming: $S \mapsto \lambda Y.exists(\dots), G \mapsto \boxed{3}_\sigma, H \mapsto \boxed{0}_\sigma$):
 $\lambda Z.all(X, |X| = 1 \wedge X \subseteq Z, exists(V, |V| = 3 \wedge representative^s(V, X), arrived(V))) : \boxed{3}_\sigma \multimap \boxed{0}_\sigma$

- (13) **25 krajów + przybyło po 3 przedstawiciele** (assuming: $S \mapsto \lambda Z.all(\dots), H \mapsto \boxed{0}_\sigma$):
 $exists(Z, |Z| = 25 \wedge country^s(Z),$
 $all(X, |X| = 1 \wedge X \subseteq Z,$
 $exists(V, |V| = 3 \wedge representative^s(V, X), arrived(V))) : \boxed{0}_\sigma$

4 Constraining analysis

Since the meaning of po given in (6) may combine with any property, the above analysis overgenerates. For example, in the Polish sentence *5 facetów dostało po 2 jabłka* ‘5 guys got 2 apples each’, the meaning of the verb *dostało* ‘got’ may first combine with either the meaning of the subject *5 facetów* ‘5 guys’ or the object *2 jabłka* ‘two apples’. Either of these properties may be consumed by the meaning of po , resulting in either of the nominal phrases being treated as the distributive share (and the other one as the sorting key). The solution to this problem, not fully explicated here for lack of space, is to treat the object of po as an item needing a licenser, and po – as providing such a semantic licenser, in a way analogous to the analysis of Negative Polarity Items in Fry 1999. As a result, only a property which contains the actual distributive share may combine with the meaning of po , so only the correct interpretation is obtained.

References

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³This may be an oversimplification, but the desired effect can also be achieved via an additional meaning constructor for po , namely, $\lambda P.P : \forall G. [\uparrow_\sigma \multimap G] \multimap [(\uparrow \text{ OBJ})_\sigma \multimap G]$, in (7) instantiating to $\lambda P.P : \forall G. [\boxed{1}_\sigma \multimap G] \multimap [\boxed{2}_\sigma \multimap G]$. After combining with the initial meaning constructor of **przybyło** in (10), this results in $\lambda X.arrived(X) : \boxed{2}_\sigma \multimap \boxed{0}_\sigma$.